# LIMITED LIABILITY COMPANY AGREEMENT
# OF
# CONSOLIDATED AUDIT TRAIL, LLC
# a Delaware Limited Liability Company

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**LIMITED LIABILITY COMPANY AGREEMENT**
**OF**
**CONSOLIDATED AUDIT TRAIL, LLC**
**a Delaware Limited Liability Company**

This Limited Liability Company Agreement (including its Recitals and the Exhibits, Appendices, Attachments, and Schedules identified herein, this "Agreement") of CONSOLIDATED AUDIT TRAIL, LLC, a Delaware limited liability company (the "Company"), dated as of the 29th day of August, 2019, is made and entered into by and among the Participants.

## RECITALS

A. Prior to the formation of the Company, in response to SEC Rule 613 requiring national securities exchanges and national securities associations to submit a national market system plan to the Securities and Exchange Commission ("Commission" or "SEC") to create, implement and maintain a consolidated audit trail, such national securities exchanges and national securities associations, pursuant to SEC Rule 608(a)(3), which authorizes them to act jointly in preparing, filing and implementing national market system plans, developed the National Market System Plan Governing the Process for Selecting a Plan Processor and Developing a Plan for the Consolidated Audit Trail (the "Selection Plan"). The Selection Plan was approved by the Commission on February 21, 2014, amended on June 17, 2015 and September 24, 2015, and, by its terms, shall automatically terminate upon the Commission's approval of this Agreement.

B. The Participants have now determined that it is advantageous and desirable to conduct in a limited liability company the activities they have heretofore conducted as parties to the Selection Plan, and have formed the Company for this purpose. This Agreement, which takes the place of the Selection Plan, is a National Market System Plan as defined in SEC Rule 600(b)(43), and serves as the National Market System Plan required by SEC Rule 613. The Participants shall jointly own the Company, which shall create, implement, and maintain the CAT and the Central Repository pursuant to SEC Rule 608 and SEC Rule 613.

C. This Agreement incorporates the exemptive relief from certain provisions of SEC Rule 613 requested in the original and supplemental request letters submitted by the Participants to the Commission, as described further in Appendix C ("Exemptive Request Letters").

## ARTICLE I

## DEFINITIONS

**Section 1.1. Definitions.** As used throughout this Agreement (including, for the avoidance of doubt, the Exhibits, Appendices, Attachments, Recitals and Schedules identified in this Agreement):

> "Account Effective Date" means: (a) with regard to those circumstances in which an Industry Member has established a trading relationship with an institution but has not established an account with that institution, (i) when the trading relationship was

established prior to the implementation date of the CAT NMS Plan applicable to the relevant CAT Reporter (as set forth in Rule 613(a)(3)(v) and (vi)), either (A) the date the relationship identifier was established within the Industry Member, (B) the date when trading began (i.e., the date the first order was received) using the relevant relationship identifier, or (C) if both dates are available, the earlier date will be used to the extent that the dates differ; or (ii) when the trading relationship was established on or after the implementation date of the CAT NMS Plan applicable to the relevant CAT Reporter (as set forth in Rule 613(a)(3)(v) and (vi)), the date the Industry Member established the relationship identifier, which would be no later than the date the first order was received; (b) where an Industry Member changes back office providers or clearing firms prior to the implementation date of the CAT NMS Plan applicable to the relevant CAT Reporter (as set forth in Rule 613(a)(3)(v) and (vi)), the date an account was established at the relevant Industry Member, either directly or via transfer; (c) where an Industry Member acquires another Industry Member prior to the implementation date of the CAT NMS Plan applicable to the relevant CAT Reporter (as set forth in Rule 613(a)(3)(v) and (vi)), the date an account was established at the relevant Industry Member, either directly or via transfer; (d) where there are multiple dates associated with an account established prior to the implementation date of the CAT NMS Plan applicable to the relevant CAT Reporter (as set forth in Rule 613(a)(3)(v) and (vi)), the earliest available date; (e) with regard to Industry Member proprietary accounts established prior to the implementation date of the CAT NMS Plan applicable to the relevant CAT Reporter (as set forth in Rule 613(a)(3)(v) and (vi)), (i) the date established for the account in the Industry Member or in a system of the Industry Member or (ii) the date when proprietary trading began in the account (i.e., the date on which the first orders were submitted from the account). With regard to paragraphs (b) – (e), the Account Effective Date will be no later than the date trading occurs at the Industry Member or in the Industry Member's system.

"Active Accounts" means an account that has had activity in Eligible Securities within the last six months.

"Advisory Committee" has the meaning set forth in Section 4.13(a).

"Affiliate" of a Person means any Person controlling, controlled by, or under common control with such Person.

"Affiliated Participant" means any Participant controlling, controlled by, or under common control with another Participant.

"Agreement" has the meaning set forth in the preamble to this Agreement.

"Allocation Report" means a report made to the Central Repository by an Industry Member that identifies the Firm Designated ID for any account(s), including subaccount(s), to which executed shares are allocated and provides the security that has been allocated, the identifier of the firm reporting the allocation, the price per share of shares allocated, the side of shares allocated, the number of shares allocated to each account, and the time of the allocation; provided, for the avoidance of doubt, any such Allocation Report shall not be required to be linked to particular orders or executions.

"Bid" means a proposal submitted by a Bidder in response to the RFP or subsequent request for proposal (or similar request).

"Bidder" means any entity, or any combination of separate entities, submitting a Bid.

"Bidding Participant" means a Participant that: (a) submits a Bid; (b) is an Affiliate of an entity that submits a Bid; or (c) is included, or is an Affiliate of an entity that is included, as a Material Subcontractor as part of a Bid.

"Business Clock" means a clock used to record the date and time of any Reportable Event required to be reported under SEC Rule 613.

"CAT" means the consolidated audit trail contemplated by SEC Rule 613.

"CAT Data" means data derived from Participant Data, Industry Member Data, SIP Data, and such other data as the Operating Committee may designate as "CAT Data" from time to time.

"CAT Executing Broker" means (a) with respect to a transaction in an Eligible Security that is executed on an exchange, the Industry Member identified as the Industry Member responsible for the order on the buy-side of the transaction and the Industry Member responsible for the sell-side of the transaction in the equity order trade event and option trade event in the CAT Data submitted to the CAT by the relevant exchange pursuant to the Participant Technical Specifications; and (b) with respect to a transaction in an Eligible Security that is executed otherwise than on an exchange and required to be reported to an equity trade reporting facility of a registered national securities association, the Industry Member identified as the executing broker and the Industry Member identified as the contra-side executing broker in the TRF/ORF/ADF transaction data event in the CAT Data submitted to the CAT by FINRA pursuant to the Participant Technical Specifications; provided, however, in those circumstances where there is a non-Industry Member identified as the contra-side executing broker in the TRF/ORF/ADF transaction data event or no contra-side executing broker is identified in the TRF/ORF/ADF transaction data event, then the Industry Member identified as the executing broker in the TRF/ORF/ADF transaction data event would be treated as CAT Executing Broker for the Buyer and for the Seller.

"CAT NMS Plan" means the plan set forth in this Agreement, as amended from time to time.

"CAT-Order-ID" has the same meaning provided in SEC Rule 613(j)(1).

"CAT Reporter" means each national securities exchange, national securities association and Industry Member that is required to record and report information to the Central Repository pursuant to SEC Rule 613(c).

"CAT-Reporter-ID" has the same meaning provided in SEC Rule 613(j)(2).

"CAT System" means all data processing equipment, communications facilities, and other facilities, including equipment, utilized by the Company or any third parties acting on the

Company's behalf in connection with operation of the CAT and any related information or relevant systems pursuant to this Agreement.

"Central Repository" means the repository responsible for the receipt, consolidation, and retention of all information reported to the CAT pursuant to SEC Rule 613 and this Agreement.

"Certificate" has the meaning set forth in Section 2.2.

"Chair" has the meaning set forth in Section 4.2(b).

"Chief Compliance Officer" means the individual then serving (even on a temporary basis) as the Chief Compliance Officer pursuant to Section 4.6, Section 6.1(b), and Section 6.2(a).

"Chief Information Security Officer" means the individual then serving (even on a temporary basis) as the Chief Information Security Officer pursuant to Section 4.6, Section 6.1(b), and Section 6.2(b).

"Code" means the Internal Revenue Code of 1986.

"Company" has the meaning set forth in the preamble to this Agreement.

"Company Interest" means any membership interest in the Company at any particular time, including the right to any and all benefits to which a Participant may be entitled under this Agreement and the Delaware Act, together with the obligations of such Participant to comply with this Agreement.

"Commission" or "SEC" means the United States Securities and Exchange Commission.

"Compliance Rule" means, with respect to a Participant, the rule(s) promulgated by such Participant as contemplated by Section 3.11.

"Compliance Subcommittee" has the meaning set forth in Section 4.12(b).

"Compliance Threshold" has the meaning set forth in Appendix C.

"Conflict of Interest" means that the interest of a Participant (e.g., commercial, reputational, regulatory or otherwise) in the matter that is subject to a vote: (a) interferes, or would be reasonably likely to interfere, with that Participant's objective consideration of the matter; or (b) is, or would be reasonably likely to be, inconsistent with the purpose and objectives of the Company and the CAT, taking into account all relevant considerations including whether a Participant that may otherwise have a conflict of interest has established appropriate safeguards to eliminate such conflict of interest and taking into account the other guiding principles set forth in this Agreement. If a Participant has a "Conflict of Interest" in a particular matter, then each of its Affiliated Participants shall be deemed to have a "Conflict of Interest" in such matter. A "Conflict of Interest" with respect to a Participant includes the situations set forth in Sections 4.3(b)(iv), 4.3(d)(i) and 4.3(d)(ii).

"Customer" has the same meaning provided in SEC Rule 613(j)(3).

"Customer Account Information" shall include, but not be limited to, account number , account type, customer type, date account opened, and large trader identifier (if applicable); except, however, that (a) in those circumstances in which an Industry Member has established a trading relationship with an institution but has not established an account with that institution, the Industry Member will (i) provide the Account Effective Date in lieu of the "date account opened"; (ii) provide the relationship identifier in lieu of the "account number"; and (iii) identify the "account type" as a "relationship"; (b) in those circumstances in which the relevant account was established prior to the implementation date of the CAT NMS Plan applicable to the relevant CAT Reporter (as set forth in Rule 613(a)(3)(v) and (vi)), and no "date account opened" is available for the account, the Industry Member will provide the Account Effective Date in the following circumstances: (i) where an Industry Member changes back office providers or clearing firms and the date account opened is changed to the date the account was opened on the new back office/clearing firm system; (ii) where an Industry Member acquires another Industry Member and the date account opened is changed to the date the account was opened on the post-merger back office/clearing firm system; (iii) where there are multiple dates associated with an account in an Industry Member's system, and the parameters of each date are determined by the individual Industry Member; and (iv) where the relevant account is an Industry Member proprietary account.

"Customer-ID" has the same meaning provided in SEC Rule 613(j)(5).

"Customer Identifying Information" means information of sufficient detail to identify a Customer, including, but not limited to, (a) with respect to individuals: name, address, date of birth, individual tax payer identification number ("ITIN")/social security number ("SSN"), individual's role in the account (e.g., primary holder, joint holder, guardian, trustee, person with the power of attorney); and (b) with respect to legal entities: name, address, Employer Identification Number ("EIN")/Legal Entity Identifier ("LEI") or other comparable common entity identifier, if applicable; provided, however, that an Industry Member that has an LEI for a Customer must submit the Customer's LEI in addition to other information of sufficient detail to identify a Customer.

"Delaware Act" means the Delaware Limited Liability Company Act.

"Disclosing Party" has the meaning set forth in Section 9.6(a).

"Effective Date" means the date of approval of this Agreement by the Commission.

"Eligible Security" includes (a) all NMS Securities and (b) all OTC Equity Securities.

"Error Rate" has the meaning provided in SEC Rule 613(j)(6).

"Exchange Act" means the Securities Exchange Act of 1934.

"Exemptive Request Letters" has the meaning set forth in Recital C.

"Financial Accountability Milestone" means, as the case may be, Full Implementation of Core Equity Reporting, Full Availability and Regulatory Utilization of Transactional Database Functionality, and Full Implementation of CAT NMS Plan Requirements.

"FINRA" means Financial Industry Regulatory Authority, Inc.

"Firm Designated ID" means (1) a unique and persistent identifier for each trading account designated by Industry Members for purposes of providing data to the Central Repository provided, however, such identifier may not be the account number for such trading account if the trading account is not a proprietary account; (2) a unique and persistent relationship identifier when an Industry Member does not have an account number available to its order handling and/or execution system at the time of order receipt, provided, however, such identifier must be masked; or (3) a unique and persistent entity identifier when an employee of an Industry Member is exercising discretion over multiple client accounts and creates an aggregated order for which a trading account number of the Industry Member is not available at the time of order origination, where each such identifier is unique among all identifiers from any given Industry Member.

"Fiscal Year" means the fiscal year of the Company determined pursuant to Section 9.2(a).

"FS-ISAC" has the meaning set forth in Section 6.2(b)(vi).

"Full Availability and Regulatory Utilization of Transactional Database Functionality" means the point at which: (a) reporting to the Order Audit Trail System ("OATS") is no longer required for new orders; (b) Industry Member reporting for equities transactions and simple electronic options transactions, excluding Customer Account Information, Customer-ID, and Customer Identifying Information, with sufficient intra-firm linkage, inter-firm linkage, national securities exchange linkage, trade reporting facilities linkage, and representative order linkages (including any equities allocation information provided in an Allocation Report) to permit the Participants and the Commission to analyze the full lifecycle of an order across the national market system, from order origination through order execution or order cancellation, is developed, tested, and implemented at a 5% Error Rate or less; (c) Industry Member reporting for manual options transactions and complex options transactions, excluding Customer Account Information, Customer-ID, and Customer Identifying Information, with all required linkages to permit the Participants and the Commission to analyze the full lifecycle of an order across the national market system, from order origination through order execution or order cancellation, including any options allocation information provided in an Allocation Report, is developed, tested, and fully implemented; (d) the query tool functionality required by Section 6.10(c)(i)(A) and Appendix D, Sections 8.1.1-8.1.3, Section 8.2.1, and Section 8.5 incorporates the data described in conditions (b)-(c) and is available to the Participants and to the Commission; and (e) the requirements of Section 6.10(a) are met. This Financial Accountability Milestone shall be considered complete as of the date identified in a Quarterly Progress Report meeting the requirements of Section 6.6(c).

"Full Implementation of CAT NMS Plan Requirements" means the point at which the Participants have satisfied all of their obligations to build and implement the CAT, such that all

CAT system functionality required by Rule 613 and the CAT NMS Plan has been developed, successfully tested, and fully implemented at the initial Error Rates specified by Section 6.5(d)(i) or less, including functionality that efficiently permits the Participants and the Commission to access all CAT Data required to be stored in the Central Repository pursuant to Section 6.5(a), including Customer Account Information, Customer-ID, Customer Identifying Information, and Allocation Reports, and to analyze the full lifecycle of an order across the national market system, from order origination through order execution or order cancellation, including any related allocation information provided in an Allocation Report. This Financial Accountability Milestone shall be considered complete as of the date identified in a Quarterly Progress Report meeting the requirements of Section 6.6(c).

"Full Implementation of Core Equity Reporting Requirements" means the point at which: (a) Industry Member reporting (excluding reporting by Small Industry Members that are not OATS reporters) for equities transactions, excluding Customer Account Information, Customer-ID, and Customer Identifying Information, is developed, tested, and implemented at a 5% Error Rate or less and with sufficient intra-firm linkage, inter-firm linkage, national securities exchange linkage, and trade reporting facilities linkage to permit the Participants and the Commission to analyze the full lifecycle of an order across the national market system, excluding linkage of representative orders, from order origination through order execution or order cancellation; and (b) the query tool functionality required by Section 6.10(c)(i)(A) and Appendix D, Sections 8.1.1-8.1.3 and Section 8.2.1 incorporates the Industry Member equities transaction data described in condition (a) and is available to the Participants and to the Commission. This Financial Accountability Milestone shall be considered complete as of the date identified in a Quarterly Progress Report meeting the requirements of Section 6.6(c).

"GAAP" means United States generally accepted accounting principles.

"Independent Auditor" has the meaning set forth in Section 6.2(a)(v)(B).

"Industry Member" means a member of a national securities exchange or a member of a national securities association.

"Industry Member Data" has the meaning set forth in Section 6.4(d)(ii).

"Information" has the meaning set forth in Section 9.6(a).

"Initial Industry Member Core Equity and Option Reporting" means the reporting by Industry Members (excluding Small Industry Members that are not OATS reporters) of both: (a) equities transaction data, excluding Customer Account Information, Customer-ID, and Customer Identifying Information; and (b) options transaction data, excluding Customer Account Information, Customer-ID, and Customer Identifying Information.

"Initial Plan Processor" means the first Plan Processor selected by the Operating Committee in accordance with SEC Rule 613, Section 6.1 and the Selection Plan.

"Last Sale Report" means any last sale report reported pursuant to the Plan for Reporting of Consolidated Options Last Sale Reports and Quotation Information filed with the SEC pursuant to, and meeting the requirements of, SEC Rule 608.

"Latency" means the delay between input into a system and the outcome based upon that input. In computer networks, latency refers to the delay between a source system sending a packet or message, and the destination system receiving such packet or message.

"Listed Option" or "Option" have the meaning set forth in Rule 600(b)(35) of Regulation NMS.

"Majority Vote" means the affirmative vote of at least a majority of all of the members of the Operating Committee or any Subcommittee, as applicable, authorized to cast a vote with respect to a matter presented for a vote (whether or not such a member is present at any meeting at which a vote is taken) by the Operating Committee or any Subcommittee, as applicable (excluding, for the avoidance of doubt, any member of the Operating Committee or any Subcommittee, as applicable, that is recused or subject to a vote to recuse from such matter pursuant to Section 4.3(d)).

"Manual Order Event" means a non-electronic communication of order-related information for which CAT Reporters must record and report the time of the event.

"Material Amendment" has the meaning set forth in Section 6.9(c).

"Material Contract" means any: (a) contract between the Company and the Plan Processor; (b) contract between the Company and any Officer; (c) contract, or group of related contracts, resulting in a total cost or liability to the Company of more than $900,000; (d) contract between the Company, on the one hand, and a Participant or an Affiliate of a Participant, on the other; (e) contract containing other than reasonable arms-length terms; (f) contract imposing, or purporting to impose, non-customary restrictions (including non-competition, non-solicitation or confidentiality (other than customary confidentiality agreements entered into in the ordinary course of business that do not restrict, or purport to restrict, any Participant or any Affiliate of any Participant)) or obligations (including indemnity, most-favored nation requirements, exclusivity, or guaranteed minimum purchase commitments) on the Company or any Participant or any Affiliate of a Participant; (g) contract containing terms that would reasonably be expected to unduly interfere with or negatively impact the ability of the Company, any Participant or any Affiliate of any Participant to perform its regulatory functions (including disciplinary matters), to carry out its responsibilities under the Exchange Act or to perform its obligations under this Agreement; (h) contract providing for a term longer than twelve (12) months or the termination of which would reasonably be expected to materially and adversely affect the Company, any Participant or any Affiliate of a Participant; (i) contract for indebtedness, the disposition or acquisition of assets or equity, or the lease or license of assets or properties; or (j) joint venture or similar contract for cost or profit sharing.

"Material Subcontractor" means any entity that is known to the Participant to be included as part of a Bid as a vendor, subcontractor, service provider, or in any other similar capacity and, excluding products or services offered by the Participant to one or more Bidders on terms subject to a fee filing approved by the SEC: (a) is anticipated to derive 5% or more of its annual revenue in any given year from services provided in such capacity; or (b) accounts for 5% or more of the total estimated annual cost of the Bid for any given year. An entity shall not be considered a

"Material Subcontractor" solely due to the entity providing services associated with any of the entity's regulatory functions as a self-regulatory organization registered with the SEC.

"Material Systems Change" means any change or update to the CAT System made by the Plan Processor which will cause a significant change to the functionality of the Central Repository.

"Material Terms of the Order" includes: the NMS Security or OTC Equity Security symbol; security type; price (if applicable); size (displayed and non-displayed); side (buy/sell); order type; if a sell order, whether the order is long, short, short exempt; open/close indicator (except on transactions in equities); time in force (if applicable); if the order is for a Listed Option, option type (put/call), option symbol or root symbol, underlying symbol, strike price, expiration date, and open/close (except on market maker quotations); and any special handling instructions.

"National Best Bid" and "National Best Offer" have the same meaning provided in SEC Rule 600(b)(42).

"NMS Plan" has the same meaning as "National Market System Plan" provided in SEC Rule 613(a)(1) and SEC Rule 600(b)(43).

"NMS Security" means any security or class of securities for which transaction reports are collected, processed, and made available pursuant to an effective transaction reporting plan, or an effective national market system plan for reporting transactions in Listed Options.

"Non-SRO Bid" means a Bid that does not include a Bidding Participant.

"Officer" means an officer of the Company, in his or her capacity as such, as set forth in Section 4.6.

"Operating Committee" means the governing body of the Company designated as such and described in Article IV.

"Options Exchange" means a registered national securities exchange or automated trading facility of a registered securities association that trades Listed Options.

"Options Market Maker" means a broker-dealer registered with an exchange for the purpose of making markets in options contracts traded on the exchange.

"Order" or "order" has, with respect to Eligible Securities, the meaning set forth in SEC Rule 613(j)(8).

"OTC Equity Security" means any equity security, other than an NMS Security, subject to prompt last sale reporting rules of a registered national securities association and reported to one of such association's equity trade reporting facilities.

"Other SLAs" has the meaning set forth in Section 6.1(h).

"Participant" means each Person identified as such on Exhibit A hereto, and any Person that becomes a Participant as permitted by this Agreement, in such Person's capacity as a Participant in the Company (it being understood that the Participants shall comprise the "members" of the Company (as the term "member" is defined in Section 18-101(11) of the Delaware Act)).

"Participant Data" has the meaning set forth in Section 6.3(d).

"Participation Fee" has the meaning set forth in Section 3.3(a).

"Payment Date" has the meaning set forth in Section 3.7(b).

"Permitted Legal Basis" means the Participant has become exempt from, or otherwise has ceased to be subject to, SEC Rule 613 or has arranged to comply with SEC Rule 613 in some manner other than through participation in this Agreement, in each instance subject to the approval of the Commission.

"Permitted Person" has the meaning set forth in Section 4.9.

"Permitted Transferee" has the meaning set forth in Section 3.4(c).

"Person" means any individual, partnership, limited liability company, corporation, joint venture, trust, business trust, cooperative or association and any heirs, executors, administrators, legal representatives, successors and assigns of such Person where the context so permits.

"PII" means personally identifiable information, including a social security number or tax identifier number or similar information; Customer Identifying Information and Customer Account Information.

"Plan Processor" means the Initial Plan Processor or any other Person selected by the Operating Committee pursuant to SEC Rule 613 and Sections 4.3(b)(i) and 6.1, and with regard to the Initial Plan Processor, the Selection Plan, to perform the CAT processing functions required by SEC Rule 613 and set forth in this Agreement.

"Pledge" and any grammatical variation thereof means, with respect to an interest, asset, or right, any pledge, security interest, hypothecation, deed of trust, lien or other similar encumbrance granted with respect to the affected interest, asset or right to secure payment or performance of an obligation.

"Primary Market Transaction" means any transaction other than a secondary market transaction and refers to any transaction where a Person purchases securities in an offering.

"Prime Rate" means the prime rate published in The Wall Street Journal (or any successor publication) on the last day of each month (or, if not a publication day, the prime rate last published prior to such last day).

"Proceeding" has the meaning set forth in Section 4.8(b).

"Qualified Bid" means a Bid that is deemed by the Selection Committee to include sufficient information regarding the Bidder's ability to provide the necessary capabilities to create, implement, and maintain the CAT so that such Bid can be effectively evaluated by the Selection Committee. When evaluating whether a Bid is a Qualified Bid, each member of the Selection Committee shall consider whether the Bid adequately addresses the evaluation factors set forth in the RFP, and apply such weighting and priority to the factors as such member of the Selection Committee deems appropriate in his or her professional judgment. The determination of whether a Bid is a Qualified Bid shall be determined pursuant to the process set forth in Section 5.2.

"Qualified Bidder" means a Bidder that has submitted a Qualified Bid.

"Quotation Information" means all bids (as defined under SEC Rule 600(b)(8)), offers (as defined under SEC Rule 600(b)(8)), all bids and offers of OTC Equity Securities, displayed quotation sizes in Eligible Securities, market center identifiers (including, in the case of FINRA, the FINRA member that is registered as a market maker or electronic communications network or otherwise utilizes the facilities of FINRA pursuant to applicable FINRA rules, that entered the quotation), withdrawals and other information pertaining to quotations in Eligible Securities required to be reported to the Plan Processor pursuant to this Agreement and SEC Rule 613.

"Raw Data" means Participant Data and Industry Member Data that has not been through any validation or otherwise checked by the CAT System.

"Received Industry Member Data" has the meaning set forth in Section 6.4(d)(ii).

"Receiving Party" has the meaning set forth in Section 9.6(a).

"Recorded Industry Member Data" has the meaning set forth in Section 6.4(d)(i).

"Registered Person" means any member, principal, executive, registered representative, or other person registered or required to be registered under a Participant's rules.

"Reportable Event" includes, but is not limited to, the original receipt or origination, modification, cancellation, routing, execution (in whole or in part) and allocation of an order, and receipt of a routed order.

"Representatives" has the meaning set forth in Section 9.6(a).

"RFP" means the "Consolidated Audit Trail National Market System Plan Request for Proposal" published by the Participants on February 26, 2013 attached as Appendix A, as amended from time to time.

"Securities Information Processor" or "SIP" has the same meaning provided in Section 3(a)(22)(A) of the Exchange Act.

"Selection Committee" means the committee formed pursuant to Section 5.1.

"Selection Plan" has the meaning set forth in Recital A.

"Shortlisted Bid" means a Bid submitted by a Qualified Bidder and selected as a Shortlisted Bid by the Selection Committee pursuant to Section 5.2(b) and, if applicable, pursuant to Section 5.2(c)(iii).

"Shortlisted Bidder" means a Qualified Bidder that has submitted a Bid selected as a Shortlisted Bid.

"SIP Data" has the meaning set forth in Section 6.5(a)(ii).

"SLA" has the meaning set forth in Section 6.1(h).

"Small Industry Member" means an Industry Member that qualifies as a small broker-dealer as defined in SEC Rule 613.

"SRO" means any self-regulatory organization within the meaning of Section 3(a)(26) of the Exchange Act.

"SRO-Assigned Market Participant Identifier" means an identifier assigned to an Industry Member by an SRO or an identifier used by a Participant.

"Subcommittee" has the meaning set forth in Section 4.12(a).

"Supermajority Vote" means the affirmative vote of at least two-thirds of all of the members of the Operating Committee or any Subcommittee, as applicable, authorized to cast a vote with respect to a matter presented for a vote (whether or not such a member is present at any meeting at which a vote is taken) by the Operating Committee or any Subcommittee, as applicable (excluding, for the avoidance of doubt, any member of the Operating Committee or any Subcommittee, as applicable, that is recused or subject to a vote to recuse from such matter pursuant to Section 4.3(d)); provided that if two-thirds of all of such members authorized to cast a vote is not a whole number then that number shall be rounded up to the nearest whole number.

"Tax Matters Partner" has the meaning set forth in Section 9.5(a).

"Transfer" and any grammatical variation thereof means any sale, exchange, issuance, redemption, assignment, distribution or other transfer, disposition or alienation in any way (whether voluntarily, involuntarily or by operation of law). Transfer shall specifically include any: (a) assignment or distribution resulting from bankruptcy, liquidation, or dissolution; or (b) Pledge.

"Technical Specifications" has the meaning set forth in Section 6.9(a).

"Trading Day" shall have such meaning as is determined by the Operating Committee. For the avoidance of doubt, the Operating Committee may establish different Trading Days for NMS Stocks (as defined in SEC Rule 600(b)(47), Listed Options, OTC Equity Securities, and any other securities that are included as Eligible Securities from time to time.

"Voting Senior Officer" has the meaning set forth in Section 5.1(a).

**Section 1.2. Principles of Interpretation**. In this Agreement (including, for the avoidance of doubt, the Exhibits, Appendices, Attachments, Recitals and Schedules identified in this Agreement), unless the context otherwise requires:

(a) words denoting the singular include the plural and vice versa;

(b) words denoting a gender include all genders;

(c) all exhibits, appendices, attachments, recitals, and schedules to the document in which the reference thereto is contained shall, unless the context otherwise requires, constitute an integral part of such document for all purposes;

(d) a reference to a particular clause, section, article, exhibit, appendix, attachment, recital, or schedule shall be a reference to a clause, section or article of, or an exhibit, appendix, attachment, recital, or schedule to, this Agreement;

(e) a reference to any statute, regulation, amendment, ordinance or law includes all statutes, regulations, proclamations, amendments or laws varying, consolidating or replacing the same from time to time, and a reference to a statute includes all regulations, policies, protocols, codes, proclamations, interpretations and ordinances issued or otherwise applicable under that statute unless, in any such case, otherwise expressly provided in any such statute or in the document in which the reference is contained;

(f) a reference to a "SEC Rule" refers to the correspondingly numbered Rule promulgated under the Exchange Act;

(g) a definition of or reference to any document, instrument or agreement includes an amendment or supplement to, or restatement, replacement, modification or novation of, any such document, instrument or agreement unless otherwise specified in such definition or in the context in which such reference is used;

(h) a reference to any Person includes such Person's permitted successors and assigns in that designated capacity;

(i) a reference to "$", "Dollars" or "US $" refers to currency of the United States of America;

(j) unless otherwise expressly provided in this Agreement, wherever the consent of any Person is required or permitted herein, such consent may be withheld in such Person's sole and absolute discretion;

(k) words such as "hereunder", "hereto", "hereof" and "herein" and other words of similar import shall refer to the whole of the applicable document and not to any particular article, section, subsection or clause thereof; and

(l) a reference to "including" (and grammatical variations thereof) means "including without limitation" (and grammatical variations thereof).

## ARTICLE II

## EFFECTIVENESS OF AGREEMENT; ORGANIZATION

**Section 2.1. Effectiveness**. This Agreement shall become effective upon approval by the Commission and execution by all Participants identified on Exhibit A and shall continue until terminated. Notwithstanding any provision in this Agreement to the contrary and without the consent of any Person being required, the Company's execution, delivery and performance of this Agreement are hereby authorized, approved and ratified in all respects.

**Section 2.2. Formation**. The Company was formed as a limited liability company under the Delaware Act by filing a certificate of formation (the "Certificate") with the Delaware Secretary of State.

**Section 2.3. Name**. The name of the Company is CONSOLIDATED AUDIT TRAIL, LLC. The name of the Company may be changed at any time or from time to time with the approval of the Operating Committee. All Company business shall be conducted in that name or such other names that comply with applicable law as the Operating Committee may select from time to time.

**Section 2.4. Registered Office; Registered Agent; Principal Office; Other Offices**. The registered office of the Company required by the Delaware Act to be maintained in the State of Delaware shall be the office of the initial registered agent named in the Certificate or such other office (which need not be a place of business of the Company) as the Operating Committee may designate from time to time in the manner provided by law. The registered agent of the Company in the State of Delaware shall be the initial registered agent named in the Certificate or such other Person or Persons as the Operating Committee may designate from time to time in the manner provided by law. The principal office of the Company shall be at such place as the Operating Committee may designate from time to time, which need not be in the State of Delaware. The Company may have such other offices as the Operating Committee may designate from time to time.

**Section 2.5. Certain Filings**. The Company shall cause to be filed such certificates and documents as may be necessary or appropriate to comply with the Delaware Act and any other applicable requirements for the organization, continuation and operation of a limited liability company in accordance with the laws of the State of Delaware and any other jurisdiction in which the Company shall conduct business, and shall continue to do so for so long as the Company conducts business therein. Each member of the Operating Committee is hereby designated as an "authorized person" within the meaning of the Delaware Act.

**Section 2.6. Purposes and Powers**. The Company may engage in: (a) the creation, implementation, and maintenance of the CAT pursuant to SEC Rule 608 and SEC Rule 613; and (b) any other business or activity that now or hereafter may be necessary, incidental, proper, advisable or convenient to accomplish the foregoing purpose and that is not prohibited by the Delaware Act, the Exchange Act or other applicable law and is consistent with tax exempt status under Section 501(c)(6) of the Code. The Company shall have and may exercise all of the

powers and rights conferred upon limited liability companies formed pursuant to the Delaware Act.

**Section 2.7.** **Term**. The term of the Company commenced on the date the Certificate was filed with the office of the Secretary of State of Delaware, and shall be perpetual unless dissolved as provided in this Agreement.

## ARTICLE III

## PARTICIPATION

**Section 3.1.** **Participants**. The name and address of each Participant are set forth on Exhibit A. New Participants may only be admitted to the Company in accordance with Section 3.5. No Participant shall have the right or power to resign or withdraw from the Company, except: (a) upon a Transfer of record ownership of all of such Participant's Company Interest in compliance with, and subject to, the provisions of Section 3.4; or (b) as permitted by Section 3.6. No Participant may be expelled or required to resign or withdraw from the Company except upon a Transfer of record ownership of all of such Participant's Company Interest in compliance with, and subject to, the provisions of Section 3.4, or as provided by Section 3.7(a)(ii) or Section 3.7(a)(iii).

**Section 3.2.** **Company Interests Generally**.

(a) All Company Interests shall have the same rights, powers, preferences and privileges, and shall be subject to the same restrictions, qualifications and limitations. Additional Company Interests may be issued only as permitted by Section 3.3.

(b) Without limiting Section 3.2(a), each Participant shall be entitled to one vote on any matter presented to the Participants for their consideration at any meeting of the Participants (or by written action of the Participants in lieu of a meeting).

(c) Company Interests shall not be evidenced by certificates.

(d) Each Participant shall have an equal Company Interest as each other Participant.

**Section 3.3.** **New Participants.**

(a) Any Person approved by the Commission as a national securities exchange or national securities association under the Exchange Act after the Effective Date may become a Participant by submitting to the Company a completed application in the form provided by the Company. As a condition to admission as a Participant, said Person shall: (i) execute a counterpart of this Agreement, at which time Exhibit A shall be amended to reflect the status of said Person as a Participant (including said Person's address for purposes of notices delivered pursuant to this Agreement); and (ii) pay a fee to the Company in an amount determined by a Majority Vote of the Operating Committee as fairly and reasonably compensating the Company and the Participants for costs incurred in creating, implementing, and maintaining the CAT, including such costs incurred in evaluating and selecting the Initial Plan Processor and any

subsequent Plan Processor and for costs the Company incurs in providing for the prospective Participant's participation in the Company, including after consideration of the factors identified in Section 3.3(b) (the "Participation Fee"). The amendment to this Agreement reflecting the admission of a new Participant shall be effective only when: (x) it is approved by the Commission in accordance with SEC Rule 608 or otherwise becomes effective pursuant to SEC Rule 608; and (y) the prospective Participant pays the Participation Fee. Neither a prospective Participant nor any Affiliate of such prospective Participant that is already a Participant shall vote on the determination of the amount of the Participation Fee to be paid by such prospective Participant. Participation Fees paid to the Company shall be added to the general revenues of the Company.

(b) In determining the amount of the Participation Fee to be paid by any prospective Participant, the Operating Committee shall consider the following factors:

(i) the portion of costs previously paid by the Company for the development, expansion and maintenance of the CAT which, under GAAP, would have been treated as capital expenditures and would have been amortized over the five (5) years preceding the admission of the prospective Participant;

(ii) an assessment of costs incurred and to be incurred by the Company for modifying the CAT or any part thereof to accommodate the prospective Participant, which are not otherwise required to be paid or reimbursed by the prospective Participant;

(iii) Participation Fees paid by other Participants admitted as such after the Effective Date;

(iv) elapsed time from the Effective Date to the anticipated date of admittance of the prospective Participant; and

(v) such other reasonable, equitable and not unfairly discriminatory factors, if any, as may be determined to be appropriate by the Operating Committee and approved by the Commission.

In the event the Company (following the vote of the Operating Committee contemplated by Section 3.3(a)) and a prospective Participant do not agree on the amount of the Participation Fee, such amount shall be subject to review by the Commission pursuant to Rule 608 of the Exchange Act.

(c) An applicant for participation in the Company may apply for limited access to the CAT System for planning and testing purposes pending its admission as a Participant by submitting to the Company a completed Application for Limited Access to the CAT System in a form provided by the Company, accompanied by payment of a deposit in the amount established by the Company, which shall be applied or refunded as described in such application. To be eligible to apply for such limited access, the applicant must have been approved by the SEC as a national securities exchange or national securities association under the Exchange Act but the applicant has not yet become a Participant, or the SEC must have published such applicant's Form 1 application or Form X-15AA-1 application to become a national securities exchange or a national securities association, respectively.

**Section 3.4. Transfer of Company Interest**.

(a) No Participant may Transfer any Company Interest except in compliance with this Section 3.4. Any Transfer or attempted Transfer in contravention of the foregoing sentence or any other provision of this Agreement shall be null and void *ab initio* and ineffective to Transfer any Company Interest and shall not bind or be recognized by or on the books of the Company, and any transferee in such transaction shall not, to the maximum extent permitted by applicable law, be or be treated as or deemed to be a Participant (or an assignee within the meaning of § 18-702 of the Delaware Act) for any purpose.

(b) No Participant may Transfer any Company Interest except to a national securities exchange or national securities association that succeeds to the business of such Participant as a result of a merger or consolidation with such Participant or the Transfer of all or substantially all of the assets or equity of such Participant.

(c) Notwithstanding anything to the contrary contained in this Agreement, no Participant may Transfer any Company Interest to any transferee as permitted by Section 3.4(b) (a "Permitted Transferee") unless: (i) such Permitted Transferee executes a counterpart of this Agreement, at which time Exhibit A shall be amended to reflect the status of said Permitted Transferee as a Participant (including said Permitted Transferee's address for purposes of notices delivered pursuant to this Agreement); and (ii) the amendment to this Agreement reflecting the Transfer of a Company Interest to a Permitted Transferee is approved by the Commission in accordance with SEC Rule 608 or otherwise becomes effective pursuant to SEC Rule 608. Subject to compliance with this Section 3.4, such amendment and such Transfer shall be effective only when it is approved by the SEC in accordance with SEC Rule 608 or otherwise becomes effective pursuant to SEC Rule 608, as applicable.

(d) The Company shall not be required to recognize any Transfer of any Company Interest until the instrument conveying such Company Interest, in form and substance satisfactory to the Company, has been delivered to the Company at its principal office for recordation on the books of the Company and the transferring Participant or Permitted Transferee has paid all costs and expenses of the Company in connection with such Transfer. The Company shall be entitled to treat the record owner of any Company Interest as the absolute owner thereof in all respects, and neither the Company nor any Participant shall incur liability for distributions of cash or other property made in good faith to such owner until such time as the instrument conveying such Company Interest, in form and substance satisfactory to the Company, has been received and accepted by the Company and recorded on the books of the Company.

(e) Notwithstanding anything to the contrary contained in this Agreement, without prior approval thereof by the Operating Committee, no Transfer of any Company Interest shall be made if the Company is advised by its counsel that such Transfer: (i) may not be effected without registration under the Securities Act of 1933; (ii) would result in the violation of any applicable state securities laws; (iii) would require the Company to register as an investment company under the Investment Company Act of 1940 or modify the exemption from such registration upon which the Company has chosen to rely; or (iv) would require the Company to register as an investment adviser under state or federal securities laws.

**Section 3.5. Admission of New Participants.** Any Person acquiring a Company Interest pursuant to Section 3.3, or any Permitted Transferee acquiring a Participant's Company Interest pursuant to Section 3.4, shall, unless such acquiring Permitted Transferee is a Participant as of immediately prior to such acquisition, be deemed to have been admitted to the Company as a Participant, automatically and with no further action being necessary by the Operating Committee, the Participants or any other Person, by virtue of, and upon the consummation of, such acquisition of a Company Interest and compliance with Section 3.3 or Section 3.4, as applicable.

**Section 3.6. Voluntary Resignation from Participation.** Any Participant may voluntarily resign from the Company, and thereby withdraw from and terminate its right to any Company Interest, only if (a) a Permitted Legal Basis for such action exists and (b) such Participant provides to the Company and each other Participant no less than thirty (30) days prior to the effective date of such action written notice specifying such Permitted Legal Basis, including appropriate documentation evidencing the existence of such Permitted Legal Basis, and, to the extent applicable, evidence reasonably satisfactory to the Company and other Participants that any orders or approvals required from the Commission in connection with such action have been obtained. A validly withdrawing Participant shall have the rights and obligations provided in Section 3.7.

**Section 3.7. Termination of Participation.**

(a) The participation in the Company of a Participant, and its right to any Company Interest, shall terminate as of the earliest of: (i) the effective date specified in a valid notice delivered pursuant to Section 3.6 (which date, for the avoidance of doubt, shall be no earlier than the date that is thirty (30) days after the delivery of such notice); (ii) such time as such Participant is no longer registered as a national securities exchange or national securities association; or (iii) the date of termination pursuant to Section 3.7(b).

(b) Each Participant shall pay all fees or other amounts required to be paid under this Agreement within thirty (30) days after receipt of an invoice or other notice indicating payment is due (unless a longer payment period is otherwise indicated) (the "Payment Date"). The Participant shall pay interest on the outstanding balance from the Payment Date until such fee or amount is paid at a per annum rate equal to the lesser of: (i) the Prime Rate plus 300 basis points; or (ii) the maximum rate permitted by applicable law. If any such remaining outstanding balance is not paid within thirty (30) days after the Payment Date, the Participants shall file an amendment to this Agreement requesting the termination of the participation in the Company of such Participant, and its right to any Company Interest, with the SEC. Such amendment shall be effective only when it is approved by the SEC in accordance with SEC Rule 608 or otherwise becomes effective pursuant to SEC Rule 608.

(c) In the event a Participant becomes subject to one or more of the events of bankruptcy enumerated in § 18-304 of the Delaware Act, that event by itself shall not cause the termination of the participation in the Company of the Participant so long as the Participant continues to be registered as a national securities exchange or national securities association. A terminated Participant shall remain liable for its proportionate share of costs and expenses allocated to it for the period during which it was a Participant, for obligations under Section

3.8(c), for its indemnification obligations pursuant to Section 4.1, and for obligations under Section 9.6, but it shall have no other obligations under this Agreement following the effective date of termination. This Agreement shall be amended to reflect any termination of participation in the Company of a Participant pursuant to this Section 3.7; provided that such amendment shall be effective only when it is approved by the Commission in accordance with SEC Rule 608 or otherwise becomes effective pursuant to SEC Rule 608.

**Section 3.8. Obligations and Liability of Participants**.

(a) Except as may be determined by the unanimous vote of all the Participants or as may be required by applicable law, no Participant shall be obligated to contribute capital or make loans to the Company. No Participant shall have the right to withdraw or to be repaid any capital contributed by it or to receive any other payment in respect of any Company Interest, including as a result of the withdrawal or resignation of such Participant from the Company, except as specifically provided in this Agreement.

(b) Except as provided in this Agreement and except as otherwise required by applicable law, no Participant shall have any personal liability whatsoever in its capacity as a Participant, whether to the Company, to any Participant or any Affiliate of any Participant, to the creditors of the Company or to any other Person, for the debts, liabilities, commitments or any other obligations of the Company or for any losses of the Company. Without limiting the foregoing, the failure of the Company to observe any formalities or requirements relating to exercise of its powers or management of its business or affairs under this Agreement or the Delaware Act shall not be grounds for imposing personal liability on any Participant or any Affiliate of a Participant for any liability of the Company.

(c) In accordance with the Delaware Act, a member of a limited liability company may, under certain circumstances, be required to return amounts previously distributed to such member. It is the intent of the Participants that no distribution to any Participant shall be deemed a return of money or other property paid or distributed in violation of the Delaware Act. The payment of any such money or distribution of any such property to a Participant shall be deemed to be a compromise within the meaning of the Delaware Act, and the Participant receiving any such money or property shall not be required to return any such money or property to any Person. However, if any court of competent jurisdiction holds that, notwithstanding the provisions of this Agreement, any Participant is obligated to make any such payment, such obligation shall be the obligation of such Participant and not of the Operating Committee, the Company or any other Participant.

**Section 3.9. Loans**. If the Company requires additional funds to carry out its purposes, to conduct its business, to meet its obligations, or to make any expenditure authorized by this Agreement, the Company may borrow funds from such one or more of the Participants, or from such third party lender(s), and on such terms and conditions, as may be approved by a Supermajority Vote of the Operating Committee.

**Section 3.10. No Partnership**. The Company is not intended to be a general partnership, limited partnership or joint venture for any purpose, and no Participant shall be

considered to be a partner or joint venturer of any other Participant, for any purpose, and this Agreement shall not be construed to suggest otherwise.

**Section 3.11. Compliance Undertaking**. Each Participant shall comply with and enforce compliance, as required by SEC Rule 608(c), by its Industry Members with the provisions of SEC Rule 613 and of this Agreement, as applicable, to the Participant and its Industry Members. The Participants shall endeavor to promulgate consistent rules (after taking into account circumstances and considerations that may impact Participants differently) requiring compliance by their respective Industry Members with the provisions of SEC Rule 613 and this Agreement.

## ARTICLE IV

## MANAGEMENT OF THE COMPANY

**Section 4.1. Operating Committee**. Except for situations in which the approval of the Participants is required by this Agreement or by non-waivable provisions of applicable law, the Company shall be managed by the Operating Committee, which shall have general charge and supervision of the business of the Company and shall be constituted as provided in Section 4.2. The Operating Committee: (a) acting collectively in accordance with this Agreement, shall be the sole "manager" of the Company within the meaning of § 18-101(10) of the Delaware Act (and no individual member of the Operating Committee shall (i) be a "manager" of the Company within the meaning of Section 18-101(10) of the Delaware Act or (ii) have any right, power or authority to act for or on behalf of the Company, to do any act that would be binding on the Company, or to incur any expenditures on behalf of the Company); (b) shall have the right, power and authority to exercise all of the powers of the Company except as otherwise provided by applicable law or this Agreement; and (c) except as otherwise expressly provided herein, shall make all decisions and authorize or otherwise approve all actions taken or to be taken by the Company. Decisions or actions relating to the Company that are made or approved by the Operating Committee, or by any Subcommittee within the scope of authority granted to such Subcommittee in accordance with this Agreement (or, with respect to matters requiring a vote, approval, consent or other action of the Participants hereunder or pursuant to non-waivable provisions of applicable law, by the Participants) in accordance with this Agreement shall constitute decisions or actions by the Company and shall be binding on the Company and each Participant. Except to the extent otherwise expressly provided to the contrary in this Agreement, no Participant shall have authority to act for, or to assume any obligation or responsibility on behalf of, the Company, without the prior approval of the Operating Committee, and each Participant shall indemnify and hold harmless the Company and each other Participant for any breach of the provisions of this sentence by such breaching Participant. Without limiting the generality of the foregoing, except as otherwise expressly provided in this Agreement, the Operating Committee shall make all policy decisions on behalf of the Company in furtherance of the functions and objectives of the Company under the Exchange Act, any rules thereunder, including SEC Rule 613, and under this Agreement. Notwithstanding anything to the contrary, the Operating Committee may delegate all or part of its administrative functions under this Agreement, but not its policy making (except to the extent determinations are delegated as specifically set forth in this Agreement) authority, to one or more Subcommittees, and any other Person. A Person to which administrative functions are so delegated shall perform the same as

agent for the Company, in the name of the Company. Each Person who performs administrative functions on behalf of the Company (including the Plan Processor) shall be required to: (i) agree to be bound by the confidentiality obligations in Section 9.6(a) as a "Receiving Party"; and (ii) agree that any nonpublic business information pertaining to any Participant or any Affiliate of such Participant that becomes known to such Person shall be held in confidence and not shared with the other Participants or any other Person, except for information that may be shared in connection with joint activities permitted under this Agreement.

**Section 4.2. Composition and Selection of Operating Committee; Chair**.

(a) The Operating Committee shall consist of one voting member representing each Participant and one alternate voting member representing each Participant who shall have a right to vote only in the absence of that Participant's voting member of the Operating Committee. Each of the voting and alternate voting members of the Operating Committee shall be appointed by the Participant that he or she represents, shall serve at the will of the Participant appointing such member and shall be subject to the confidentiality obligations of the Participant that he or she represents as set forth in Section 9.6. One individual may serve as the voting member of the Operating Committee for multiple Affiliated Participants, and such individual shall have the right to vote on behalf of each such Affiliated Participant.

(b) No later than the date the CAT System commences operations, the Operating Committee shall elect, by Majority Vote, one member thereof to act as the initial chair of the Operating Committee (the "Chair"). Such initial Chair, and each successor thereto, shall serve in such capacity for a two (2)-year term or until the earliest of his death, resignation or removal in accordance with the provisions of this Agreement. The Operating Committee shall elect, from the members thereof, a successor to the then serving Chair (which successor, subject to the last sentence of this Section 4.2(b), may be the Person then serving in such capacity) no later than three (3) months prior to the expiration of the then current term of the Person then serving as Chair. The Operating Committee, by Supermajority Vote, may remove the Chair from such position. In the case of any death, removal, resignation, or other vacancy of the Chair, a successor Chair shall be promptly elected by the Operating Committee, by Majority Vote, from among the members thereof who shall serve until the end of the then current term. The Chair shall preside at all meetings of the Operating Committee, shall designate a Person to act as Secretary to record the minutes of each such meeting, and shall perform such other duties and possess such other powers as the Operating Committee may from time to time prescribe. The Chair shall not be entitled to a tie-breaking vote at any meeting of the Operating Committee. Notwithstanding anything in this Agreement to the contrary: (i) no Person shall serve as Chair for more than two successive full terms; and (ii) no Person then appointed to the Operating Committee by a Participant that then serves, or whose Affiliate then serves, as the Plan Processor shall be eligible to serve as the Chair.

**Section 4.3. Action of Operating Committee**.

(a) Except as otherwise provided herein, each of the members of the Operating Committee, including the Chair, shall be authorized to cast one (1) vote for each Participant that he or she represents on all matters voted upon by the Operating Committee, and action of the Operating Committee shall be authorized by Majority Vote, subject to the approval

of the SEC whenever such approval is required under applicable provisions of the Exchange Act and the rules of the SEC adopted thereunder. Action of the Operating Committee authorized in accordance with this Agreement shall be without prejudice to the rights of any Participant to present contrary views to any regulatory body or in any other appropriate forum. Without limiting the generality of the foregoing, the Company shall not take any of the following actions unless the Operating Committee, by Majority Vote, authorizes such action:

(i) select the Chair pursuant to Section 4.2(b);

(ii) select the members of the Advisory Committee pursuant to Section 4.13;

(iii) interpret this Agreement (unless otherwise noted herein);

(iv) approve any recommendation by the Chief Compliance Officer pursuant to Section 6.2(a)(v)(A);

(v) determine to hold an Executive Session of the Operating Committee pursuant to Section 4.4(a);

(vi) determine the appropriate funding-related policies, procedures and practices consistent with Article XI; or

(vii) any other matter specified elsewhere in this Agreement (which includes, as stated in the definition of "Agreement," the Appendices to this Agreement) as requiring a vote, approval or other action of the Operating Committee (other than those matters expressly requiring a Supermajority Vote or a different vote of the Operating Committee).

(b) Notwithstanding Section 4.3(a) or anything else to the contrary in this Agreement, the Company shall not take any of the following actions unless such action shall have been authorized by the Supermajority Vote of the Operating Committee, subject to the approval of the SEC whenever such approval is required under applicable provisions of the Exchange Act and the rules of the SEC adopted thereunder:

(i) select a Plan Processor, other than the Initial Plan Processor selected in accordance with Article V;

(ii) terminate a Plan Processor without cause in accordance with Section 6.1(q);

(iii) approve the Plan Processor's appointment or removal of the Chief Information Security Officer, the Chief Compliance Officer, or any Independent Auditor in accordance with Section 6.1(b);

(iv) enter into, modify or terminate any Material Contract (if the Material Contract is with a Participant or an Affiliate of a Participant, such Participant and Affiliated Participant shall be recused from any vote under this Section 4.3(b)(iv));

(v) make any Material Systems Change;

(vi) approve the initial Technical Specifications pursuant to Section 6.9 or any Material Amendment to the Technical Specifications proposed by the Plan Processor in accordance with Section 6.9;

(vii) amend the Technical Specifications on its own motion; or

(viii) any other matter specified elsewhere in this Agreement (which includes, as stated in the definition of "Agreement," the Appendices to this Agreement) as requiring a vote, approval or other action of the Operating Committee by a Supermajority Vote.

(c) Any action required or permitted to be taken at any meeting of the Operating Committee or any Subcommittee may be taken without a meeting, if all of the members of the Operating Committee or Subcommittee, as the case may be, then serving consent to the action in writing or by electronic transmission. Such written consents and hard copies of the electronic transmissions shall be filed with the minutes of proceedings of the Operating Committee or Subcommittee, as applicable.

(d) If a member of the Operating Committee or any Subcommittee determines that voting on a matter under consideration by the Operating Committee or such Subcommittee raises a Conflict of Interest, such member shall recuse himself or herself from voting on such matter. If the members of the Operating Committee or any Subcommittee (excluding the member thereof proposed to be recused) determine by Supermajority Vote that any member voting on a matter under consideration by the Operating Committee or such Subcommittee raises a Conflict of Interest, such member shall be recused from voting on such matter. No member of the Operating Committee or any Subcommittee shall be automatically recused from voting on any matter, except as provided in Section 4.3(b)(iv) or as otherwise specified elsewhere in this Agreement, and except as provided below:

(i) if a Participant is a Bidding Participant whose Bid remains under consideration, members appointed to the Operating Committee or any Subcommittee by such Participant or any of its Affiliated Participants shall be recused from any vote concerning: (A) whether another Bidder may revise its Bid; (B) the selection of a Bidder; or (C) any contract to which such Participant or any of its Affiliates would be a party in its capacity as Plan Processor; and

(ii) if a Participant is (A) then serving as Plan Processor, (B) is an Affiliate of the Person then serving as Plan Processor, or (C) is an Affiliate of an entity that is a Material Subcontractor to the Plan Processor, then in each case members appointed to the Operating Committee or any Subcommittee by such Participant or any of its Affiliated Participants shall be recused from any vote concerning: (1) the proposed removal of such Plan Processor; or (2) any contract between the Company and such Plan Processor.

**Section 4.4. Meetings of the Operating Committee**.

(a) Meetings of the Operating Committee may be attended by each Participant's voting Representative and its alternate voting Representative and by a maximum of

two (2) nonvoting Representatives of each Participant, by members of the Advisory Committee, by the Chief Compliance Officer, by other Representatives of the Company and the Plan Processor, by Representatives of the SEC, and by such other Persons that the Operating Committee may invite to attend; provided that the Operating Committee may, where appropriate, determine to meet in an Executive Session, during which only voting members of the Operating Committee and Representatives of the SEC shall be present; provided, that the Operating Committee may invite other Representatives of the Participants, of the Company, of the Plan Processor (including the Chief Compliance Officer and the Chief Information Security Officer), or such other Persons that the Operating Committee may invite to attend, to be present during an Executive Session. Any determination of the Operating Committee to meet in an Executive Session shall be made upon a Majority Vote and shall be reflected in the minutes of the meeting. Regular meetings of the Operating Committee shall be held not less than once each calendar quarter at such times as shall from time to time be determined by the Operating Committee, on not less than ten (10) days' notice. Special meetings of the Operating Committee may be called upon the request of two or more Participants on not less than two (2) days' notice; provided that each Participant, collectively with all of such Participant's Affiliated Participants, shall be deemed a single Participant for purposes of this sentence. Emergency meetings of the Operating Committee may be called upon the request of two (2) or more Participants and may occur as soon as practical after calling for such meeting; provided that each Participant, collectively with all of such Participant's Affiliated Participants, shall be deemed a single Participant for purposes of this sentence. In the case of an emergency meeting of the Operating Committee, in addition to those Persons otherwise entitled to attend such meeting: (i) each Participant shall have the right to designate a reasonable number of its employees or other Representatives with substantial knowledge or expertise relevant to the subject matter of such meeting to attend such meeting; and (ii) each Participant shall use commercially reasonable efforts to designate an employee or other Representative of such Participant with substantial knowledge or expertise relevant to the subject matter of such meeting to attend such meeting; provided, for the avoidance of doubt, that no Person attending any such meeting solely by virtue of this sentence shall have the right to vote on any matter submitted for a vote at any such meeting. The Chair, or in his or her absence, a member of the Operating Committee designated by the Chair or by members of the Operating Committee in attendance, shall preside at each meeting of the Operating Committee, and a Person in attendance designated by the Chair (or the member of the Operating Committee presiding in the Chair's absence) shall act as Secretary to record the minutes thereof. The location of the regular and special meetings of the Operating Committee shall be fixed by the Operating Committee, provided that in general the location of meetings shall be rotated among the locations of the principal offices of the Participants. Members of the Operating Committee may be present at a meeting by conference telephone or other electronic means that enables each of them to hear and be heard by all others present at the meeting. Whenever notice of any meeting of the Operating Committee is required to be given by law or this Agreement, a written waiver, signed by the Person entitled to notice, or a waiver by electronic transmission by the Person entitled to notice, whether before, at or after the time stated in such notice, shall be deemed equivalent to notice. Attendance at a meeting of the Operating Committee by a member thereof shall constitute a waiver of notice of such meeting, except when such member of the Operating Committee attends any such meeting for the express purpose of objecting, at the beginning of the meeting, to the transaction of any business because the meeting is not lawfully called or convened.

(b) Any Person that is not a Participant, but for which the SEC has published a Form 1 Application or Form X-15AA-1 Application to become a national securities exchange or a national securities association, respectively, shall be permitted to appoint one primary Representative and one alternate Representative to attend regularly scheduled Operating Committee meetings in the capacity of a non-voting observer but shall not be permitted to have any Representative attend a special meeting, emergency meeting or meeting held in Executive Session of the Operating Committee. If such Person's Form 1 Application or Form X-15AA-1 Application is withdrawn or returned for any reason, then such Person shall no longer be eligible to be represented in regularly scheduled Operating Committee meetings. The Operating Committee shall have the discretion, in limited instances, to deviate from this policy if it determines, by Majority Vote, that circumstances so warrant; provided, however, that the exercise of such discretion is reasonable and does not impose any unnecessary or inappropriate burden on competition.

**Section 4.5. Interpretation of Other Regulations**. Interpretive questions arising during the operation or maintenance of the Central Repository with respect to applicable laws, rules or regulations shall be presented to the Operating Committee, which shall determine whether to seek interpretive guidance from the SEC or other appropriate regulatory body and, if so, in what form.

**Section 4.6. Officers of the Company**.

(a) Each of the Chief Compliance Officer and the Chief Information Security Officer (each of whom shall be employed solely by the Plan Processor and neither of whom shall be deemed or construed in any way to be an employee of the Company) shall be an Officer with the same respective title, as applicable, as the Chief Compliance Officer of the Company and the Chief Information Security Officer of the Company. Neither such Officer shall receive or be entitled to any compensation from the Company or any Participant by virtue of his or her service in such capacity (other than, if a Participant is then serving as the Plan Processor, compensation paid to such Officer as an employee of such Participant). Each such Officer shall report directly to the Operating Committee. The Chief Compliance Officer shall work on a regular and frequent basis with the Compliance Subcommittee and/or other Subcommittees as may be determined by the Operating Committee. Except to the extent otherwise provided herein, including Section 6.2, each such Officer shall have such fiduciary and other duties with regard to the Plan Processor as imposed by the Plan Processor on such individual by virtue of his or her employment by the Plan Processor. Notwithstanding the foregoing, the Company shall require the Plan Processor, in a written agreement with the Company, to acknowledge that the Officers of the Company owe fiduciary duties to the Company (set forth in Section 4.7(c) of this Agreement), and that, to the extent that the duties owed to the Company by the Officers of the Company, including the Chief Compliance Officer or Chief Information Security Officer, conflict with any duties owed to the Plan Processor, the duties to the Company will control.

(b) The Plan Processor shall inform the Operating Committee of the individual who has direct management responsibility for the Plan Processor's performance of its obligations with respect to the CAT. Subject to approval by the Operating Committee of such individual, the Operating Committee shall appoint such individual as an Officer. In addition, the Operating Committee by Supermajority Vote may appoint other Officers as it shall from time to

time deem necessary, and may assign any title to any such Officer as it deems appropriate. Any Officer appointed pursuant to this Section 4.6(b) shall have only such duties and responsibilities as set forth in this Agreement or as the Operating Committee shall from time to time expressly determine, but no such Officer shall have any authority to bind the Company (which authority is vested solely in the Operating Committee) or be an employee of the Company, unless in each case the Operating Committee, by Supermajority Vote, expressly determines otherwise. No person subject to a "statutory disqualification" (as defined in Section 3(a)(39) of the Exchange Act) may serve as an Officer. It is the intent of the Participants that the Company have no employees.

**Section 4.7. Interpretation of Certain Rights and Duties of Participants, Members of the Operating Committee and Officers**. To the fullest extent permitted by the Delaware Act and other applicable law:

(a) the respective obligations of the Participants, Officers, and the members of the Operating Committee, to each other and to the Company are limited to the express obligations set forth in this Agreement;

(b) the Participants hereby expressly acknowledge and agree that each member of the Operating Committee, individually, is serving hereunder solely as, and shall act in all respects hereunder solely as, an agent of the Participant appointing such member of the Operating Committee;

(c) no Participant or member of the Operating Committee, in such Person's capacity as such, shall have any fiduciary or similar duties or obligations to the Company or any other Participant or member of the Operating Committee, whether express or implied by the Delaware Act or any other law, in each case subject only to the implied contractual covenant of good faith and fair dealing, and each Participant and the Company, to the fullest extent permitted by applicable law, waives any claim or cause of action against any Participant or member of the Operating Committee that might otherwise arise in respect of any such fiduciary duty or similar duty or obligation; provided, however, that the provisions of this Section 4.7(c) shall have no effect on the terms of any relationship, agreement or arrangement between any member of the Operating Committee and the Participant appointing such member of the Operating Committee or between any Participant (other than solely in its capacity as a Participant) and the Company such as a contract between such Participant and the Company pursuant to which such Participant serves as the Plan Processor. Each Officer shall have the same fiduciary duties and obligations to the Company as a comparable officer of a Delaware corporation and in all cases shall conduct the business of the Company and execute his or her duties and obligations in good faith and in the manner that the Officer reasonably believes to be in the best interests of the Company;

(d) subject to Section 4.7(c), each Participant and each member of the Operating Committee may, with respect to any vote, consent or approval that such Person is entitled to grant or withhold pursuant to this Agreement, grant or withhold such vote, consent or approval in its sole and absolute discretion, with or without cause; and

(e) for the avoidance of doubt, no Participant shall be entitled to appraisal or dissenter rights for any reason with respect to any Company Interest.

**Section 4.8. Exculpation and Indemnification**.

(a) Except for the indemnification obligations of Participants under Section 4.1, no Participant or member of the Operating Committee shall be liable to the Company or to any Participant for any loss suffered by the Company or by any other Participant unless such loss is caused by: (i) the fraud, gross negligence, willful misconduct or willful violation of law on the part of such Participant or member of the Operating Committee; or (ii) in the case of a Participant, a material breach of this Agreement by such Participant. The provisions of this Section 4.8(a) shall have no effect on the terms of any relationship, agreement or arrangement between any member of the Operating Committee and the Participant appointing such member to the Operating Committee or between any Participant (other than solely in its capacity as a Participant) and the Company such as a contract between such Participant and the Company pursuant to which such Participant serves as the Plan Processor.

(b) Subject to the limitations and conditions as provided in this Section 4.8(b), the Company shall indemnify any Participant and any member of the Operating Committee (and may, upon approval of the Operating Committee, indemnify any employee or agent of the Company) who was or is made a party or is threatened to be made a party to or is involved in any threatened, pending or completed action, suit or proceeding, whether civil, criminal, administrative, arbitrative (hereinafter a "Proceeding"), or any appeal in such a Proceeding or any inquiry or investigation that could lead to such a Proceeding, by reason of the fact that such Person is or was a Participant, a member of the Operating Committee or any Subcommittee, or an employee or agent of the Company against judgments, penalties (including excise and similar taxes and punitive damages), fines, settlements and reasonable expenses (including attorneys' fees) actually incurred by such Person in connection with such Proceeding, if and only if the Person seeking indemnification is entitled to exculpation pursuant to Section 4.8(a). Indemnification under this Section 4.8(b) shall continue as to a Person who has ceased to serve in the capacity which initially entitled such Person to indemnification hereunder. As a condition precedent to an indemnified Person's right to be indemnified pursuant to this Section 4.8(b), such indemnified Person must notify the Company in writing as soon as practicable of any Proceeding for which such indemnified Person will or could seek indemnification. With respect to any Proceeding of which the Company is so notified, the Company shall be entitled to participate therein at its own expense and/or to assume the defense thereof at its own expense, with legal counsel reasonably acceptable to the indemnified Person. If the Company does not assume the defense of any such Proceeding of which the Company receives notice under this Section 4.8(b), reasonable expenses incurred by an indemnified Person in connection with any such Proceeding shall be paid or reimbursed by the Company in advance of the final disposition of such Proceeding upon receipt by the Company of: (i) written affirmation by the indemnified Person of such Person's good faith belief that such Person has met the standard of conduct necessary for such Person to be entitled to indemnification by the Company (which, in the case of a Person other than a Participant or a member of the Operating Committee, shall be, unless otherwise determined by the Operating Committee, that (A) such Person determined, in good faith, that such conduct was in, or was not opposed to, the best interests of the Company and (B) such conduct did not constitute gross negligence or willful misconduct); and (ii) a written undertaking by such Person to repay such expenses if it shall ultimately be determined by a court of competent jurisdiction that such Person has not met such standard of conduct or is otherwise not entitled to indemnification by the Company. The Company shall not indemnify an indemnified

Person to the extent such Person is reimbursed from the proceeds of insurance, and in the event the Company makes any indemnification payments to an indemnified Person and such Person is subsequently reimbursed from the proceeds of insurance, such Person shall promptly refund such indemnification payments to the Company to the extent of such insurance reimbursement. The rights granted pursuant to this Section 4.8(b) shall be deemed contract rights, and no amendment, modification or repeal of this Section 4.8(b) shall have the effect of limiting or denying any such rights with respect to actions taken or Proceedings arising prior to any amendment, modification or repeal. It is expressly acknowledged that the indemnification provided in this Section 4.8(b) could involve indemnification for negligence or under theories of strict liability. For Persons other than Participants or members of the Operating Committee, indemnification shall only be made upon the approval of the Operating Committee. Notwithstanding anything to the contrary in this Section 4.8 or elsewhere in this Agreement, no Person shall be indemnified hereunder for any losses, liabilities or expenses arising from or out of a violation of federal or state securities laws or any other intentional or criminal wrongdoing. Any indemnification under this Section 4.8 shall be paid from, and only to the extent of, Company assets, and no Participant shall have any personal liability on account thereof in the absence of a separate written agreement to the contrary.

**Section 4.9. Freedom of Action**. Each Participant and such Participant's Affiliates, and their respective Representatives (individually, "Permitted Person" and collectively, the "Permitted Persons") may have other business interests and may engage in any business or trade, profession, employment, or activity whatsoever (regardless of whether any such activity competes, directly or indirectly, with the Company's business or activities), for its own account, or in partnership with, or as a Representative of, any other Person. No Permitted Person (other than, if a Participant is then serving as the Plan Processor, any Officer then employed by the Plan Processor) shall be required to devote its entire time (business or otherwise), or any particular portion of its time (business or otherwise) to the business of the Company. Neither the Company nor any Participant nor any Affiliate thereof, by virtue of this Agreement, shall have any rights in and to any such independent venture or the income or profits derived therefrom, regardless of whether or not such venture was initially presented to a Permitted Person as a direct or indirect result of such Permitted Person's relationship with the Company. No Permitted Person shall have any obligation hereunder to present any business opportunity to the Company, even if the opportunity is one that the Company might reasonably have pursued or had the ability or desire to pursue, in each case, if granted the opportunity to do so, and no Permitted Person shall be liable to the Company or any Participant (or any Affiliate thereof) for breach of any fiduciary or other duty relating to the Company (whether imposed by applicable law or otherwise), by reason of the fact that the Permitted Person pursues or acquires such business opportunity, directs such business opportunity to another Person or fails to present such business opportunity, or information regarding such business opportunity, to the Company. Each Participant and the Company, to the fullest extent permitted by applicable law, waives any claim or cause of action against any Permitted Person for breach of any fiduciary duty or other duty (contractual or otherwise) by reason of the fact that the Permitted Person pursues or acquires any opportunity for itself, directs such opportunity to another Person, or does not present such opportunity to the Company. This Section 4.9 shall have no effect on the terms of any relationship, agreement or arrangement between any Participant (other than solely in its capacity as a Participant) and the Company such as a contract between such Participant and the Company pursuant to which such Participant serves as the Plan Processor.

**Section 4.10. Arrangements with Participants and Members of the Operating Committee**. Subject to the terms of this Agreement, including Section 4.3(b)(iv) and Section 4.3(d), and any limitations imposed on the Company and the Participants under applicable law, rules, or regulations, the Company may engage in business with, or enter into one or more agreements, leases, contracts or other arrangements for the furnishing to or by it of goods, services, technology or space with, any Participant, any member of the Operating Committee or any Affiliate of any Participant or member of the Operating Committee, and may pay compensation in connection with such business, goods, services, technology or space.

**Section 4.11. Participant Action Without a Meeting**. Any action required or permitted to be taken by Participants pursuant to this Agreement (including pursuant to any provision of this Agreement that requires the consent or approval of Participants) may be taken without a meeting, by unanimous consent in writing, setting forth the action so taken, which consent shall be signed by all Participants entitled to consent.

**Section 4.12. Subcommittees**.

(a) The Operating Committee may, by Majority Vote, designate by resolution one (1) or more subcommittees (each, a "Subcommittee") it deems necessary or desirable in furtherance of the management of the business and affairs of the Company. For any Subcommittee, any member of the Operating Committee who wants to serve thereon may so serve, and if Affiliated Participants have collectively appointed one member to the Operating Committee to represent them, then such Affiliated Participants may have only that member serve on the Subcommittee or may decide not to have only that collectively appointed member serve on the Subcommittee. Such member may designate an individual other than himself or herself who is also an employee of the Participant or Affiliated Participants that appointed such member to serve on a Subcommittee in lieu of the particular member. Any Subcommittee, to the extent provided in the resolution of the Operating Committee designating it and subject to Section 4.1 and non-waivable provisions of the Delaware Act, shall have and may exercise all the powers and authority of the Operating Committee in the management of the business and affairs of the Company as so specified in the resolution of the Operating Committee. Each Subcommittee shall keep minutes and make such reports as the Operating Committee may from time to time request. Except as the Operating Committee may otherwise determine, any Subcommittee may make rules for the conduct of its business, but unless otherwise provided by the Operating Committee or in such rules, its business shall be conducted as nearly as possible in the same manner as is provided in this Agreement for the Operating Committee.

(b) The Operating Committee shall maintain a compliance Subcommittee (the "Compliance Subcommittee"). The Compliance Subcommittee's purpose shall be to aid the Chief Compliance Officer (who shall directly report to the Operating Committee in accordance with Section 6.2(a)(iii)) as necessary, including with respect to issues involving:

(i) the maintenance of the confidentiality of information submitted to the Plan Processor or Central Repository pursuant to SEC Rule 613, applicable law, or this Agreement by Participants and Industry Members;

(ii) the timeliness, accuracy, and completeness of information submitted pursuant to SEC Rule 613, applicable law, or this Agreement by Participants and Industry Members; and

(iii) the manner in and extent to which each Participant is meeting its obligations under SEC Rule 613, Section 3.11, and as set forth elsewhere in this Agreement and ensuring the consistency of this Agreement's enforcement as to all Participants.

**Section 4.13. Advisory Committee**.

(a) An advisory committee to the Company (the "Advisory Committee") shall be formed and shall function in accordance with SEC Rule 613(b)(7) and this Section 4.13.

(b) No member of the Advisory Committee may be employed by or affiliated with any Participant or any of its Affiliates or facilities. A Representative of the SEC shall serve as an observer of the Advisory Committee (but shall not be a member thereof). The Operating Committee shall select one (1) member to serve on the Advisory Committee from representatives of each category identified in Sections 4.13(b)(i) through 4.13(b)(xii) to serve on the Advisory Committee on behalf of himself or herself individually and not on behalf of the entity for which the individual is then currently employed; provided that the members so selected pursuant to Sections 4.13(b)(i) through 4.13(b)(xii) must include, in the aggregate, representatives of no fewer than three (3) broker-dealers that are active in the options business and representatives of no fewer than three (3) broker-dealers that are active in the equities business; and provided further that upon a change in employment of any such member so selected pursuant to Sections 4.13(b)(i) through 4.13(b)(xii) a Majority Vote of the Operating Committee shall be required for such member to be eligible to continue to serve on the Advisory Committee:

(i) a broker-dealer with no more than 150 Registered Persons;

(ii) a broker-dealer with at least 151 and no more than 499 Registered Persons;

(iii) a broker-dealer with 500 or more Registered Persons;

(iv) a broker-dealer with a substantial wholesale customer base;

(v) a broker-dealer that is approved by a national securities exchange (A) to effect transactions on an exchange as a specialist, market maker, or floor broker; or (B) to act as an institutional broker on an exchange;

(vi) a proprietary-trading broker-dealer;

(vii) a clearing firm;

(viii) an individual who maintains a securities account with a registered broker or dealer but who otherwise has no material business relationship with a broker or dealer or with a Participant;

(ix) a member of academia who is a financial economist;

(x) three institutional investors, including an individual trading on behalf of an investment company or group of investment companies registered pursuant to the Investment Company Act of 1940;

(xi) an individual with significant and reputable regulatory expertise; and

(xii) a service bureau that provides reporting services to one or more CAT Reporters.

(c) Four of the fourteen initial members of the Advisory Committee, as determined by the Operating Committee, shall have an initial term of one (1) year. Five of the fourteen initial members of the Advisory Committee, as determined by the Operating Committee, shall have an initial term of two (2) years. All other members of the Advisory Committee shall have a term of three (3) years. No member of the Advisory Committee may serve thereon for more than two consecutive terms.

(d) The Advisory Committee shall advise the Participants on the implementation, operation, and administration of the Central Repository, including possible expansion of the Central Repository to other securities and other types of transactions. Members of the Advisory Committee shall have the right to attend meetings of the Operating Committee or any Subcommittee, to receive information concerning the operation of the Central Repository (subject to Section 4.13(e)), and to submit their views to the Operating Committee or any Subcommittee on matters pursuant to this Agreement prior to a decision by the Operating Committee on such matters; provided that members of the Advisory Committee shall have no right to vote on any matter considered by the Operating Committee or any Subcommittee and that the Operating Committee or any Subcommittee may meet in Executive Session if, by Majority Vote, the Operating Committee or Subcommittee determines that such an Executive Session is advisable. The Advisory Committee may provide the Operating Committee with recommendations of one or more candidates for the Operating Committee to consider when selecting members of the Advisory Committee pursuant to Section 4.3(a)(ii); provided, however, that the Operating Committee, at its sole discretion, will select the members of the Advisory Committee pursuant to Section 4.3(a)(ii) from the candidates recommended to the Operating Committee by the Advisory Committee, the Operating Committee itself, Participants or other persons. The Operating Committee may solicit and consider views on the operation of the Central Repository in addition to those of the Advisory Committee.

(e) Members of the Advisory Committee shall receive the same information concerning the operation of the Central Repository as the Operating Committee; provided, however, that the Operating Committee may withhold information it reasonably determines requires confidential treatment. Any information received by members of the Advisory Committee in furtherance of the performance of their functions pursuant to this Agreement shall remain confidential unless otherwise specified by the Operating Committee.

## ARTICLE V

## INITIAL PLAN PROCESSOR SELECTION

**Section 5.1. Selection Committee**. The Participants shall establish a Selection Committee in accordance with this Article V to evaluate and review Bids and select the Initial Plan Processor.

(a) Composition. Each Participant shall select from its staff one (1) senior officer ("Voting Senior Officer") to represent the Participant as a member of the Selection Committee. In the case of Affiliated Participants, one (1) individual may be (but is not required to be) the Voting Senior Officer for more than one or all of the Affiliated Participants. Where one (1) individual serves as the Voting Senior Officer for more than one Affiliated Participant, such individual shall have the right to vote on behalf of each such Affiliated Participant.

(b) Voting.

(i) Unless recused pursuant to Sections 5.1(b)(ii), 5.1(b)(iii), or 5.1(b)(iv), each Participant shall have one vote on all matters considered by the Selection Committee.

(ii) No Bidding Participant shall vote on whether a Shortlisted Bidder shall be permitted to revise its Bid pursuant to Section 5.2(c)(ii) or 5.2(d)(i) below if a Bid submitted by or including the Participant or an Affiliate of the Participant is a Shortlisted Bid.

(iii) No Bidding Participant shall vote in the process narrowing the set of Shortlisted Bidders as set forth in Section 5.2(c)(iii) if a Bid submitted by or including the Participant or an Affiliate of the Participant is a Shortlisted Bid.

(iv) No Bidding Participant shall vote in any round if a Bid submitted by or including the Participant or an Affiliate of the Participant is a part of such round.

(v) All votes by the Selection Committee shall be confidential and non-public. All such votes shall be tabulated by an independent third party approved by the Operating Committee, and a Participant's individual votes shall not be disclosed to other Participants or to the public.

(c) Quorum.

(i) Any action requiring a vote by the Selection Committee can only be taken at a meeting in which all Participants entitled to vote are present. Meetings of the Selection Committee shall be held as needed at such times and locations as shall from time to time be determined by the Selection Committee. Meetings may be held by conference telephone or other acceptable electronic means if all Participants entitled to vote consent thereto in writing or by other means the Selection Committee deems acceptable.

(ii) For purposes of establishing a quorum, a Participant is considered present at a meeting only if the Participant's Voting Senior Officer is either in physical

attendance at the meeting or is participating by conference telephone or other acceptable electronic means.

(iii) Any Participant recused from voting on a particular action pursuant to Section 5.1(b) above shall not be considered "entitled to vote" for purposes of establishing whether a quorum is present for a vote to be taken on that action.

(d) Qualifications for Voting Senior Officer of Bidding Participants. The following criteria must be met before a Voting Senior Officer is eligible to represent a Bidding Participant and serve on the Selection Committee:

(i) the Voting Senior Officer is not responsible for the Bidding Participant's market operations, and is responsible primarily for the Bidding Participant's legal and/or regulatory functions, including functions related to the formulation and implementation of the Bidding Participant's legal and/or regulatory program;

(ii) the Bidding Participant has established functional separation of its legal and/or regulatory functions from its market operations and other business or commercial objectives;

(iii) the Voting Senior Officer ultimately reports (including through the Bidding Participant's CEO or Chief Legal Officer/General Counsel) to an independent governing body that determines or oversees the Voting Senior Officer's compensation, and the Voting Senior Officer does not receive any compensation (other than what is determined or overseen by the independent governing body) that is based on achieving business or commercial objectives;

(iv) the Voting Senior Officer does not have responsibility for any non-regulatory functions of the Bidding Participant, other than the legal aspects of the organization performed by the Chief Legal Officer/General Counsel or the Office of the General Counsel;

(v) the ultimate decision making of the Voting Senior Officer position is tied to the regulatory effectiveness of the Bidding Participant, as opposed to other business or commercial objectives;

(vi) promotion or termination of the Voting Senior Officer is not based on achieving business or commercial objectives;

(vii) the Voting Senior Officer has no decision-making authority with respect to the development or formulation of the Bid submitted by or including the Participant or an Affiliate of the Participant; however, the staff assigned to developing and formulating such Bid may consult with the Voting Senior Officer, provided such staff members cannot share information concerning the Bid with the Voting Senior Officer;

(viii) the Voting Senior Officer does not report to any senior officers responsible for the development or formulation of the Bid submitted by or including the Participant or by an Affiliate of the Participant; however, joint reporting to the Bidding Participant's CEO or similar executive officer by the Voting Senior Officer and senior staff developing and formulating such Bid is permissible, but the Bidding Participant's CEO or

similar executive officer cannot share information concerning such Bid with the Voting Senior Officer;

(ix) the compensation of the Voting Senior Officer is not separately tied to income earned if the Bid submitted by or including the Participant or an Affiliate of the Participant is selected; and

(x) the Voting Senior Officer, any staff advising the Voting Senior Officer, and any similar executive officer or member of an independent governing body to which the Voting Senior Officer reports may not disclose to any Person any non-public information gained during the review of Bids, presentation by Qualified Bidders, and selection process. Staff advising the Voting Senior Officer during the Bid review, presentation, and selection process may not include the staff, contractors, or subcontractors that are developing or formulating the Bid submitted by or including a Participant or an Affiliate of the Participant.

**Section 5.2. Bid Evaluation and Initial Plan Processor Selection**.

(a) Initial Bid Review to Determine Qualified Bids.

(i) The Selection Committee shall review all Bids in accordance with the process developed by the Selection Committee.

(ii) After review, the Selection Committee shall vote on each Bid to determine whether such Bid is a Qualified Bid. A Bid that is deemed unqualified by at least a two-thirds (2/3rds) vote of the Selection Committee shall not be deemed a Qualified Bid and shall be eliminated individually from further consideration.

(b) Selection of Shortlisted Bids.

(i) Each Qualified Bidder shall be given the opportunity to present its Bid to the Selection Committee. Following the presentations by Qualified Bidders, the Selection Committee shall review and evaluate the Qualified Bids to select the Shortlisted Bids in accordance with the process in this Section 5.1(b).

(ii) If there are six (6) or fewer Qualified Bids, all such Qualified Bids shall be Shortlisted Bids.

(iii) If there are more than six (6) Qualified Bids but fewer than eleven (11) Qualified Bids, the Selection Committee shall select five (5) Qualified Bids as Shortlisted Bids, subject to the requirement in Section 5.2(d) below. Each Voting Senior Officer shall select a first, second, third, fourth, and fifth choice from among the Qualified Bids.

(A) A weighted score shall be assigned to each choice as follows:

(1) First choice receives five (5) points;

(2) Second choice receives four (4) points;

(3) Third choice receives three (3) points;

(4) Fourth choice receives two (2) points; and

(5) Fifth choice receives one (1) point.

(B) The five (5) Qualified Bids receiving the highest cumulative scores shall be Shortlisted Bids.

(C) In the event of a tie to select the five Shortlisted Bids, all such tied Qualified Bids shall be Shortlisted Bids.

(D) To the extent there are Non-SRO Bids that are Qualified Bids, the Shortlisted Bids selected pursuant to this Section 5.2(b)(iii) must, if possible, include at least two Non-SRO Bids. If, following the vote set forth in this Section 5.2(b)(iii), no Non-SRO Bid was selected as a Shortlisted Bid, the two Non-SRO Bids receiving the highest cumulative votes (or one Non-SRO Bid if a single Non-SRO Bid is a Qualified Bid) shall be added as Shortlisted Bids. If one Non-SRO Bid was selected as a Shortlisted Bid, the Non-SRO Bid receiving the next highest cumulative vote shall be added as a Shortlisted Bid.

(iv) If there are eleven (11) or more Qualified Bids, the Selection Committee shall select fifty percent (50%) of the Qualified Bids as Shortlisted Bids, subject to the requirement in Section 5.2(d) below. If there is an odd number of Qualified Bids, the number of Shortlisted Bids chosen shall be rounded up to the next whole number (e.g., if there are thirteen Qualified Bids, then seven Shortlisted Bids shall be selected). Each Voting Senior Officer shall select as many choices as Shortlisted Bids to be chosen.

(A) A weighted score shall be assigned to each choice in single point increments as follows:

(1) Last receives one (1) point;

(2) Next-to-last choice receives two (2) points;

(3) Second-from-last choice receives three (3) points;

(4) Third-from-last choice receives four (4) points;

(5) Fourth-from-last choice receives five (5) points; and

(6) Fifth-from-last choice receives six (6) points.

For each additional Shortlisted Bid that must be chosen, the points assigned shall increase in single point increments.

(B) The fifty percent (50%) of Qualified Bids (or, if there is an odd number of Qualified Bids, the next whole number above fifty percent (50%) of Qualified Bids) receiving the highest cumulative scores shall be Shortlisted Bids.

(C) In the event of a tie to select the Shortlisted Bids, all such tied Qualified Bids shall be Shortlisted Bids.

(D) To the extent there are Non-SRO Bids that are Qualified Bids, the Shortlisted Bids selected pursuant to this Section 5.2(b)(iv) must, if possible, include at least two Non-SRO Bids. If, following the vote set forth in this Section 5.2(b)(iv), no Non-SRO Bid was selected as a Shortlisted Bid, the two Non-SRO Bids receiving the highest cumulative votes (or one Non-SRO Bid if a single Non-SRO Bid is a Qualified Bid) shall be added as Shortlisted Bids. If one Non-SRO Bid was selected as a Shortlisted Bid, the Non-SRO Bid receiving the next highest cumulative vote shall be added as a Shortlisted Bid.

(c) Formulation of the CAT NMS Plan.

(i) The Selection Committee shall review the Shortlisted Bids to identify optimal proposed solutions for the CAT and provide descriptions of such proposed solutions for inclusion in this Agreement. This process may, but is not required to, include iterative discussions with Shortlisted Bidders to address any aspects of an optimal proposed solution that were not fully addressed in a particular Bid.

(ii) Prior to the approval of the CAT NMS Plan, all Shortlisted Bidders will be permitted to revise their Bids one or more times if the Selection Committee determines, by majority vote, that such revision(s) are necessary or appropriate.

(iii) Prior to approval of the CAT NMS Plan, and either before or after any revisions to Shortlisted Bids are accepted, the Selection Committee may determine, by at least a two-thirds vote, to narrow the number of Shortlisted Bids to three Bids, in accordance with the process in this Section 5.2(c)(iii).

(A) Each Voting Senior Officer shall select a first, second, and third choice from among the Shortlisted Bids.

(B) A weighted score shall be assigned to each choice as follows:

(1) First receives three (3) points;

(2) Second receives two (2) points; and

(3) Third receives one (1) point.

(C) The three Shortlisted Bids receiving the highest cumulative scores will be the new set of Shortlisted Bids.

(D) In the event of a tie that would result in more than three final Shortlisted Bids, the votes shall be recounted, omitting each Voting Senior Officer's third choice, in order to break the tie. If this recount produces a tie that would result in a number of final Shortlisted Bids larger than or equal to that from the initial count, the results of the initial count shall constitute the final set of Shortlisted Bids.

(E) To the extent there are Non-SRO Bids that are Shortlisted Bids, the final Shortlisted Bids selected pursuant to this Section 5.2(c)(iii) must, if possible, include at least one Non-SRO Bid. If following the vote set forth in this Section 5.2(c)(iii), no Non-SRO Bid was selected as a final Shortlisted Bid, the Non-SRO Bid receiving the highest cumulative votes shall be retained as a Shortlisted Bid.

(F) The third party tabulating votes, as specified in Section 5.1(b)(5), shall identify to the Selection Committee the new set of Shortlisted Bids, but shall keep confidential the individual scores and rankings of the Shortlisted Bids from the process in this Section 5.2(c)(iii).

(iv) The Participants shall incorporate information on optimal proposed solutions in this Agreement, including cost-benefit information as required by SEC Rule 613.

(d) Review of Shortlisted Bids Under the CAT NMS Plan.

(i) A Shortlisted Bidder shall be permitted to revise its Bid only upon approval by a majority of the Selection Committee, subject to the recusal provision in Section 5.1(b)(ii) above, that revisions are necessary or appropriate in light of the content of the Shortlisted Bidder's initial Bid and the provisions in this Agreement. A Shortlisted Bidder may not revise its Bid unless approved to do so by the Selection Committee pursuant to this Section 5.2(d)(i).

(ii) The Selection Committee shall review and evaluate all Shortlisted Bids, including any permitted revisions thereto submitted by Shortlisted Bidders. In performing the review and evaluation, the Selection Committee may consult with the Advisory Committee established pursuant to paragraph (b)(7) of SEC Rule 613 and Section 4.13, and such other Persons as the Selection Committee deems appropriate.

(e) Selection of Plan Processor Under this Agreement.

(i) There shall be two rounds of voting by the Selection Committee to select the Initial Plan Processor from among the Shortlisted Bidders. Each round shall be scored independently of prior rounds of voting, including the scoring to determine the Shortlisted Bids under Section 5.2(b).

(ii) Each Participant shall have one vote in each round, except that no Bidding Participant shall be entitled to vote in any round if the Participant's Bid, a Bid submitted by an Affiliate of the Participant, or a Bid including the Participant or an Affiliate of the Participant is considered in such round.

(iii) First Round Voting by the Selection Committee.

(A) In the first round of voting, each Voting Senior Officer, subject to the recusal provisions in Section 5.2(e)(ii), shall select a first and second choice from among the Shortlisted Bids.

(B) A weighted score shall be assigned to each choice as follows:

(1) First choice receives two (2) points; and

(2) Second choice receives one (1) point.

(C) The two Shortlisted Bids receiving the highest cumulative scores in the first round shall advance to the second round.

(D) In the event of a tie that would result in more than two Shortlisted Bids advancing to the second round, the tie shall be broken by assigning one point per vote, with the Shortlisted Bid(s) receiving the highest number of votes advancing to the second round. If, at this point, the Shortlisted Bids remain tied, a revote shall be taken with each vote receiving one point. If the revote results in a tie, the Participants shall identify areas for further discussion and, following any such discussion, voting shall continue until two Shortlisted Bids are selected to advance to the second round.

(iv) Second Round Voting by the Selection Committee.

(A) In the second round of voting, each Voting Senior Officer, subject to the recusal provisions in Section 5.2(e)(ii) above, shall vote for one Shortlisted Bid.

(B) The Shortlisted Bid receiving the most votes in the second round shall be selected, and the proposed entity included in the Shortlisted Bid to serve as the Plan Processor shall be selected as the Plan Processor.

(C) In the event of a tie, a revote shall be taken. If the revote results in a tie, the Participants shall identify areas for further discussions with the two Shortlisted Bidders. Following any such discussions, voting shall continue until one Shortlisted Bid is selected.

## ARTICLE VI

## FUNCTIONS AND ACTIVITIES OF CAT SYSTEM

**Section 6.1. Plan Processor**.

(a) The Initial Plan Processor shall be selected in accordance with Article V and shall serve as the Plan Processor until its resignation or removal from such position in accordance with this Section 6.1. The Company, under the direction of the Operating Committee shall enter into one or more agreements with the Plan Processor obligating the Plan Processor to perform the functions and duties contemplated by this Agreement to be performed by the Plan Processor, as well as such other functions and duties the Operating Committee deems necessary or appropriate.

(b) The Plan Processor may appoint such officers of the Plan Processor as it deems necessary and appropriate to perform its functions under this Agreement and SEC Rule 613; provided that the Plan Processor shall, at a minimum, appoint, in accordance with Section 6.2: (i) the Chief Compliance Officer; (ii) the Chief Information Security Officer; and (iii) the Independent Auditor. Notwithstanding anything to the contrary, the Operating Committee, by Supermajority Vote, shall approve any appointment or removal of the Chief Compliance Officer, the Chief Information Security Officer, or the Independent Auditor.

(c) The Plan Processor shall develop and, with the prior approval of the Operating Committee, implement policies, procedures, and control structures related to the CAT System that are consistent with SEC Rule 613(e)(4), Appendix C, and Appendix D.

(d) The Plan Processor shall:

(i) comply with applicable provisions of 15 U.S.C. § 78u-6 (Securities Whistleblower Incentives and Protection) and the recordkeeping requirements of SEC Rule 613(e)(8);

(ii) consistent with Appendix D, Central Repository Requirements, ensure the effective management and operation of the Central Repository;

(iii) consistent with Appendix D, Data Management, ensure the accuracy of the consolidation of the CAT Data reported to the Central Repository pursuant to Section 6.3 and Section 6.4; and

(iv) consistent with Appendix D, Upgrade Process and Development of New Functionality, design and implement appropriate policies and procedures governing the determination to develop new functionality for the CAT including, among other requirements, a mechanism by which changes can be suggested by Advisory Committee members, Participants, or the SEC. Such policies and procedures also shall: (A) provide for the escalation of reviews of proposed technological changes and upgrades (including as required by Section 6.1(i) and Section 6.1(j) or as otherwise appropriate) to the Operating Committee; and (B) address the handling of surveillance, including coordinated, SEC Rule 17d-2 or Regulatory Service Agreement(s) ("RSA") surveillance queries and requests for data.

(e) Any policy, procedure or standard (and any material modification or amendment thereto) applicable primarily to the performance of the Plan Processor's duties as the Plan Processor (excluding, for the avoidance of doubt, any policies, procedures or standards generally applicable to the Plan Processor's operations and employees) shall become effective only upon approval thereof by the Operating Committee.

(f) The Plan Processor shall, subject to the prior approval of the Operating Committee, establish appropriate procedures for escalation of matters to the Operating Committee.

(g) In addition to other policies, procedures and standards generally applicable to the Plan Processor's employees and contractors, the Plan Processor shall have hiring standards and shall conduct and enforce background checks (e.g., fingerprint-based) for all of its employees and contractors to ensure the protection, safeguarding and security of the facilities, systems, networks, equipment and data of the CAT System, and shall have an insider and external threat policy to detect, monitor and remedy cyber and other threats. Each Participant will also conduct background checks of its employees and contractors that will use the CAT System.

(h) The Plan Processor shall enter into appropriate Service Level Agreements ("SLAs") governing the performance of the Central Repository, as generally described in Appendix D, Functionality of the CAT System, with the prior approval of the Operating Committee. The Plan Processor in conjunction with the Operating Committee shall regularly review and, as necessary, update the SLAs, in accordance with the terms of the SLAs. As further contemplated in Appendix C, System Service Level Agreements (SLAs), and in Appendix D, System SLAs, the Plan Processor may enter into appropriate service level agreements with third parties applicable to the Plan Processor's functions related to the CAT System ("Other SLAs"), with the prior approval of the Operating Committee. The Chief Compliance Officer and/or the Independent Auditor shall, in conjunction with the Plan Processor and, as necessary, the Operating Committee, regularly review and, as necessary, update the Other SLAs, in accordance with the terms of the applicable Other SLA.

(i) The Plan Processor shall, on an ongoing basis and consistent with any applicable policies and procedures, evaluate and implement potential system changes and upgrades to maintain and improve the normal day-to-day operating function of the CAT System.

(j) In consultation with the Operating Committee, the Plan Processor shall, on an as needed basis and consistent with any applicable operational and escalation policies and procedures, implement such material system changes and upgrades as may be required to ensure effective functioning of the CAT System (i.e., those system changes and upgrades beyond the scope contemplated by Section 6.1(i)).

(k) In consultation with the Operating Committee, the Plan Processor shall, on an as needed basis, implement system changes and upgrades to the CAT System to ensure compliance with any applicable laws, regulations or rules (including those promulgated by the SEC or any Participant).

(l) The Plan Processor shall develop and, with the prior approval of the Operating Committee, implement a securities trading policy, as well as necessary procedures, control structures and tools to enforce this policy. The securities trading policy shall include:

(i) the category(ies) of employees, and as appropriate, contractors, of the Plan Processor to whom the policy will apply;

(ii) the scope of securities that are allowed or not allowed for trading;

(iii) the creation and maintenance of restricted trading lists;

(iv) a mechanism for declaring new or open account activity;

(v) a comprehensive list of any exclusions to the policy (e.g., blind trust, non-discretionary accounts);

(vi) requirements for duplicative records to be received by the Plan Processor for periodic review; and

(vii) a mechanism to review employee trading accounts.

(m) The Plan Processor shall develop and, with the prior approval of the Operating Committee, implement a training program that addresses the security and confidentiality of all information accessible from the CAT, as well as the operational risks associated with accessing the Central Repository. The training program will be made available to all individuals who have access to the Central Repository on behalf of the Participants or the SEC, prior to such individuals being granted access to the Central Repository.

(n) The Operating Committee will review the Plan Processor's performance under this Agreement at least once each year, or more often than once each year upon the request of two Participants that are not Affiliated Participants. The Operating Committee shall notify the SEC of any determination made by the Operating Committee concerning the continuing engagement of the Plan Processor as a result of the Operating Committee's review of the Plan Processor and shall provide the SEC with a copy of any reports that may be prepared in connection therewith.

(o) The Plan Processor shall provide the Operating Committee regular reports on the CAT System's operation and maintenance. The reports shall address:

(i) operational performance management information regarding the capacity and performance of the CAT System as specified by the Operating Committee. Such reports shall at a minimum address:

(A) the capacity and performance of the Central Repository, including at a minimum the requirements set forth in Appendix D, Central Repository Requirements;

(B) the basic functionality of the CAT System, including the functions set forth in Appendix D, Functionality of the CAT System.

(ii) data security issues for the Plan Processor and the Central Repository taking into account the data security requirements set forth in Appendix D, Data Security;

(iii) Participant usage statistics for the Plan Processor and the Central Repository, including capacity planning studies and daily reports called for by Appendix D, Capacity Requirements, as well as business continuity planning and disaster recovery issues for the Plan Processor and the Central Repository, taking into account the business continuity planning and disaster recovery requirements set forth in Appendix D, BCP / DR Process;

(iv) system improvement issues with the Plan Processor and the Central Repository as contemplated by Appendix D, Upgrade Process and Development of New Functionality;

(v) Error Rates relating to the Central Repository,[1] including, in each case to the extent the Operating Committee determines necessary or advisable, Error Rates by day and by delta over time, and Compliance Thresholds by CAT Reporter, by Reportable Event, by age before resolution, by symbol, by symbol type (e.g., ETF and Index) and by event time (by hour and cumulative on the hour) as set forth in Appendix C, Error Communication, Correction, and Processing;

(vi) financial statements of the Plan Processor prepared in accordance with GAAP (A) audited by an independent public accounting firm or (B) certified by the Plan Processor's Chief Financial Officer (which financial statements contemplated by this Section 6.1(o)(vi) shall be provided no later than 180 days after the Plan Processor's fiscal year end);

(vii) continued solvency of the Plan Processor;

(viii) budgetary status of any items subject to Section 6.2(a)(ii);

(ix) internal audit analysis and the status of any internal audit related deliverables; and

(x) additional items as requested by the Operating Committee, any Officer of the Company, or the Independent Auditor.

(p) Upon the request of the Operating Committee or any Subcommittee, the Plan Processor shall attend any meeting of the Operating Committee or such Subcommittee.

(q) The Operating Committee, by Supermajority Vote, may remove the Plan Processor from such position at any time.

[1] This Error Rate includes errors by CAT Reporters and linkage validation errors. In addition, errors attributable to the Plan Processor will be memorialized and reported to the Operating Committee.

(r) The Operating Committee may, by Majority Vote, remove the Plan Processor from such position at any time if it determines that the Plan Processor has failed to perform its functions in a reasonably acceptable manner in accordance with the provisions of this Agreement or that the Plan Processor's expenses have become excessive and are not justified. In making such determination, the Operating Committee shall consider, among other factors: (i) the reasonableness of the Plan Processor's response to requests from Participants or the Company for technological changes or enhancements; (ii) results of any assessments performed pursuant to Section 6.6; (iii) the timeliness of conducting preventative and corrective information technology system maintenance for reliable and secure operations; (iv) compliance with requirements of Appendix D; and (v) such other factors related to experience, technological capability, quality and reliability of service, costs, back-up facilities, failure to meet service level agreement(s) and regulatory considerations as the Operating Committee may determine to be appropriate.

(s) The Plan Processor may resign from such position; provided that no such resignation shall be effective earlier than two (2) years (or such other shorter period as may be determined by the Operating Committee by Supermajority Vote) after the Plan Processor provides written notice of such resignation to the Company.

(t) The Operating Committee, by Supermajority Vote, shall fill any vacancy in the Plan Processor position, and shall establish a Plan Processor Selection Subcommittee in accordance with Section 4.12 to evaluate and review Bids and make a recommendation to the Operating Committee with respect to the selection of the successor Plan Processor. Any successor Plan Processor appointed pursuant to this Section 6.1(t) shall be subject to all the terms and conditions of this Agreement applicable to the Plan Processor commencing from such appointment effective date.

(u) The Plan Processor shall afford to Participants and the Commission such access to the Representatives of the Plan Processor as any Participant or the Commission may request solely for the purpose of performing such Person's regulatory and oversight responsibilities pursuant to the federal securities laws, rules, and regulations or any contractual obligations, and shall direct such Representatives to cooperate with any inquiry, investigation, or proceeding conducted by or on behalf of any Participant or the Commission related to such purpose.

**Section 6.2. Chief Compliance Officer and Chief Information Security Officer.**

(a) Chief Compliance Officer.

(i) The Plan Processor shall designate an employee of the Plan Processor to serve, subject to the approval of the Operating Committee by Supermajority Vote, as the Chief Compliance Officer. The Plan Processor shall also designate at least one other employee (in addition to the person then serving as Chief Compliance Officer), which employee the Operating Committee has previously approved, to serve temporarily as the Chief Compliance Officer if the employee then serving as the Chief Compliance Officer becomes unavailable or unable to serve in such capacity (including by reason of injury or illness). Any person designated to serve as the Chief Compliance Officer (including to serve temporarily) shall be appropriately qualified to serve in such capacity based on the duties and responsibilities assigned

to the Chief Compliance Officer under this Agreement and shall dedicate such person's entire working time to such service (or temporary service) (except for any time required to attend to any incidental administrative matters related to such person's employment with the Plan Processor that do not detract in any material respect from such person's service as the Chief Compliance Officer). The Plan Processor may, at its discretion: (A) designate another employee previously approved by the Operating Committee by Supermajority Vote to serve in such capacity to temporarily serve as the Chief Compliance Officer if the employee then serving as the Chief Compliance Officer becomes unavailable or unable to serve as the Chief Compliance Officer (including by reason of injury or illness) for a period not in excess of thirty (30) days; or (B) designate another employee of the Plan Processor to replace, subject to approval of the Operating Committee by a Supermajority Vote, the Chief Compliance Officer. The Plan Processor shall promptly designate another employee of the Plan Processor to replace, subject to the approval of the Operating Committee by Supermajority Vote, the Chief Compliance Officer if the Chief Compliance Officer's employment with the Plan Processor terminates or the Chief Compliance Officer is otherwise unavailable or unable to serve as the Chief Compliance Officer (including by reason of injury or illness) for a period in excess of thirty (30) days. The Operating Committee shall report any action taken pursuant to Section 6.2(a)(i) to the SEC.

(ii) The Plan Processor, subject to the oversight of the Operating Committee, shall ensure that the Chief Compliance Officer has appropriate resources to fulfill the obligations of the Chief Compliance Officer set forth in SEC Rule 613 and in this Agreement.

(iii) In respect of all duties and responsibilities of the Chief Compliance Officer in such capacity (including those set forth in this Agreement), the Chief Compliance Officer shall be directly responsible and shall directly report to the Operating Committee, notwithstanding that he or she is employed by the Plan Processor.

(iv) The compensation (including base salary and bonus) of the Chief Compliance Officer shall be payable by the Plan Processor, but subject to review and approval by the Operating Committee, and the Operating Committee shall render the Chief Compliance Officer's annual performance review.

(v) The Chief Compliance Officer shall:

(A) regularly review the operation of the Central Repository to ensure its continued effectiveness based on market and technological developments and consistent with Appendix D, Upgrade Process and Development of New Functionality, and make any appropriate recommendations for enhancements to the nature of the information collected and the manner in which it is processed;

(B) identify and assist the Company in retaining an appropriately qualified independent auditor of national recognition (subject to the approval of the Operating Committee by Supermajority Vote, the "Independent Auditor") and, in collaboration with such Independent Auditor, create and implement an annual audit plan (subject

to the approval of the Operating Committee) which shall at a minimum include a review of all Plan Processor policies, procedures and control structures;

(C) in collaboration with the Chief Information Security Officer, and consistent with Appendix D, Data Security, and any other applicable requirements related to data security, Customer Account Information and Customer Identifying Information, identify and assist the Company in retaining an appropriately qualified independent auditor (based on specialized technical expertise, which may be the Independent Auditor or subject to the approval of the Operating Company by Supermajority Vote, another appropriately qualified independent auditor), and in collaboration with such independent auditor, create and implement an annual audit plan (subject to the approval of the Operating Committee), which shall at a minimum include a review of all Plan Processor policies, procedures and control structures, and real time tools that monitor and address data security issues for the Plan Processor and the Central Repository;

(D) have the ability to hire or retain adequate resources as needed (e.g., advisors and counsel) to fulfill its obligations;

(E) perform reviews with respect to the matters referenced in Section 4.12(b) and report periodically, and on an as needed basis, to the Operating Committee concerning the findings of any such reviews;

(F) report to the Operating Committee and conduct any relevant review of the Plan Processor or the Central Repository requested by the Operating Committee, including directing internal or external auditors, as appropriate, to support any such review;

(G) perform and provide the regular written assessment to the SEC required by Section 6.6 and SEC Rule 613;

(H) regularly review the information security program developed and maintained by the Plan Processor pursuant to Section 6.12 and determine the frequency of such reviews;

(I) report in a timely manner to the Operating Committee any instances of non-compliance by the Plan Processor with any of the Central Repository's policies or procedures with respect to information security;

(J) conduct regular monitoring of the CAT System for compliance by each Participant and each Industry Member with SEC Rule 613, this Agreement and Appendix D, Reporting and Linkage Requirements, and provide the results: (1) with regard to Industry Members, to each Participant with oversight of such Industry Member or to such Participant's agent pursuant to a regulatory services agreement, or

to the Participant responsible for enforcing compliance by such Industry Member pursuant to an agreement entered into by the applicable Participant pursuant to SEC Rule 17d-2; and (2) with regard to each Participant, to the chief regulatory officer or equivalent of such Participant;

(K) develop a mechanism to conduct regular monitoring of the CAT System for compliance by each Participant with SEC Rule 613, this Agreement, and Appendix D, Reporting and Linkage Requirements;

(L) develop and implement a notification and escalation process to resolve and remediate any alleged noncompliance by a Participant or Industry Member with the rules of the CAT, which process will include appropriate notification and order of escalation to a Participant, the Operating Committee, or the Commission;

(M) develop and conduct an annual assessment of Business Clock synchronization as specified in Section 6.8(c);

(N) have access to Plan Processor staff and documentation as appropriate to fulfill its obligations;

(O) have access to the Operating Committee, including attending all regular, special and emergency meetings of the Operating Committee as a non-voting observer; provided, however, that the Chief Compliance Officer shall not have the right to attend any Executive Session that the Operating Committee may hold;

(P) work on a more regular and frequent basis with the Compliance Subcommittee or other Subcommittee as may be determined by the Operating Committee; and

(Q) oversee the Plan Processor's compliance with applicable laws, rules and regulations related to the CAT System, in its capacity as Plan Processor.

(b) Chief Information Security Officer.

(i) The Plan Processor shall designate an employee of the Plan Processor to serve, subject to the approval of the Operating Committee by Supermajority Vote, as the Chief Information Security Officer. The Plan Processor shall also designate at least one other employee (in addition to the person then serving as Chief Information Security Officer), which employee the Operating Committee has previously approved, to serve temporarily as the Chief Information Security Officer if the employee then serving as the Chief Information Security Officer becomes unavailable or unable to serve in such capacity (including by reason of injury or illness). Any person designated to serve as the Chief Information Security Officer (including to serve temporarily) shall be appropriately qualified to serve in such capacity based on the duties and responsibilities assigned to the Chief Information Security Officer under this

Agreement and shall dedicate such person's entire working time to such service (or temporary service) (except for any time required to attend to any incidental administrative matters related to such person's employment with the Plan Processor that do not detract in any material respect from such person's service as the Chief Information Security Officer). The Plan Processor may, at its discretion: (A) designate another employee previously approved by the Operating Committee by Supermajority Vote to serve in such capacity to temporarily serve as the Chief Information Security Officer if the employee then serving as Chief Information Security Officer becomes unavailable or unable to serve as Chief Information Security Officer (including by reason of injury or illness) for a period not in excess of thirty (30) days; or (B) designate another employee of the Plan Processor to replace, subject to approval of the Operating Committee by a Supermajority Vote, the Chief Information Security Officer. The Plan Processor shall promptly designate another employee of the Plan Processor to replace, subject to the approval of the Operating Committee by Supermajority Vote, the Chief Information Security Officer if the Chief Information Security Officer's employment with the Plan Processor terminates or the Chief Information Security Officer is otherwise unavailable or unable to serve as Chief Information Security Officer (including by reason of injury or illness) for a period in excess of thirty (30) days. The Operating Committee shall report any action taken pursuant to Section 6.2(b)(i) to the SEC.

(ii) The Plan Processor, subject to the oversight of the Operating Committee, shall ensure that the Chief Information Security Officer has appropriate resources to fulfill the obligations of the Chief Information Security Officer set forth in SEC Rule 613 and in this Agreement, including providing appropriate responses to questions posed by the Participants and the SEC.

(iii) In respect of all duties and responsibilities of the Chief Information Security Officer in such capacity (including those set forth in this Agreement), the Chief Information Security Officer shall be directly responsible and directly report to the Operating Committee, notwithstanding that he or she is employed by the Plan Processor.

(iv) The compensation (including base salary and bonus) of the Chief Information Security Officer shall be payable by the Plan Processor, but subject to review and approval by the Operating Committee, and the Operating Committee shall render the Chief Information Security Officer's annual performance review.

(v) Consistent with Appendices C and D, the Chief Information Security Officer shall be responsible for creating and enforcing appropriate policies, procedures, and control structures to monitor and address data security issues for the Plan Processor and the Central Repository including:

(A) data security, including the standards set forth in Appendix D, Data Security;

(B) connectivity and data transfer, including the standards set forth in Appendix D, Connectivity and Data Transfer;

(C) data encryption, including the standards set forth in Appendix D, Data Encryption;

(D) data storage and environment, including the standards set forth in Appendix D, Data Storage and Environment;

(E) data access and breach management, including the standards set forth in Appendix D, Data Access, and Appendix D, Breach Management;

(F) PII data requirements, including the standards set forth in Appendix D, PII Data Requirements;

(G) industry standards, including the standards set forth in Appendix D, Industry Standards; and

(H) penetration test reviews, which shall occur at least every year or earlier, or at the request of the Operating Committee, set forth in Appendix D, Data Storage and Environment.

(vi) At regular intervals, to the extent that such information is available to the Company, the Chief Information Security Officer shall report to the Operating Committee the activities of the Financial Services Information Sharing and Analysis Center ("FS-ISAC") or other comparable body.

(vii) The Chief Information Security Officer shall review the information security policies and procedures of the Participants that are related to the CAT to ensure that such policies and procedures are comparable to the information security policies and procedures applicable to the Central Repository. If the Chief Information Security Officer, in consultation with the Chief Compliance Officer, finds that any such policies and procedures are not comparable to the policies and procedures applicable to the CAT System, and the issue is not promptly addressed by the applicable Participant, the Chief Information Security Officer, in consultation with the Chief Compliance Officer, will be required to notify the Operating Committee of such deficiencies.

**Section 6.3. Data Recording and Reporting by Participants**. This Section 6.3 shall become effective on the first anniversary of the Effective Date and shall remain effective thereafter until modified or amended in accordance with the provisions of this Agreement and applicable law.

(a) Format. As contemplated in Appendix D, Data Types and Sources, each Participant shall report Participant Data to the Central Repository for consolidation and storage in a format or formats specified by the Plan Processor, approved by the Operating Committee and compliant with SEC Rule 613.

(b) Timing of Recording and Reporting.

(i) As further described in Appendix D, Reporting and Linkage Requirements, each Participant shall record Participant Data contemporaneously with the applicable Reportable Event.

(ii) Each Participant shall report Participant Data to the Central Repository by 8:00 a.m. Eastern Time on the Trading Day following the day the Participant records such Participant Data. A Participant may voluntarily report Participant Data prior to the 8:00 a.m. Eastern Time deadline.

(c) Applicable Securities.

(i) Each Participant that is a national securities exchange shall report Participant Data for each NMS Security registered or listed for trading on such exchange or admitted to unlisted trading privileges on such exchange.

(ii) Each Participant that is a national securities association shall report Participant Data for each Eligible Security for which transaction reports are required to be submitted to such association.

(d) Participant Data. Subject to Section 6.3(c), and Appendix D, Reporting and Linkage Requirements, and in accordance with the Technical Specifications, each Participant shall record and electronically report to the Central Repository the following details for each order and each Reportable Event, as applicable ("Participant Data"):

(i) for original receipt or origination of an order:

(A) Firm Designated ID(s) for each Customer;

(B) CAT-Order-ID;

(C) SRO-Assigned Market Participant Identifier of the Industry Member receiving or originating the order;

(D) date of order receipt or origination;

(E) time of order receipt or origination (using timestamps pursuant to Section 6.8); and

(F) Material Terms of the Order;

(ii) for the routing of an order:

(A) CAT-Order-ID;

(B) date on which the order is routed;

(C) time at which the order is routed (using timestamps pursuant to Section 6.8);

(D) SRO-Assigned Market Participant Identifier of the Industry Member or Participant routing the order;

(E) SRO-Assigned Market Participant Identifier of the Industry Member or Participant to which the order is being routed;

(F) if routed internally at the Industry Member, the identity and nature of the department or desk to which the order is routed; and

(G) Material Terms of the Order;

(iii) for the receipt of an order that has been routed, the following information:

(A) CAT-Order-ID;

(B) date on which the order is received;

(C) time at which the order is received (using timestamps pursuant to Section 6.8);

(D) SRO-Assigned Market Participant Identifier of the Industry Member or Participant receiving the order;

(E) SRO-Assigned Market Participant Identifier of the Industry Member or Participant routing the order; and

(F) Material Terms of the Order;

(iv) if the order is modified or cancelled:

(A) CAT-Order-ID;

(B) date the modification or cancellation is received or originated;

(C) time at which the modification or cancellation is received or originated (using timestamps pursuant to Section 6.8);

(D) price and remaining size of the order, if modified;

(E) other changes in the Material Terms of the Order, if modified; and

(F) whether the modification or cancellation instruction was given by the Customer or was initiated by the Industry Member or Participant;

(v) if the order is executed, in whole or in part:

(A) CAT-Order-ID;

(B) date of execution;

(C) time of execution (using timestamps pursuant to Section 6.8);

(D) execution capacity (principal, agency or riskless principal);

(E) execution price and size;

(F) SRO-Assigned Market Participant Identifier of the Participant or Industry Member executing the order;

(G) whether the execution was reported pursuant to an effective transaction reporting plan or the Plan for Reporting of Consolidated Options Last Sale Reports and Quotation Information; and

(vi) other information or additional events as may be prescribed in Appendix D, Reporting and Linkage Requirements.

(e) CAT-Reporter-ID.

(i) Each Participant must submit to the Central Repository, on a daily basis,

(A) all SRO-Assigned Market Participant Identifiers used by its Industry Members or itself; and

(B) information to identify (1) each such Industry Member, including CRD number and LEI if such LEI has been obtained, and itself, including LEI, if such LEI has been obtained.

(ii) The Plan Processor will use the SRO-Assigned Market Participant Identifiers and identifying information to assign a CAT-Reporter-ID to each Industry Member or Participant for internal use across all CAT Data in the Central Repository.

(f) Means of Transmission. As contemplated in Appendix D, each Participant may utilize such methods as may be provided by the Plan Processor and approved by the Operating Committee to transmit Participant Data to the Central Repository.

**Section 6.4. Data Reporting and Recording by Industry Members**. The requirements for Industry Members under this Section 6.4 shall become effective on the second

anniversary of the Effective Date in the case of Industry Members other than Small Industry Members, or the third anniversary of the Effective Date in the case of Small Industry Members, and shall remain effective thereafter until modified or amended in accordance with the provisions of this Agreement and applicable law.

(a) Format. As contemplated in Appendix D, Data Types and Sources, each Participant shall, through its Compliance Rule, require its Industry Members to report Industry Member Data to the Central Repository for consolidation and storage in a format or formats specified by the Plan Processor, approved by the Operating Committee and compliant with SEC Rule 613.

(b) Timing of Recording and Reporting.

(i) As further described in Appendix D, Reporting and Linkage Requirements, each Participant shall, through its Compliance Rule, require its Industry Members to record Recorded Industry Member Data contemporaneously with the applicable Reportable Event.

(ii) Consistent with Appendix D, Reporting and Linkage Requirements, each Participant shall, through its Compliance Rule, require its Industry Members to report: (A) Recorded Industry Member Data to the Central Repository by 8:00 a.m. Eastern Time on the Trading Day following the day the Industry Member records such Recorded Industry Member Data; and (B) Received Industry Member Data to the Central Repository by 8:00 a.m. Eastern Time on the Trading Day following the day the Industry Member receives such Received Industry Member Data. Each Participant shall, through its Compliance Rule, permit its Industry Members to voluntarily report Industry Member Data prior to the applicable 8:00 a.m. Eastern Time deadline.

(c) Applicable Securities.

(i) Each Participant that is a national securities exchange shall, through its Compliance Rule, require its Industry Members to report Industry Member Data for each NMS Security registered or listed for trading on such exchange or admitted to unlisted trading privileges on such exchange.

(ii) Each Participant that is a national securities association shall, through its Compliance Rule, require its Industry Members to report Industry Member Data for each Eligible Security for which transaction reports are required to be submitted to such association.

(d) Required Industry Member Data.

(i) Subject to Section 6.4(c) and Section 6.4(d)(iii) with respect to Options Market Makers, and consistent with Appendix D, Reporting and Linkage Requirements, and the Technical Specifications, each Participant shall, through its Compliance Rule, require its Industry Members to record and electronically report to the Central Repository for each order and each Reportable Event the information referred to in Section 6.3(d), as applicable ("Recorded Industry Member Data").

(ii) Subject to Section 6.4(c) and Section 6.4(d)(iii) with respect to Options Market Makers, and consistent with Appendix D, Reporting and Linkage Requirements, and the Technical Specifications, each Participant shall, through its Compliance Rule, require its Industry Members to record and report to the Central Repository the following, as applicable ("Received Industry Member Data" and collectively with the information referred to in Section 6.4(d)(i) "Industry Member Data"):

(A) if the order is executed, in whole or in part:

(1) An Allocation Report;

(2) SRO-Assigned Market Participant Identifier of the clearing broker or prime broker, if applicable; and

(3) CAT-Order-ID of any contra-side order(s);

(B) if the trade is cancelled, a cancelled trade indicator;

(C) for original receipt or origination of an order, the Firm Designated ID for the relevant Customer, and in accordance with Section 6.4(d)(iv), Customer Account Information and Customer Identifying Information for the relevant Customer; and

(D) for the original receipt or origination of an order to sell an equity security, whether the order is for a short sale effected by a market maker in connection with bona fide market making activities in the security for which the exception in Rule 203(b)(2)(iii) of Regulation SHO is claimed.[*]

(iii) With respect to the reporting obligations of an Options Market Maker with regard to its quotes in Listed Options, Reportable Events required pursuant to Section 6.3(d)(ii) and (iv) shall be reported to the Central Repository by an Options Exchange in lieu of the reporting of such information by the Options Market Maker. Each Participant that is an Options Exchange shall, through its Compliance Rule, require its Industry Members that are Options Market Makers to report to the Options Exchange the time at which a quote in a Listed Option is sent to the Options Exchange (and, if applicable, any subsequent quote modifications and/or cancellation time when such modification or cancellation is originated by the Options Market Maker). Such time information also shall be reported to the Central Repository by the Options Exchange in lieu of reporting by the Options Market Maker.

(iv) Each Industry Member must submit an initial set of the Customer information required in Section 6.4(d)(ii)(C) for Active Accounts to the Central Repository upon the Industry Member's commencement of reporting to the Central Repository. Each Industry Member must submit to the Central Repository any updates, additions or other changes to the

[*] *The Commission amended Section 6.4 of the CAT NMS Plan by adding paragraph (d)(ii)(D) in connection with the Commission's issuance of Release No. 34-98738, "Short Position and Short Activity Reporting by Institutional Investment Managers," effective January 2, 2024. The compliance date for Section 6.4(d)(ii)(D) is July 1, 2025. See Securities Exchange Act Release No. 98739 (Oct. 13, 2023), 88 Fed. Reg. 75079 (Nov. 1, 2023).*

Customer information required in Section 6.4(d)(ii)(C) on a daily basis for all Active Accounts. In addition, on a periodic basis as designated by the Plan Processor and approved by the Operating Committee, each Industry Member will be required to submit to the Central Repository a complete set of all Customer information required in Section 6.4(d)(ii)(C). The Plan Processor will correlate such Customer information across all Industry Members, use it to assign a Customer-ID for each Customer, and use the Customer-ID to link all Reportable Events associated with an order for a Customer.

(v) Each Participant shall, through its Compliance Rule, require its Industry Members to record and report to the Central Repository other information or additional events as may be prescribed in Appendix D, Reporting and Linkage Requirements.

(vi) Each Industry Member must submit to the Central Repository information sufficient to identify such Industry Member, including CRD number and LEI, if such LEI has been obtained.

(e) Means of Transmission. As contemplated in Appendix D, Data Types and Sources, each Industry Member may utilize such methods as may be provided by the Plan Processor and approved by the Operating Committee to transmit Industry Member Data to the Central Repository.

**Section 6.5. Central Repository**.

(a) Collection of Data.

(i) The Central Repository, under the oversight of the Plan Processor, and consistent with Appendix D, Central Repository Requirements, shall receive, consolidate, and retain all CAT Data.

(ii) The Central Repository shall collect (from a SIP or pursuant to an NMS Plan) and retain on a current and continuing basis, in a format compatible with the Participant Data and Industry Member Data, all data, including the following (collectively, "SIP Data"):

(A) information, including the size and quote condition, on quotes including the National Best Bid and National Best Offer for each NMS Security;

(B) Last Sale Reports and transaction reports reported pursuant to an effective transaction reporting plan filed with the SEC pursuant to, and meeting the requirements of, SEC Rules 601 and 608;

(C) trading halts, Limit Up/Limit Down price bands, and Limit Up/Limit Down indicators; and

(D) summary data or reports described in the specifications for each of the SIPs and disseminated by the respective SIP.

(b) Retention of Data.

(i) Consistent with Appendix D, Data Retention Requirements, the Central Repository shall retain the information collected pursuant to paragraphs (c)(7) and (e)(7) of SEC Rule 613 in a convenient and usable standard electronic data format that is directly available and searchable electronically without any manual intervention by the Plan Processor for a period of not less than six (6) years, subject to the exceptions in Section 6.3 of Appendix D. Such data when available to the Participant regulatory staff and the SEC shall be linked.

(ii) The Plan Processor shall implement and comply with the records retention policy contemplated by Section 6.1(d)(i) (as such policy is reviewed and updated periodically in accordance with Section 6.1(d)(i)).

(c) Access to the Central Repository

(i) Consistent with Appendix D, Data Access, the Plan Processor shall provide Participants and the SEC access to the Central Repository (including all systems operated by the Central Repository), and access to and use of the CAT Data stored in the Central Repository, solely for the purpose of performing their respective regulatory and oversight responsibilities pursuant to the federal securities laws, rules and regulations or any contractual obligations.

(ii) The Plan Processor shall create and maintain a method of access to CAT Data stored in the Central Repository that includes the ability to run searches and generate reports. The method in which the CAT Data is stored in the Central Repository shall allow the ability to return results of queries that are complex in nature, including market reconstruction and the status of order books at varying time intervals.

(iii) The Plan Processor shall, at least annually and at such earlier time promptly following a request by the Operating Committee, certify to the Operating Committee that only Participants and the SEC have access to the Central Repository (other than access provided to any Industry Member for the purpose of correcting CAT Data previously reported to the Central Repository by such Industry Member).

(iv) Appendix C, The Security and Confidentiality of Information Reported to the Central Repository, and Appendix D, Data Security, describes the security and confidentiality of the CAT Data, including how access to the Central Repository is controlled.

(d) Data Accuracy

(i) The Operating Committee shall set and periodically review a maximum Error Rate for data reported to the Central Repository. The initial maximum Error Rate shall be set to 5%.

(ii) Consistent with Appendix D, Reporting and Linkage Requirements and Data Security, the Operating Committee shall adopt policies and procedures, including standards, requiring CAT Data reported to the Central Repository be timely, accurate, and complete, and to ensure the integrity of such CAT Data (e.g., that such CAT Data has not been

altered and remains reliable). The Plan Processor shall be responsible for implementing such policies and procedures.

(iii) Appendix D, Receipt of Data from Reporters, describes the mechanisms and protocols for Participant Data and Industry Member Data submission for all key phases, including:

(A) file transmission and receipt validation;

(B) validation of CAT Data; and

(C) validation of linkages.

(e) Appendix D, Receipt of Data from Reporters, also describes the mechanisms and protocols for managing and handling corrections of CAT Data. The Plan Processor shall require an audit trail for corrected CAT Data in accordance with mechanisms and protocols approved by the Operating Committee.

(f) Data Confidentiality

(i) The Plan Processor shall, without limiting the obligations imposed on Participants by this Agreement and in accordance with the framework set forth in, Appendix D, Data Security, and Functionality of the CAT System, be responsible for the security and confidentiality of all CAT Data received and reported to the Central Repository. Without limiting the foregoing, the Plan Processor shall:

(A) require all individuals who have access to the Central Repository (including the respective employees and consultants of the Participants and the Plan Processor, but excluding employees and Commissioners of the SEC) to agree: (1) to use appropriate safeguards to ensure the confidentiality of CAT Data stored in the Central Repository; and (2) not to use CAT Data stored in the Central Repository for purposes other than surveillance and regulation in accordance with such individual's employment duties; provided that a Participant will be permitted to use the Raw Data it reports to the Central Repository for regulatory, surveillance, commercial or other purposes as permitted by applicable law, rule, or regulation;

(B) require all individuals who have access to the Central Repository (including the respective employees and consultants of the Participants and the Plan Processor, but excluding employees and Commissioners of the SEC) to execute a personal "Safeguard of Information Affidavit" in a form approved by the Operating Committee providing for personal liability for misuse of data;

(C) develop and maintain a comprehensive information security program with a dedicated staff for the Central Repository, consistent with Appendix D, Data Security, that employs state of the art technology,

which program will be regularly reviewed by the Chief Compliance Officer and Chief Information Security Officer;

(D) implement and maintain a mechanism to confirm the identity of all individuals permitted to access the CAT Data stored in the Central Repository and maintain a record of all instances where such CAT Data was accessed; and

(E) implement and maintain appropriate policies regarding limitations on trading activities of its employees and independent contractors involved with all CAT Data consistent with Section 6.1(n).

(ii) Each Participant shall adopt and enforce policies and procedures that:

(A) implement effective information barriers between such Participant's regulatory and non-regulatory staff with regard to access and use of CAT Data stored in the Central Repository;

(B) permit only persons designated by Participants to have access to the CAT Data stored in the Central Repository; and

(C) impose penalties for staff non-compliance with any of its or the Plan Processor's policies or procedures with respect to information security.

(iii) Each Participant shall as promptly as reasonably practicable, and in any event within 24 hours, report to the Chief Compliance Officer, in accordance with the guidance provided by the Operating Committee, any instance of which such Participant becomes aware of: (A) noncompliance with the policies and procedures adopted by such Participant pursuant to Section 6.5(e)(ii); or (B) a breach of the security of the CAT.

(iv) The Plan Processor shall:

(A) ensure data confidentiality and security during all communications between CAT Reporters and the Plan Processor, data extractions, manipulation and transformation, loading to and from the Central Repository and data maintenance by the Central Repository;

(B) require the establishment of secure controls for data retrieval and query reports by Participant regulatory staff; and

(C) otherwise provide appropriate database security for the Central Repository.

(v) The Company shall endeavor to join the FS-ISAC and comparable bodies as the Operating Committee may determine.

(g) Participants Confidentiality Policies and Procedures. The Participants shall establish, maintain and enforce written policies and procedures reasonably designed to (1) ensure the confidentiality of the CAT Data obtained from the Central Repository; and (2) limit the use of CAT Data obtained from the Central Repository solely for surveillance and regulatory purposes. Each Participant shall periodically review the effectiveness of the policies and procedures required by this paragraph, and take prompt action to remedy deficiencies in such policies and procedures.

(h) A Participant may use the Raw Data it reports to the Central Repository for regulatory, surveillance, commercial or other purposes as otherwise not prohibited by applicable law, rule or regulation.

**Section 6.6. Written Assessments, Audits and Reports**.

(a) One-Time Written Assessments and Reports. The Participants shall provide the SEC with the following written assessments, audits and reports:

(i) at least one (1) month prior to submitting a rule filing to establish initial fees for CAT Reporters, an independent audit of fees, costs, and expenses incurred by the Participants on behalf of the Company prior to the Effective Date of the Plan that will be publicly available;

(ii) within six (6) months of effectiveness of the Plan, an assessment of the clock synchronization standard, including consideration of industry standards based on the type of CAT Reporter, Industry Member and type of system, and propose any appropriate amendment based on this assessment;

(iii) within twelve (12) months of effectiveness of the Plan, a report detailing the Participants' consideration of coordinated surveillance (e.g., entering into 17d-2 agreements or regulatory services agreements);

(iv) within 24 months of effectiveness of the Plan, a report discussing the feasibility, benefits, and risks of allowing an Industry Member to bulk download the Raw Data it submitted to the Central Repository;

(v) within 36 months of effectiveness of the Plan, an assessment of errors in the customer information submitted to the Central Repository and whether to prioritize the correction of certain data fields over others;

(vi) within 36 months of effectiveness of the Plan, a report on the impact of tiered-fees on market liquidity, including an analysis of the impact of the tiered-fee structure on Industry Members' provision of liquidity; and

(vii) prior to the implementation of any Material Systems Change, an assessment of the projected impact of such Material Systems Change on the maximum Error Rate.

(b) Regular Written Assessment of the Plan Processor's Performance.

(i) Requirement.

(A) Annually, or more frequently in connection with any review of the Plan Processor's performance under this Agreement pursuant to Section 6.1(n), the Participants shall provide the SEC with a written assessment of the operation of the CAT that meets the requirements of SEC Rule 613, Appendix D, and this Agreement.

(B) The Chief Compliance Officer shall oversee the assessment contemplated by Section 6.6(b)(i)(A) and shall provide the Participants a reasonable time to review and comment upon such assessment prior to its submission to the SEC. In no case shall the written assessment be changed or amended in response to a comment by a Participant; rather, any comment by a Participant shall be provided to the SEC at the same time as the written assessment.

(ii) Contents of Written Assessment. The annual written assessment required by this Section 6.6 shall include:

(A) an evaluation of the performance of the CAT, including the items specified in SEC Rule 613(b)(6)(i) and other performance metrics identified by the Chief Compliance Officer, and a description of such metrics;

(B) a detailed plan, based on the evaluation conducted pursuant to Section 6.6(b)(i), for any potential improvements to the performance of the CAT with respect to the items specified in SEC Rule 613(b)(6)(ii), as well as:

(1) an evaluation of potential technology upgrades based on a review of technological advancements over the preceding year, drawing on technological expertise whether internal or external;

(2) an evaluation of the time necessary to restore and recover CAT Data at a back-up site;

(3) an evaluation of the information security program to ensure that the program is consistent with the highest industry standards for the protection of data;

(4) an evaluation of how the Plan Processor and the Participants are monitoring Error Rates and to explore the imposition of Error Rates based on product, data elements or other criteria;

(5) a copy of the evaluation required by Section 6.8(c) as to whether industry standards have evolved such

that: (i) the synchronization standard in Section 6.8(a) should be shortened; or (ii) the required time stamp in Section 6.8(b) should be in finer increments;

(6) an assessment of whether any data elements should be added, deleted or changed; and

(7) any other items identified and described by the Chief Compliance Officer;

(C) an estimate of the costs and benefits associated with any potential improvements to the performance of the CAT, including an assessment of the potential impact on competition, efficiency, capital formation, and investor protection; and

(D) an estimated implementation timeline for any potential improvements to the performance of the CAT, if applicable.

(c) Implementation Plan and Quarterly Progress Reports.

(i) Within 30 calendar days following the effective date of this provision, the Participants shall file with the Commission and make publicly available on each of their websites, or collectively on the CAT NMS Plan website, a complete CAT implementation plan that includes the Participants' timeline for achieving the objective milestones setting forth how and when the Participants will facilitate the achievement of Full Implementation of CAT NMS Plan Requirements (the "Implementation Plan"). The Implementation Plan shall include:

(A) For each of the objective milestones set forth in Section C.10 of Appendix C of this Agreement to assess progress toward implementation of the CAT, the completion date and a description of the status; and

(B) For each of the Financial Accountability Milestones, the completion date and a description of the status.

If the Participants decide to complete any of the milestones identified in the Implementation Plan by releasing functionality in a phased approach, the Implementation Plan shall describe each phased release necessary to achieve the completion of the relevant milestone and provide completion dates for each such release identified.

(ii) Within 30 calendar days after the end of each calendar quarter, Participants shall file with the Commission and make publicly available on each of their websites, or collectively on the CAT NMS Plan website, a complete report that provides a detailed description of the progress made by the Participants during that calendar quarter toward achieving each of the milestones set forth in the Implementation Plan (the "Quarterly Progress Report"). If, subsequent to the publication of the Implementation Plan, the Participants decide to complete any of the milestones set forth therein by releasing functionality in a phased approach,

each Quarterly Progress Report shall reflect this change by describing the phases necessary to achieve the completion of the relevant milestone and providing the information specified below for each phase. The Participants shall file and make publicly available the first of such reports within 30 calendar days after the end of the calendar quarter in which the Participants filed and made publicly available the Implementation Plan.

(A) For each milestone completed by the end of a given calendar quarter, the report shall include the following: (1) the CAT implementation plan completion date, (2) the date on which the milestone was completed, and (3) a description of any variance from the Implementation Plan.

(B) For each milestone in progress at the end of a given calendar quarter, the report shall include the following: (1) the CAT implementation plan completion date, (2) the currently targeted completion date, and (3) a description of:

(a) the current status of the milestone;

(b) any difference between the CAT implementation plan completion date and the currently targeted completion date, including the basis for making the adjustment and the impact of this adjustment on any other milestone; and

(c) any other factual indicators that demonstrate the current level of completion with respect to the milestone.

(C) For each milestone that has not yet been initiated by the end of a given calendar quarter, the report shall include the following: (1) the CAT implementation plan completion date, (2) the currently targeted completion date, and (3) a description of:

(a) the current status of the milestone; and

(b) any difference between the Implementation Plan completion date and the currently targeted completion date, including the basis for making the adjustment and the impact of this adjustment on any other milestone.

(iii) The Implementation Plan and each Quarterly Progress Report shall be approved by at least a Supermajority Vote of the Operating Committee before such documents are filed with the Commission or made publicly available on each of the Participant websites or collectively on the CAT NMS Plan website. However, if the Implementation Plan or any Quarterly Progress Report is approved only by a Supermajority Vote of the Operating Committee, and not by a unanimous vote of the Operating Committee (including, for the avoidance of doubt, all members of the Operating Committee, whether or not present and whether or not recused), each Participant whose Operating Committee member did not vote to approve the Implementation Plan or Quarterly Progress Report shall separately file with the

Commission a statement identifying itself and explaining why the member did not vote to approve the Implementation Plan or Quarterly Progress Report. These statements shall be made publicly available by each dissenting Participant on its website or collectively by all Participants on the CAT NMS Plan website. The Operating Committee shall submit the Implementation Plan and Quarterly Progress Reports to the Chief Executive Officer, President, or an equivalently situated senior officer of each Participant, prior to being voted on by the Operating Committee.

**Section 6.7. Implementation**.

(a) Unless otherwise ordered by the SEC:

(i) within two (2) months after the Effective Date, the Participants shall jointly select the winning Shortlisted Bid and the Plan Processor pursuant to the process set forth in Article V. Following the selection of the Initial Plan Processor, the Participants shall file with the Commission a statement identifying the Plan Processor and including the information required by SEC Rule 608;

(ii) within four (4) months after the Effective Date, each Participant shall, and through its Compliance Rule shall require its Industry Members to, synchronize its or their Business Clocks as required by Section 6.8 and certify to the Chief Compliance Officer (in the case of Participants) or the applicable Participant (in the case of Industry Members) that such Participant has met this requirement;

(iii) within one (1) year after the Effective Date, each Participant shall report to the Central Repository Participant Data;

(iv) within fourteen (14) months after the Effective Date, each Participant shall implement a new or enhanced surveillance system(s) in accordance with Section 6.10;

(v) within two (2) years after the Effective Date, each Participant shall, through its Compliance Rule, require its Industry Members (other than Small Industry Members) to report to the Central Repository Industry Member Data; and

(vi) within three (3) years after the Effective Date, each Participant shall, through its Compliance Rule, require its Small Industry Members to report to the Central Repository Industry Member Data.

(b) The Chief Compliance Officer shall appropriately document objective milestones to assess progress toward the implementation of this Agreement.

(c) Industry Members and Participants shall be required to participate in testing with the Central Repository on a schedule to be determined by the Operating Committee.

(d) Appendix C, A Plan to Eliminate Existing Rules and Systems (SEC Rule 613(a)(1)(ix)), and Appendix D, Data Types and Sources, set forth additional implementation details concerning the elimination of rules and systems.

**Section 6.8. Timestamps and Synchronization of Business Clocks**.

(a) Each Participant shall:

(i) other than such Business Clocks used solely for Manual Order Events, synchronize its Business Clocks at a minimum to within 100 microseconds of the time maintained by the National Institute of Standards and Technology, consistent with industry standards;

(ii) other than such Business Clocks used solely for Manual Order Events or the time of allocation on Allocation Reports, through its Compliance Rule, require its Industry Members to:

(A) synchronize their respective Business Clocks at a minimum to within fifty (50) milliseconds of the time maintained by the National Institute of Standards and Technology, and maintain such a synchronization;

(B) certify periodically (according to a schedule to be defined by the Operating Committee) that their Business Clocks meet the requirements of the Compliance Rule;

(C) and report to the Plan Processor and the Participant any violation of the Compliance Rule pursuant to the thresholds set by the Operating Committee; and

(iii) synchronize its Business Clocks and, through its Compliance Rule, require its Industry Members to synchronize their Business Clocks used solely for Manual Order Events at a minimum to within one second of the time maintained by the National Institute of Standards and Technology ("NIST"), consistent with industry standards, and maintain such synchronization. Each Participant shall require its Industry Members to certify periodically (according to a schedule defined by the Operating Committee) that their Business Clocks used solely for Manual Order Events meet the requirements of the Compliance Rule. The Compliance Rule of a Participant shall require its Industry Members using Business Clocks solely for Manual Order Events to report to the Plan Processor any violation of the Compliance Rule pursuant to the thresholds set by the Operating Committee.

(iv) through its Compliance Rule, require its Industry Members to synchronize their Business Clocks used solely for the time of allocation on Allocation Reports at a minimum to within one second of the time maintained by NIST, consistent with industry standards, and maintain such synchronization. Each Participant shall require its Industry Members to certify periodically (according to a schedule defined by the Operating Committee) that their Business Clocks used solely for the time of allocation on Allocation Reports meet the requirements of the Compliance Rule. The Compliance Rule of a Participant shall require its Industry Members using Business Clocks solely for the time of allocation on Allocation Reports to report to the Plan Processor any violation of the Compliance Rule pursuant to the thresholds set by the Operating Committee.

(b) Each Participant shall, and through its Compliance Rule shall require its Industry Members to, report information required by SEC Rule 613 and this Agreement to the Central Repository in milliseconds. To the extent that any Participant's order handling or execution systems utilize timestamps in increments finer than the minimum required in this Agreement, such Participant shall utilize such finer increment when reporting CAT Data to the Central Repository so that all Reportable Events reported to the Central Repository can be adequately sequenced. Each Participant shall, through its Compliance Rule: (i) require that, to the extent that its Industry Members utilize timestamps in increments finer than the minimum required in this Agreement in their order handling or execution systems, such Industry Members shall utilize such finer increment when reporting CAT Data to the Central Repository; and (ii) provide that a pattern or practice of reporting events outside of the required clock synchronization time period without reasonable justification or exceptional circumstances may be considered a violation of SEC Rule 613 and the CAT NMS Plan. Notwithstanding the preceding sentences, each Participant and Industry Member shall be permitted to record and report: (i) Manual Order Events to the Central Repository in increments up to and including one second, provided that Participants and Industry Members shall be required to record and report the time when a Manual Order Event has been captured electronically in an order handling and execution system of such Participant or Industry Member ("Electronic Capture Time") in milliseconds; and (ii) the time of allocation on Allocation Reports in increments up to and including one second.

(c) In conjunction with Participants' and other appropriate Industry Member advisory groups, the Chief Compliance Officer shall annually evaluate and make a recommendation to the Operating Committee as to whether industry standards have evolved such that: (i) the synchronization standard in Section 6.8(a) should be shortened; or (ii) the required time stamp in Section 6.8(b) should be in finer increments. Industry standards should be determined based on the type of CAT Reporter, Industry Member and type of system.

**Section 6.9. Technical Specifications**.

(a) Publication. The Plan Processor shall publish technical specifications that are at a minimum consistent with Appendices C and D, and updates thereto as needed, providing detailed instructions regarding the submission of CAT Data by Participants and Industry Members to the Plan Processor for entry into the Central Repository (collectively, the "Technical Specifications"). The Technical Specifications shall be made available on a publicly available web site to be developed and maintained by the Plan Processor. The initial Technical Specifications and any Material Amendments thereto shall be provided to the Operating Committee for approval by Supermajority Vote.

(b) Content. The Technical Specifications shall include a detailed description of the following:

(i) the specifications for the layout of files and records submitted to the Central Repository;

(ii) the process for the release of new data format specification changes;

(iii) the process for industry testing for any changes to data format specifications;

(iv) the procedures for obtaining feedback about and submitting corrections to information submitted to the Central Repository;

(v) each data element, including permitted values, in any type of report submitted to the Central Repository;

(vi) any error messages generated by the Plan Processor in the course of validating the data;

(vii) the process for file submissions (and re-submissions for corrected files);

(viii) the storage and access requirements for all files submitted;

(ix) metadata requirements for all files submitted to the CAT System;

(x) any required secure network connectivity;

(xi) data security standards, which shall, at a minimum: (A) satisfy all applicable regulations regarding database security, including provisions of Regulation Systems Compliance and Integrity under the Exchange Act ("Reg SCI"); (B) to the extent not otherwise provided for under this Agreement (including Appendix C hereto), set forth such provisions as may be necessary or appropriate to comply with SEC Rule 613(e)(4); and (C) comply with industry best practices; and

(xii) any other items reasonably deemed appropriate by the Plan Processor and approved by the Operating Committee.

(c) Amendments. Amendments to the Technical Specifications may be made only in accordance with this Section 6.9(c). For purposes of this Section 6.9(c), an amendment to the Technical Specifications shall be deemed "material" if it would require a Participant or an Industry Member to engage in significant changes to the coding necessary to submit information to the Central Repository pursuant to this Agreement or if it is required to safeguard the security or confidentiality of the CAT Data ("Material Amendment").

(i) Except for Material Amendments to the Technical Specifications, the Plan Processor shall have the sole discretion to amend and publish interpretations regarding the Technical Specifications as needed in furtherance of the purposes and requirements of this Agreement. All non-Material Amendments made to the Technical Specifications and all published interpretations shall be provided to the Operating Committee in writing at least ten (10) days before being published. Such non-Material Amendments and published interpretations shall be deemed approved ten (10) days following provision to the Operating Committee unless two (2) unaffiliated Participants call for a vote to be taken on the proposed amendment or interpretation. If an amendment or interpretation is called out for a vote by two or more unaffiliated Participants, the proposed amendment must be approved by Majority Vote of the

Operating Committee. Once a non-Material amendment has been approved, or deemed approved, by the Operating Committee, the Plan Processor shall be responsible for determining the specific changes to the Central Repository and providing technical documentation of those changes, including an implementation timeline.

(ii) The Operating Committee, by Supermajority Vote, shall approve any Material Amendments to the Technical Specifications.

(iii) The Operating Committee, by Supermajority Vote, may amend the Technical Specifications on its own motion.

**Section 6.10. Surveillance**.

(a) Surveillance Systems. Using the tools provided for in Appendix D, Functionality of the CAT System, each Participant shall develop and implement a surveillance system, or enhance existing surveillance systems, reasonably designed to make use of the consolidated information contained in the Central Repository. Unless otherwise ordered by the SEC, within fourteen (14) months after the Effective Date, each Participant shall initially implement a new or enhanced surveillance system(s) as required by SEC Rule 613 and the preceding sentence.

(b) Coordinated Surveillance. Participants may, but are not required to, coordinate or share surveillance efforts through the use of regulatory services agreements and agreements adopted pursuant to SEC Rule 17d-2.

(c) Use of CAT Data by Regulators.

(i) Consistent with Appendix D, Functionality of the CAT System, the Plan Processor shall provide Participants and the SEC with access to all CAT Data stored in the Central Repository. Regulators will have access to processed CAT Data through two different methods; an online targeted query tool, and user-defined direct queries and bulk extracts.

(A) The online targeted query tool will provide authorized users with the ability to retrieve CAT Data via an online query screen that includes the ability to choose from a variety of pre-defined selection criteria. Targeted queries must include date(s) and/or time range(s), as well as one or more of a variety of fields.

(B) The user-defined direct queries and bulk extracts will provide authorized users with the ability to retrieve CAT Data via a query tool or language that allows users to query all available attributes and data sources.

(ii) Extraction of CAT Data shall be consistent with all permission rights granted by the Plan Processor. All CAT Data returned shall be encrypted, and PII data shall be masked unless users have permission to view the CAT Data that has been requested.

(iii) The Plan Processor shall implement an automated mechanism to monitor direct query usage. Such monitoring shall include automated alerts to notify the Plan Processor of potential issues with bottlenecks or excessively long queues for queries or CAT Data extractions. The Plan Processor shall provide the Operating Committee or its designee(s) details as to how the monitoring will be accomplished and the metrics that will be used to trigger alerts.

(iv) The Plan Processor shall reasonably assist regulatory staff (including those of Participants) with creating queries.

(v) Without limiting the manner in which regulatory staff (including those of Participants) may submit queries, the Plan Processor shall submit queries on behalf of a regulatory staff (including those of Participants) as reasonably requested.

(vi) The Plan Processor shall staff a CAT help desk, as described in Appendix D, CAT Help Desk, to provide technical expertise to assist regulatory staff (including those of Participants) with questions about the content and structure of the CAT Data.

**Section 6.11. Debt Securities and Primary Market Transactions**. Unless otherwise ordered by the Commission, within six (6) months after the Effective Date, the Participants shall jointly provide to the SEC a document outlining how the Participants could incorporate into the CAT information with respect to equity securities that are not NMS Securities or OTC Equity Securities, including Primary Market Transactions in securities that are not NMS Securities or OTC Equity Securities and in debt securities, which document shall include details for each order and Reportable Event that may be required to be provided, which market participants may be required to provide the data, the implementation timeline, and a cost estimate.

**Section 6.12. Information Security Program**. The Plan Processor shall develop and maintain a comprehensive information security program for the Central Repository, to be approved and reviewed at least annually by the Operating Committee, and which contains at a minimum the specific requirements detailed in Appendix D, Data Security.

## ARTICLE VII

## INTENTIONALLY OMITTED

## ARTICLE VIII

## TAX STATUS

The Company intends to operate in a manner such that it qualifies as a "business league" within the meaning of Section 501(c)(6) of the Code. The Operating Committee shall cause the Company to: (i) make an election to be treated as a corporation for U.S. federal income tax purposes by filing Form 8832 with the Internal Revenue Service effective as of the date of formation and (ii) file with the Internal Revenue Service, Form 1024, Application for Recognition of Exemption under Section 501(a) to be treated as a "business league" as described in Section 501(c)(6) of the Code.

## ARTICLE IX

## RECORDS AND ACCOUNTING; REPORTS

**Section 9.1.** **Books and Records**. The Company shall maintain complete and accurate books and records of the Company in accordance with SEC Rule 17a-1, which shall be maintained and be available, in addition to any documents and information required to be furnished to the Participants under the Act, at the office of the Plan Processor and/or such other location(s) as may be designated by the Company for examination and copying by any Participant or its duly authorized representative, at such Participant's reasonable request and at its expense during ordinary business hours for any purpose reasonably related to such Participant's involvement with the CAT NMS Plan, including for compliance and other regulatory purposes, and in compliance with such other conditions as may be reasonably established by the Operating Committee. For the avoidance of doubt, all CAT Data and other books and records of the Company shall be the property of the Company, rather than the Plan Processor, and, to the extent in the possession or control of the Plan Processor, shall be made available by the Plan Processor to the Commission upon request. Except as provided in this Section 9.1 or required by non-waivable provisions of applicable law, no Participant shall have any right to examine or copy any of the books and records of the Company.

**Section 9.2.** **Accounting**.

(a) Except as provided in Section 9.3, the Operating Committee shall maintain a system of accounting established and administered in accordance with GAAP, and all financial statements or information that may be supplied to the Participants shall be prepared in accordance with GAAP (except that unaudited statements shall be subject to year-end adjustments and need not include footnotes). The Company shall prepare and provide to each Participant (1) within 30 days after the end of each calendar month, an unaudited balance sheet, income statement, statement of cash flows and statement of changes in equity for, or as of the end of, (x) such month and (y) the portion of the then current Fiscal Year ending at the end of such month; and (2) as soon as practicable after the end of each Fiscal Year, a balance sheet, income statement, statement of cash flows and statement of changes in equity for, or as of the end of, such year, audited by an independent public accounting firm (which audited balance sheet, income statement, statement of cash flows and statement of changes in equity contemplated by this Section 9.2(a) shall be made publicly available). The Fiscal Year shall be the calendar year unless otherwise determined by the Operating Committee.

(b) In all other respects, matters concerning accounting procedures shall be determined by the Operating Committee.

**Section 9.3.** **Tax Returns**. The Operating Committee shall cause federal, state, provincial, and local income tax returns for the Company to be prepared and timely filed with the appropriate authorities.

**Section 9.4.** **Company Funds**. Pending use in the business of the Company or distribution to the Participants, the funds of the Company shall be held and/or invested in

accordance with the then effective cash management and investment policy adopted by the Operating Committee.

**Section 9.5. Intentionally Omitted**.

**Section 9.6. Confidentiality**.

(a) For purposes of this Agreement, "Information" means information disclosed by or on behalf of the Company or a Participant (the "Disclosing Party") to the Company or any other Participant (the "Receiving Party") in connection with this Agreement or the CAT System, but excludes any CAT Data or information otherwise disclosed pursuant to the requirements of SEC Rule 613. The Receiving Party agrees to maintain the Information in confidence with the same degree of care it holds its own confidential information (but in any event not less than reasonable care). A Receiving Party may only disclose Information to its Representatives (as defined below) on a need-to-know basis, and only to those of such Representatives whom shall have agreed to abide by the non-disclosure and non-use provisions in this Section 9.6. Each Receiving Party that is a Participant agrees that he, she or it shall not use for any purpose, other than in connection with the operation of the Company, and the Company agrees not to use for any purpose not expressly authorized by the Disclosing Party, any Information. The "Representatives" of a Person are such Person's Affiliates and the respective directors, managers, officers, employees, consultants, advisors and agents of such Person and such Person's Affiliates; provided, however, that a Participant is not a Representative of the Company. The obligations set forth in this Section 9.6(a) shall survive indefinitely (including after a Participant ceases to hold any Company Interest) but shall not apply to: (i) any Information that was already lawfully in the Receiving Party's possession and, to the knowledge of the Receiving Party, free from any confidentiality obligation to the Disclosing Party at the time of receipt from the Disclosing Party; (ii) any Information that is, now or in the future, public knowledge through no act or omission in breach of this Agreement by the Receiving Party; (iii) any Information that was lawfully obtained from a third party having, to the knowledge of the Receiving Party, the right to disclose it free from any obligation of confidentiality; or (iv) any Information that was independently developed by the Receiving Party prior to disclosure to it pursuant hereto and without recourse to or reliance upon Information disclosed to it pursuant hereto as established by its written records or other competent evidence. The obligations set forth in this Section 9.6(a) shall not restrict: (x) disclosures that are, in the opinion of the Receiving Party after consultation with counsel; required to be made by applicable laws and regulations, stock market or exchange requirements or the rules of any self-regulatory organization having jurisdiction; (y) disclosures required to be made pursuant to an order, subpoena or legal process; or (z) disclosures reasonably necessary for the conduct of any litigation or arbitral proceeding among the Participants (and their respective Representatives) and/or the Company; provided that the Receiving Party shall, to the extent not prohibited by applicable law, notify the Disclosing Party prior to making any disclosure permitted by the foregoing clause (x) or clause (y), and, in the case of a disclosure permitted by the foregoing clause (y), shall consult with the Disclosing Party with respect to such disclosure, and prior to making such disclosure, to the extent not prohibited by applicable law, shall permit the Disclosing Party, at such Disclosing Party's cost and expense, to seek a protective order or similar relief protecting the confidentiality of such Information.

(b) The Company shall not, and shall cause its Representatives not to, disclose any Information of a Participant to any other Participant without the prior written approval of the disclosing Participant.

(c) A Participant shall be free, in its own discretion, to share Information of such Participant to other Participants without the approval of the Company.

## ARTICLE X

## DISSOLUTION AND TERMINATION

**Section 10.1. Dissolution of Company**. The Company shall, subject to the SEC's approval, dissolve and its assets and business shall be wound up upon the occurrence of any of the following events:

(a) unanimous written consent of the Participants to dissolve the Company;

(b) an event that makes it unlawful or impossible for the Company business to be continued;

(c) the termination of one or more Participants such that there is only one remaining Participant; or

(d) the entry of a decree of judicial dissolution under Section 18-802 of the Delaware Act.

**Section 10.2. Liquidation and Distribution**. Following the occurrence of an event described in Section 10.1, the Operating Committee shall act as liquidating trustee and shall wind up the affairs of the Company by: (a) selling its assets in an orderly manner (so as to avoid the loss normally associated with forced sales); and (b) applying and distributing the proceeds of such sale, together with other funds held by the Company: (i) first, to the payment of all debts and liabilities of the Company; (ii) second, to the establishments of any reserves reasonably necessary to provide for any contingent recourse liabilities and obligations; and (iii) third, to such persons or institutions as is consistent with the purposes of the Company and consistent with Section 501(c)(6) of the Code.

**Section 10.3. Termination**. Each of the Participants shall be furnished with a statement prepared by the Company's independent accountants, which shall set forth the assets and liabilities of the Company as of the date of the final distribution of the Company's assets under Section 10.2 and the net profit or net loss for the fiscal period ending on such date. Upon compliance with the distribution plan set forth in Section 10.2, the Participants shall cease to be such, and the liquidating trustee shall execute, acknowledge, and cause to be filed a certificate of cancellation of the Company. Upon completion of the dissolution, winding up, liquidation and distribution of the liquidation proceeds, the Company shall terminate.

## ARTICLE XI

## FUNDING OF THE COMPANY

**Section 11.1. Funding Authority**.

(a) On an annual basis the Operating Committee shall approve a reasonable operating budget for the Company. The budget shall include the projected costs of the Company, including the costs of developing and operating the CAT for the upcoming year, and the sources of all revenues to cover such costs, as well as the funding of any reserve that the Operating Committee reasonably deems appropriate for prudent operation of the Company.

(i) Without limiting the foregoing, the reasonably budgeted CAT costs shall include technology (including cloud hosting services, operating fees, CAIS operating fees, change request fees and capitalized developed technology costs), legal, consulting, insurance, professional and administration, and public relations costs, a reserve and such other cost categories as reasonably determined by the Operating Committee to be included in the budget.

(ii) For the reserve referenced in paragraph (a)(i) of this Section, the budget will include an amount reasonably necessary to allow the Company to maintain a reserve of not more than 25% of the annual budget. To the extent collected CAT fees exceed CAT costs, including the reserve of 25% of the annual budget, such surplus shall be used to offset future fees. For the avoidance of doubt, the Company will only include an amount for the reserve in the annual budget if the Company does not have a sufficient reserve (which shall be up to but not more than 25% of the annual budget). For the avoidance of doubt, the calculation of the amount of the reserve would exclude the amount of the reserve from the budget.

(b) Subject to Section 11.1 and Section 11.2, the Operating Committee shall have discretion to establish funding for the Company, including: (i) establishing fees that the Participants shall pay; and (ii) establishing fees for Industry Members that shall be implemented by Participants. The Participants shall file with the SEC under Section 19(b) of the Exchange Act any such fees on Industry Members that the Operating Committee approves, and such fees shall be labeled as "Consolidated Audit Trail Funding Fees."

(c) To fund the development and implementation of the CAT, the Company shall time the imposition and collection of all fees on Participants and Industry Members in a manner reasonably related to the timing when the Company expects to incur such development and implementation costs. In determining fees on Participants and Industry Members the Operating Committee shall take into account fees, costs and expenses (including legal and consulting fees and expenses) reasonably incurred by the Participants on behalf of the Company prior to the Effective Date in connection with the creation and implementation of the CAT, and such fees, costs and expenses shall be fairly and reasonably shared among the Participants and Industry Members. Any surplus of the Company's revenues over its expenses shall be treated as an operational reserve to offset future fees.

(d) Consistent with this Article XI, the Operating Committee shall adopt policies, procedures, and practices regarding the budget and budgeting process, resolution of disputes, billing and collection of fees, and other related matters.

**Section 11.2. Funding Principles**. In establishing the funding of the Company, the Operating Committee shall seek:

(a) to create transparent, predictable revenue streams for the Company that are aligned with the anticipated costs to build, operate and administer the CAT and the other costs of the Company;

(b) to establish an allocation of the Company's related costs among Participants and Industry Members that is consistent with the Exchange Act, taking into account the timeline for implementation of the CAT;

(c) to establish a fee structure in which the fees charged to Participants and Industry Members are based upon the executed equivalent share volume of transactions in Eligible Securities, and the costs of the CAT.

(d) to provide for ease of billing and other administrative functions;

(e) to avoid any disincentives such as placing an inappropriate burden on competition and a reduction in market quality; and

(f) to build financial stability to support the Company as a going concern.

**Section 11.3. Recovery**.

(a) Prospective CAT Costs. The Operating Committee will establish fees ("CAT Fees") to be payable by Participants and Industry Members with regard to CAT costs not previously paid by the Participants ("Prospective CAT Costs") as follows:

(i) Fee Rate. The Operating Committee will calculate the Fee Rate for the CAT Fee twice per year, once at the beginning of the year and once during the year as follows.

(A) General.

(I) For the beginning of each year, the Operating Committee will calculate the Fee Rate by dividing the reasonably budgeted CAT costs for the year by the reasonably projected total executed equivalent share volume of all transactions in Eligible Securities for the year. Once the Operating Committee has approved such Fee Rate, the Participants shall be required to file with the SEC pursuant to Section 19(b) of the Exchange Act CAT Fees to be charged to Industry Members calculated using such Fee Rate. Participants and Industry Members will be required to pay CAT Fees calculated using this Fee Rate once such CAT Fees are

in effect with regard to Industry Members in accordance with Section 19(b) of the Exchange Act.

(II) During each year, the Operating Committee will calculate a new Fee Rate by dividing the reasonably budgeted CAT costs for the remainder of the year by the reasonably projected total executed equivalent share volume of all transactions in Eligible Securities for the remainder of the year. Once the Operating Committee has approved the new Fee Rate, the Participants shall be required to file with the SEC pursuant to Section 19(b) of the Exchange Act CAT Fees to be charged to Industry Members calculated using the new Fee Rate. Participants and Industry Members will be required to pay CAT Fees calculated using this new Fee Rate once such CAT Fees are in effect with regard to Industry Members in accordance with Section 19(b) of the Exchange Act.

(III) For the avoidance of doubt, CAT Fees with a Fee Rate calculated as set forth in this paragraph (a)(i) shall remain in effect until the Operating Committee approves a new Fee Rate as described in paragraph (a)(i) and CAT Fees with the new Fee Rate are in effect with regard to Industry Members in accordance with Section 19(b) of the Exchange Act.

(IV) For the avoidance of doubt, the first CAT Fee may commence at the beginning of the year or during the year. If it were to commence during the year, the first CAT Fee would be calculated as described in paragraph (II) of this Section.

(B) Executed Equivalent Shares. For purposes of calculating CAT Fees, executed equivalent shares in a transaction in Eligible Securities will be reasonably counted as follows:

(I) each executed share for a transaction in NMS Stocks will be counted as one executed equivalent share;

(II) each executed contract for a transaction in Listed Options will be counted based on the multiplier applicable to the specific Listed Option (i.e., 100 executed equivalent shares or such other applicable multiplier); and

(III) each executed share for a transaction in OTC Equity Securities shall be counted as 0.01 executed equivalent share.

(C) Budgeted CAT Costs. The budgeted CAT costs for the year shall be comprised of all reasonable fees, costs and expenses reasonably budgeted to be incurred by or for the Company in connection with the development, implementation and operation of the CAT as set forth in the

annual operating budget approved by the Operating Committee pursuant to Section 11.1(a) of the CAT NMS Plan, or as adjusted during the year by the Operating Committee.

(D) Projected Total Executed Equivalent Share Volume of Transactions in Eligible Securities. The Operating Committee shall reasonably determine the projected total executed equivalent share volume of all transactions in Eligible Securities for each relevant period based on the executed equivalent share volume of all transactions in Eligible Securities for the prior twelve months.

(ii) Participant CAT Fees.

(A) CAT Fee Obligation. Each Participant that is a national securities exchange will be required to pay the CAT Fee for each transaction in Eligible Securities executed on the exchange in the prior month based on CAT Data. Each Participant that is a national securities association will be required to pay the CAT Fee for each transaction in Eligible Securities executed otherwise than on an exchange in the prior month based on CAT Data. The CAT Fee for each transaction in Eligible Securities will be calculated by multiplying the number of executed equivalent shares in the transaction by one-third and by the Fee Rate reasonably determined pursuant to paragraph (a)(i) of this Section 11.3.

(B) Effectiveness. Each Participant will be required to pay the CAT Fee calculated using the Fee Rate reasonably determined pursuant to paragraph (a)(i) of this Section 11.3 and approved by the Operating Committee only if such CAT Fees are in effect with regard to Industry Members in accordance with Section 19(b) of the Exchange Act.

(iii) Industry Member CAT Fees.

(A) CAT Fee Obligation. Each Industry Member that is the CAT Executing Broker for the buyer in a transaction in Eligible Securities ("CAT Executing Broker for the Buyer" or "CEBB") and each Industry Member that is the CAT Executing Broker for the seller in a transaction in Eligible Securities ("CAT Executing Broker for the Seller" or "CEBS") will be required to pay a CAT Fee for each such transaction in Eligible Securities in the prior month based on CAT Data. The CEBB's CAT Fee or CEBS's CAT Fee (as applicable) for each transaction in Eligible Securities will be calculated by multiplying the number of executed equivalent shares in the transaction by one-third and by the Fee Rate reasonably determined pursuant to paragraph (a)(i) of this Section 11.3.

(B) Content of Fee Filings. When the Participants file with the SEC pursuant to Section 19(b) of the Exchange Act CAT Fees to be charged to Industry Members calculated using the Fee Rate that the

Operating Committee approved in accordance with paragraph (a) of this Section 11.3, such filings shall set forth (A) the Fee Rate; (B) the budget for the upcoming year (or remainder of the year, as applicable), including a brief description of each line item in the budget, including (1) technology line items of cloud hosting services, operating fees, CAIS operating fees, change request fees and capitalized developed technology costs, (2) legal, (3) consulting, (4) insurance, (5) professional and administration, and (6) public relations costs, a reserve and/or such other categories as reasonably determined by the Operating Committee to be included in the budget, and the reason for changes in each such line item from the prior CAT Fee filing; (C) a discussion of how the budget is reconciled to the collected fees; and (D) the projected total executed equivalent share volume of all transactions in Eligible Securities for the year (or remainder of the year, as applicable), and a description of the calculation of the projection. The information provided in this Section would be provided with sufficient detail to demonstrate that the budget for the upcoming year, or part of year, as applicable, is reasonable and appropriate.

(C) No Participant will make a filing with the SEC pursuant to Section 19(b) of the Exchange Act regarding any CAT Fee related to Prospective CAT Costs until the Financial Accountability Milestone related to Period 4 described in Section 11.6 has been satisfied.

(iv) CAT Fee Details.

(A) Details regarding the calculation of a Participant or CAT Executing Brokers' CAT Fees will be provided upon request to such Participant or CAT Executing Broker. At a minimum, such details would include each Participant or CAT Executing Broker's executed equivalent share volume and corresponding fee by (1) Listed Options, NMS Stocks and OTC Equity Securities, (2) by transactions executed on each exchange and transactions executed otherwise than on an exchange, and (3) by buy-side transactions and sell-side transactions.

(B) For each CAT Fee, at a minimum, CAT LLC will make publicly available the aggregate executed equivalent share volume and corresponding aggregate fee by (1) Listed Options, NMS Stocks and OTC Equity Securities, (2) by transactions executed on each exchange and transactions executed otherwise than on an exchange, and (3) by buy-side transactions and sell-side transactions.

(b) Past CAT Costs. The Operating Committee will establish one or more fees (each a "Historical CAT Assessment") to be payable by Industry Members with regard to CAT costs previously paid by the Participants ("Past CAT Costs") as follows:

(i) Calculation of Historical Fee Rates.

(A) General. The Operating Committee will calculate the Historical Fee Rate for each Historical CAT Assessment by dividing the Historical CAT Costs for each Historical CAT Assessment by the reasonably projected total executed equivalent share volume of all transactions in Eligible Securities for the Historical Recovery Period for each Historical CAT Assessment. Once the Operating Committee has approved such Historical Fee Rate, the Participants shall be required to file with the SEC pursuant to Section 19(b) of the Exchange Act such Historical CAT Assessment to be charged to Industry Members calculated using such Historical Fee Rate. Industry Members will be required to pay such Historical CAT Assessment calculated using such Historical Fee Rate once such Historical CAT Assessment is in effect in accordance with Section 19(b) of the Exchange Act.

(B) Executed Equivalent Shares. For purposes of calculating each Historical CAT Assessment, executed equivalent shares in a transaction in Eligible Securities will be reasonably counted in the same manner as set forth in paragraph (a)(i)(B) of this Section 11.3.

(C) Historical CAT Costs. The Operating Committee will reasonably determine the Historical CAT Costs sought to be recovered by each Historical CAT Assessment, where the Historical CAT Costs will be Past CAT Costs minus Past CAT Costs reasonably excluded from Historical CAT Costs by the Operating Committee. Each Historical CAT Assessment will seek to recover from CAT Executing Brokers two-thirds of Historical CAT Costs incurred during the period covered by the Historical CAT Assessment.

(D) Historical Recovery Period.

(I) The length of the Historical Recovery Period used in calculating each Historical Fee Rate will be reasonably established by the Operating Committee based upon the amount of the Historical CAT Costs to be recovered by the Historical CAT Assessment; provided, however, no Historical Recovery Period used in calculating the Historical Fee Rate shall be less than 24 months or more than five years.

(II) Notwithstanding the length of the Historical Recovery Period used in calculating the Historical Fee Rate, each Historical CAT Assessment calculated using the Historical Fee Rate will remain in effect until all Historical CAT Costs for the Historical CAT Assessment are collected.

(E) Projected Total Executed Equivalent Share Volume of Transactions in Eligible Securities for Historical Recovery Period. The Operating Committee shall reasonably determine the projected total

executed equivalent share volume of all transactions in Eligible Securities for each Historical Recovery Period based on the executed equivalent share volume of all transactions in Eligible Securities for the prior twelve months.

(ii) Past CAT Costs and Participants. Because Participants previously have paid Past CAT Costs via loans to the Company, Participants would not be required to pay any Historical CAT Assessment. In lieu of a Historical CAT Assessment, the Participants' one-third share of Historical CAT Costs and such other additional Past CAT Costs as reasonably determined by the Operating Committee will be paid by the cancellation of loans made to the Company on a pro rata basis based on the outstanding loan amounts due under the loans. Historical CAT Assessments are designed to recover two-thirds of the Historical CAT Costs.

(iii) Historical CAT Assessment for Industry Members.

(A) Each month in which a Historical CAT Assessment is in effect, each CEBB and each CEBS shall pay a fee for each transaction in Eligible Securities executed by the CEBB or CEBS from the prior month as set forth in CAT Data, where the Historical CAT Assessment for each transaction will be calculated by multiplying the number of executed equivalent shares in the transaction by one-third and by the Historical Fee Rate reasonably determined pursuant to paragraph (b)(i) of this Section 11.3.

(B) Historical CAT Assessment Fee Filings.

(I) Participants will be required to file with the SEC pursuant to Section 19(b) of the Exchange Act a filing for each Historical CAT Assessment.

(II) When the Participants file with the SEC pursuant to Section 19(b) of the Exchange Act a Historical CAT Assessment calculated using the Historical Fee Rate that the Operating Committee approved in accordance with paragraph (b) of this Section 11.3, such filing shall set forth (A) the Historical Fee Rate; (B) a brief description of the amount and type of the Historical CAT Costs, including (1) the technology line items of cloud hosting services, operating fees, CAIS operating fees, change request fees, and capitalized developed technology costs, (2) legal, (3) consulting, (4) insurance, (5) professional and administration and (6) public relations costs; (C) the Historical Recovery Period and the reasons for its length; and (D) the projected total executed equivalent share volume of all transactions in Eligible Securities for the Historical Recovery Period, and a description of the calculation of the projection. The information provided in this Section would be provided with sufficient detail to demonstrate that the Historical CAT Costs are reasonable and appropriate.

(III) No Participant will make a filing with the SEC pursuant to Section 19(b) of the Exchange Act regarding any Historical CAT Assessment until any applicable Financial Accountability Milestone described in Section 11.6 has been satisfied.

(iv) Historical CAT Assessment Details.

(A) Details regarding the calculation of a CAT Executing Broker's Historical CAT Assessment will be provided upon request to such CAT Executing Broker. At a minimum, such details would include each CAT Executing Broker's executed equivalent share volume and corresponding fee by (1) Listed Options, NMS Stocks and OTC Equity Securities, (2) by transactions executed on each exchange and transactions executed otherwise than on an exchange, and (3) by buy-side transactions and sell-side transactions.

(B) For each Historical CAT Assessment, at a minimum, CAT LLC will make publicly available the aggregate executed equivalent share volume and corresponding aggregate fee by (1) Listed Options, NMS Stocks and OTC Equity Securities, (2) by transactions executed on each exchange and transactions executed otherwise than on an exchange, and (3) by buy-side transactions and sell-side transactions.

(c) The Operating Committee may establish any other fees ancillary to the operation of the CAT that it reasonably determines appropriate, including fees: (i) for the late or inaccurate reporting of information to the CAT; (ii) for correcting submitted information; and (iii) based on access and use of the CAT for regulatory and oversight purposes (and not including any reporting obligations).

(d) The Company shall make publicly available a schedule of effective fees and charges adopted pursuant to this Agreement as in effect from time to time. The Operating Committee shall review such fee schedule on at least an annual basis and shall make any changes to such fee schedule that it deems appropriate. The Operating Committee is authorized to review such fee schedule on a more regular basis, but shall not make any changes on more than a semi-annual basis unless, pursuant to a Supermajority Vote, the Operating Committee concludes that such change is necessary for the adequate funding of the Company.

**Section 11.4. Collection of Fees**. The Operating Committee shall establish a system for the collection of fees authorized under this Article XI. The Operating Committee may include such collection responsibility as a function of the Plan Processor or another administrator. Alternatively, the Operating Committee may use the facilities of a clearing agency registered under Section 17A of the Exchange Act to provide for the collection of such fees. Participants shall require each Industry Member to pay all applicable fees authorized under this Article XI within thirty (30) days after receipt of an invoice or other notice indicating payment is due (unless a longer payment period is otherwise indicated). If an Industry Member fails to pay any such fee when due (as determined in accordance with the preceding sentence), such Industry

Member shall pay interest on the outstanding balance from such due date until such fee is paid at a per annum rate equal to the lesser of: (a) the Prime Rate plus 300 basis points; or (b) the maximum rate permitted by applicable law. Each Participant shall pay all applicable fees authorized under this Article XI as required by Section 3.7(b).

**Section 11.5. Fee Disputes**. Disputes with respect to fees the Company charges Participants pursuant to this Article XI shall be determined by the Operating Committee or a Subcommittee designated by the Operating Committee. Decisions by the Operating Committee or such designated Subcommittee on such matters shall be binding on Participants, without prejudice to the rights of any Participant to seek redress from the SEC pursuant to SEC Rule 608 or in any other appropriate forum. The Participants shall adopt rules requiring that disputes with respect to fees charged to Industry Members pursuant to this Article XI be determined by the Operating Committee or a Subcommittee. Decisions by the Operating Committee or Subcommittee on such matters shall be binding on Industry Members, without prejudice to the rights of any Industry Member to seek redress from the SEC pursuant to SEC Rule 608 or in any other appropriate forum.

**Section 11.6. Funding Incentives for Post-Amendment Expenses**. Notwithstanding the foregoing provisions, this Section shall apply with respect to all fees, costs, and expenses (including legal and consulting fees, costs, and expenses) incurred by or for the Company in connection with the development, implementation, and operation of the CAT from the effective date of this Section until such time as Full Implementation of CAT NMS Plan Requirements has been achieved ("Post-Amendment Expenses").

(a) The following conditions shall apply to the collection of any fees established by the Operating Committee or implemented by the Participants to recover a portion of Post-Amendment Expenses from Industry Members ("Post-Amendment Industry Member Fees").

(i) The Participants will be entitled to collect the full amount of:

(A) Any Post-Amendment Industry Member Fees established or implemented to recover Post-Amendment Expenses incurred from the effective date of this Section to the date of Initial Industry Member Core Equity and Option Reporting ("Period 1"), so long as such date is no later than July 31, 2020;

(B) Any Post-Amendment Industry Member Fees established or implemented to recover the Post-Amendment Expenses incurred from the date immediately following the achievement of Initial Industry Member Core Equity and Option Reporting to the date of Full Implementation of Core Equity Reporting ("Period 2"), so long as such date is no later than December 31, 2020;

(C) Any Post-Amendment Industry Member Fees established or implemented to recover the Post-Amendment Expenses incurred from the date immediately following the achievement of Full Implementation of

Core Equity Reporting to the date of Full Availability and Regulatory Utilization of Transactional Database Functionality ("Period 3"), so long as such date is no later than December 31, 2021; and

(D) Any Post-Amendment Industry Member Fees established or implemented to recover the Post-Amendment Expenses incurred from the date immediately following the achievement of Full Availability and Regulatory Utilization of Transactional Database Functionality to the date of Full Implementation of CAT NMS Plan Requirements ("Period 4"), so long as such date is no later than December 30, 2022.

(ii) The amount of Post-Amendment Industry Member Fees that the Participants are entitled to collect for Period 1 will be reduced according to the following schedule if the Participants miss the deadline set forth for that Period:

(A) By 25% if the Participants miss the deadline set forth in Section 11.6(a)(i)(A) by less than 45 days;

(B) By 50% if the Participants miss the deadline set forth in Section 11.6(a)(i)(A) by 45 days or more, but less than 90 days;

(C) By 75% if the Participants miss the deadline set forth in Section 11.6(a)(i)(A) by 90 days or more, but less than 135 days; and

(D) By 100% if the Participants miss the deadline set forth in Section 11.6(a)(i)(A) by 135 days or more.

(iii) The amount of Post-Amendment Industry Member Fees that the Participants are entitled to collect for Periods 2, 3, and 4 will be reduced according to the following schedule if the Participants miss the deadline set forth for that Period:

(A) By 25% if the Participants miss the deadline set forth in Section 11.6(a)(i)(B)-(D) by less than 90 days;

(B) By 50% if the Participants miss the deadline set forth in Section 11.6(a)(i)(B)-(D) by 90 days or more, but less than 180 days;

(C) By 75% if the Participants miss the deadline set forth in Section 11.6(a)(i)(B)-(D) by 180 days or more, but less than 270 days; and

(D) By 100% if the Participants miss the deadline set forth in Section 11.6(a)(i)(B)-(D) by 270 days or more.

(iv) The Participants will only be permitted to collect Post-Amendment Industry Member Fees for Period 1, Period 2, Period 3, or Period 4 at the end of each respective Period.

(b) In all CAT NMS Plan amendments submitted by the Operating Committee to the Commission pursuant to Rule 608(b)(3)(i), and in all filings submitted by the Participants to the Commission under Section 19(b) of the Exchange Act, to establish or implement Post-Amendment Industry Member Fees pursuant to this Article, the Operating Committee or the Participants shall clearly indicate whether such fees are related to Post-Amendment Expenses incurred during Period 1, Period 2, Period 3, or Period 4.

## ARTICLE XII

## MISCELLANEOUS

**Section 12.1. Notices and Addresses**. All notices required to be given under this Agreement shall be in writing and may be delivered by certified or registered mail, postage prepaid, by hand, or by any private overnight courier service. Such notices shall be mailed or delivered to the Participants at the addresses set forth on Exhibit A to this Agreement or such other address as a Participant may notify the other Participants of in writing. Any notices to be sent to the Company shall be delivered to the principal place of business of the Company or at such other address as the Operating Committee may specify in a notice sent to all of the Participants. Notices shall be effective: (i) if mailed, on the date three (3) days after the date of mailing; or (ii) if hand delivered or delivered by private courier, on the date of delivery.

**Section 12.2. Governing Law; Submission to Jurisdiction**. This Agreement shall be governed by and construed in accordance with the Delaware Act and internal laws and decisions of the State of Delaware without giving effect to any choice or conflict of law provision or rule (whether of the State of Delaware or any other jurisdiction) that would cause the application of laws of any jurisdictions other than those of the State of Delaware; provided that the rights and obligations of the Participants, Industry Members and other Persons contracting with the Company in respect of the matters covered by this Agreement shall at all times also be subject to any applicable provisions of the Exchange Act and any rules and regulations promulgated thereunder. Each of the Company and the Participants: (a) consents to submit itself to the exclusive personal jurisdiction of the Court of Chancery of the State of Delaware, New Castle County, or, if that court does not have jurisdiction, a federal court sitting in Wilmington, Delaware in any action or proceeding arising out of or relating to this Agreement or any of the transactions contemplated by this Agreement; (b) agrees that all claims in respect of such action or proceeding shall be heard and determined only in any such court; (c) agrees that it shall not attempt to deny or defeat such personal jurisdiction by motion or other request for leave from any such court; and (d) agrees not to bring any action or proceeding arising out of or relating to this Agreement or any of the transaction contemplated by this Agreement in any other court. Each of the Company and the Participants waives any defense of inconvenient forum to the maintenance of any action or proceeding so brought and waives any bond, surety or other security that might be required of any other Person with respect thereto. The Company or any Participant may make service on the Company or any other Participant by sending or delivering a copy of the process to the party to be served at the address and in the manner provided for the giving of notices in Section 12.1. Nothing in this Section 12.2, however, shall affect the right of any Person to serve legal process in any other manner permitted by law.

**Section 12.3. Amendments**. Except as provided by Section 3.3, Section 3.4, Section 3.7, and Section 5.3, this Agreement may be amended from time to time only by a written amendment authorized by the affirmative vote of not less than two-thirds of all of the Participants or with respect to Section 3.8 by the affirmative vote of all of the Participants, in each case that has been approved by the SEC pursuant to SEC Rule 608 or has otherwise become effective under SEC Rule 608. Notwithstanding the foregoing or anything else to the contrary, to the extent the SEC grants exemptive relief applicable to any provision of this Agreement, Participants and Industry Members shall be entitled to comply with such provision pursuant to the terms of the exemptive relief so granted at the time such relief is granted irrespective of whether this Agreement has been amended.

**Section 12.4. Successors and Assigns**. Subject to the restrictions on Transfers set forth herein, this Agreement: (a) shall be binding upon, and inure to the benefit of, the Company and the Participants, and their respective successors and permitted assigns; and (b) may not be assigned except in connection with a Transfer of Company Interests permitted hereunder.

**Section 12.5. Counterparts**. This Agreement may be executed in multiple counterparts, each of which shall be deemed an original, but all of which shall constitute one instrument. Any counterpart may be delivered by facsimile transmission or by electronic communication in portable document format (.pdf) or tagged image format (.tif), and the parties hereto agree that their electronically transmitted signatures shall have the same effect as manually transmitted signatures.

**Section 12.6. Modifications to be in Writing; Waivers**. This Agreement constitutes the entire understanding of the parties hereto with respect to the subject matter hereof, and no amendment, modification or alteration shall be binding unless the same is in writing and adopted in accordance with Section 12.3. No waiver of any provision of this Agreement shall be valid unless the same shall be in writing and signed by each Person granting the waiver. No waiver by any Person of any default or breach hereunder, whether intentional or not, shall be deemed to extend to any prior or subsequent default or breach or affect in any way any rights arising by virtue of any prior or subsequent such occurrence.

**Section 12.7. Captions**. The captions are inserted for convenience of reference only and shall not affect the construction of this Agreement.

**Section 12.8. Validity and Severability**. If any provision of this Agreement shall be held invalid or unenforceable, that shall not affect the validity or enforceability of any other provisions of this Agreement, all of which shall remain in full force and effect. If the final judgment of a court of competent jurisdiction declares that any term or provision hereof is invalid or unenforceable, each of the Company and the Participants agrees that the body making the determination of invalidity or unenforceability shall have the power to reduce the scope, duration or area of the term or provision, to delete specific words or phrases, or to replace any invalid or unenforceable term or provision with a term or provision that is valid and enforceable and that comes closest to expressing the intention of the invalid or unenforceable term or provision, and this Agreement shall be enforceable as so modified.

**Section 12.9. Third Party Beneficiaries**. Except to the extent provided in any separate written agreement between the Company and another Person, the provisions of this Agreement are not intended to be for the benefit of any creditor or other Person (other than a Participant in its capacity as such) to whom any debts, liabilities or obligations are owed by (or who otherwise has any claim against) the Company or any Participants. Moreover, notwithstanding anything contained in this Agreement (but subject to the immediately following sentence), no such creditor or other Person shall obtain any rights under this Agreement or shall, by reason of this Agreement, make any claim in respect of any debt, liability or obligation (or otherwise) against the Company or any Participant. Notwithstanding the foregoing provisions of this Section 12.9, each Person entitled to indemnification under Section 4.8 that is not a party to this Agreement shall be deemed to be an express third party beneficiary of this Agreement for all purposes relating to such Person's indemnification and exculpation rights hereunder.

**Section 12.10. Expenses**. Except as may be otherwise specifically provided to the contrary in this Agreement, including in Article XI, or as may be otherwise determined by the Operating Committee, each of the Company and the Participants shall bear its own internal costs and expenses incurred in connection with this Agreement, including those incurred in connection with all periodic meetings of the Participants or the Operating Committee, and the transactions contemplated hereby.

**Section 12.11. Specific Performance**. Each of the Company and the Participants acknowledges and agrees that one or more of them would be damaged irreparably in the event any of the provisions of this Agreement are not performed in accordance with their specific terms or otherwise are breached. Accordingly, each such Person agrees that each other such Person may be entitled to an injunction or injunctions to prevent breaches of the provisions of this Agreement and to enforce specifically this Agreement and the terms and provisions hereof in any action instituted in any court having jurisdiction over the Parties and the matter, in each case with no need to post bond or other security.

**Section 12.12. Waiver of Partition**. Each Participant agrees that irreparable damage would be done to the Company if any Participant brought an action in court to partition the assets or properties of the Company. Accordingly, each Participant agrees that such Person shall not, either directly or indirectly, take any action to require partition or appraisal of the Company or of any of the assets or properties of the Company, and notwithstanding any provisions of this Agreement to the contrary, each Participant (and such Participant's successors and permitted assigns) accepts the provisions of this Agreement as such Person's sole entitlement on termination, dissolution and/or liquidation of the Company and hereby irrevocably waives any and all right to maintain any action for partition or to compel any sale or other liquidation with respect to such Person's interest, in or with respect to, any assets or properties of the Company. Each Participant agrees not to petition a court for the dissolution, termination or liquidation of the Company.

**Section 12.13. Construction**. The Company and all Participants have participated jointly in negotiating and drafting this Agreement. If an ambiguity or a question of intent or interpretation arises, this Agreement shall be construed as if drafted jointly by the Company and all Participants, and no presumption or burden of proof shall arise favoring or disfavoring any Person by virtue of the authorship of any provision of this Agreement.

**Section 12.14. Incorporation of Exhibits, Appendices, Attachments, Recitals and Schedules**. The Exhibits, Appendices, Attachments, Recitals and Schedules identified in this Agreement are incorporated herein by reference and made a part hereof.

*[SIGNATURE PAGE FOLLOWS]*

IN WITNESS WHEREOF, the Participants have executed this Limited Liability Company Agreement as of the day and year first above written.

**PARTICIPANTS:**

**BOX EXCHANGE LLC**

By:_____

Name:_____

Title:_____

**CBOE BYX EXCHANGE, INC.**

By:_____

Name:_____

Title:_____

**CBOE BZX EXCHANGE, INC.**

By:_____

Name:_____

Title:_____

**CBOE EDGA EXCHANGE, INC.**

By:_____

Name:_____

Title:_____

**CBOE EDGX EXCHANGE, INC.**

By:_____

Name:_____

Title:_____

**CBOE C2 EXCHANGE, INC.**

By:_____

Name:_____

Title:_____

**CBOE EXCHANGE, INC.**

By:_____

Name:_____

Title:_____

**FINANCIAL INDUSTRY REGULATORY AUTHORITY, INC.**

By:_____

Name:_____

Title:_____

**INVESTORS' EXCHANGE, LLC**

By:_____

Name:_____

Title:_____

**LONG-TERM STOCK EXCHANGE, LLC**

By: _____

Name: _____

Title: _____

**MEMX LLC**

By:_____

Name:_____

Title:_____

**MIAX EMERALD, LLC**

By:_____

Name:_____

Title:_____

**MIAMI INTERNATIONAL SECURITIES EXCHANGE LLC**

By:_____

Name:_____

Title:_____

**MIAX PEARL, LLC**

By:_____

Name:_____

Title:_____

**MIAX SAPPHIRE, LLC**

By:_____

Name:_____

Title:_____

**NASDAQ BX, INC.**

By:_____

Name:_____

Title:_____

**NASDAQ GEMX, LLC**

By:_____

Name:_____

Title:_____

**NASDAQ ISE, LLC**

By:_____

Name:_____

Title:_____

**NASDAQ MRX, LLC**

By:_____

Name:_____

Title:_____

**NASDAQ PHLX LLC**

By:_____

Name:_____

Title:_____

**THE NASDAQ STOCK MARKET LLC**

By:_____

Name:_____

Title:_____

**NEW YORK STOCK EXCHANGE LLC**

By:_____

Name:_____

Title:_____

**NYSE AMERICAN LLC**

By:_____

Name:_____

Title:_____

**NYSE ARCA, INC.**

By:_____

Name:_____

Title:_____

**NYSE CHICAGO, INC.**

By:_____

Name:_____

Title:_____

**NYSE NATIONAL, INC.**

By:_____

Name:_____

Title:_____

# EXHIBIT A

## PARTICIPANTS IN CONSOLIDATED AUDIT TRAIL, LLC

| | | |
|---|---|---|
| Cboe BZX Exchange, Inc.<br>400 South LaSalle St.<br>Chicago, IL 60605 | Cboe BYX Exchange, Inc.<br>400 South LaSalle St.<br>Chicago, IL 60605 | Cboe Exchange, Inc.<br>400 South LaSalle St.<br>Chicago, IL 60605 |
| Cboe C2 Exchange, Inc.<br>400 South LaSalle St.<br>Chicago, IL 60605 | Cboe EDGA Exchange, Inc.<br>400 South LaSalle St.<br>Chicago, IL 60605 | Cboe EDGX Exchange, Inc.<br>400 South LaSalle St.<br>Chicago, IL 60605 |
| BOX Exchange LLC<br>101 Arch St., Suite 610<br>Boston, MA 02110 | New York Stock Exchange LLC<br>11 Wall St.<br>New York, NY 10005 | NYSE Chicago, Inc.<br>440 South LaSalle St., Suite 800<br>Chicago, IL 60605 |
| NYSE National, Inc.<br>11 Wall St.<br>New York, NY 10005 | NYSE American LLC<br>11 Wall St.<br>New York, NY 10005 | NYSE Arca, Inc.<br>11 Wall St.<br>New York, NY 10005 |
| NASDAQ GEMX, LLC<br>One Liberty Plaza<br>165 Broadway<br>New York, NY 10006 | NASDAQ ISE, LLC<br>One Liberty Plaza<br>165 Broadway<br>New York, NY 10006 | NASDAQ MRX, LLC<br>60 Broad Street<br>New York, NY 10004 |
| NASDAQ BX, Inc.<br>One Liberty Plaza<br>165 Broadway<br>New York, NY 10006 | NASDAQ PHLX LLC<br>One Liberty Plaza<br>165 Broadway<br>New York, NY 10006 | The NASDAQ Stock Market LLC<br>One Liberty Plaza<br>165 Broadway<br>New York, NY 10006 |
| Financial Industry Regulatory Authority, Inc.<br>1735 K Street, NW<br>Washington DC, 20006 | Investors' Exchange, LLC<br>3 World Trade Center, 58th Floor<br>New York, NY 10007 | Miami International Securities Exchange LLC<br>7 Roszel Road, 5th floor<br>Princeton, NJ 08540 |
| MIAX PEARL, LLC<br>7 Roszel Road, 5th Floor,<br>Princeton, New Jersey 08540 | MIAX Emerald, LLC<br>7 Roszel Road, 5th Floor<br>Princeton, New Jersey 08540 | Long-Term Stock Exchange, Inc.<br>300 Montgomery Street,<br>Suite 300,<br>San Francisco, CA 94104 |
| MEMX LLC<br>111 Town Square Place<br>Suite 520<br>Jersey City, NJ 07310 | MIAX Sapphire, LLC<br>7 Roszel Road, 5th Floor<br>Princeton, New Jersey 08540 | |

# APPENDIX A

**Consolidated Audit Trail National Market System Plan Request for Proposal, issued February 26, 2013, version 3.0 updated March 3, 2014**

(The Request for Proposal is available at Securities Exchange Act Release No. 77724 (CAT NMS Plan published for comment on May 17, 2016))

Certain provisions of Articles I-XII have been modified as noted on the cover page of this CAT NMS Plan. To the extent text in the following Appendices conflicts with any such modifications, the modified language of Articles I-XII shall control

## APPENDIX B

### Fee Schedule
### Consolidated Audit Trail Funding Fees for Participants

(a) CAT Fee. Each Participant shall pay the CAT Fee set forth in Section 11.3(a) of the CAT NMS Plan to Consolidated Audit Trail, LLC in the manner prescribed by Consolidated Audit Trail, LLC on a monthly basis based on the Participant's transactions in Eligible Securities in the prior month.

# APPENDIX C

## DISCUSSION OF CONSIDERATIONS

### SEC RULE 613(A)(1) CONSIDERATIONS

SEC Rule 613(a) requires the Participants to discuss various "considerations" related to how the Participants propose to implement the requirements of the CAT NMS Plan, cost estimates for the proposed solution, and a discussion of the costs and benefits of alternate solutions considered but not proposed.[2] This Appendix C discusses the considerations identified in SEC Rule 613(a). The first section below provides a background of the process the Participants have undertaken to develop and draft the CAT NMS Plan. Section A below addresses the requirements, set forth in SEC Rule 613(a)(1)(i) through (a)(1)(vi), that the "Participants specify and explain the choices they made to meet the requirements specified in [SEC Rule 613] for the [CAT]."[3] In many instances, details of the requirements (i.e., the specific technical requirements that the Plan Processor must meet) will be set forth in the Plan Processor Requirements document ("PPR"). Relevant portions of the PPR are outlined and described throughout this Appendix C, as well as included as Appendix D.

Section B below discusses the requirements in SEC Rule 613(a)(1)(vii) and SEC Rule 613(a)(1)(viii) that the CAT NMS Plan include detailed estimates of the costs, and the impact on competition, efficiency, and capital formation, for creating, implementing, and maintaining the CAT. The information in Section B below is intended to aid the Commission in its economic analysis of the CAT and the CAT NMS Plan.[4]

Section C below, in accordance with SEC Rule 613(a)(1)(x), establishes objective milestones to assess the Participants' progress toward the implementation of the CAT in accordance with the CAT NMS Plan. This section includes a plan to eliminate existing rules and systems (or components thereof) that will be rendered duplicative by the CAT, as required by SEC Rule 613(a)(1)(ix).

Section D below addresses how the Participants solicited the input of their Industry Members and other appropriate parties in designing the CAT NMS Plan as required by SEC Rule 613(a)(1)(xi).

Capitalized terms used and not otherwise defined in this Appendix C have the respective meanings ascribed to such terms in the Agreement to which this Appendix C is attached.

### BACKGROUND

SEC Rule 613 requires the Participants to jointly file a national market system plan to govern the creation, implementation, and maintenance of the CAT, and the Central Repository.

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[2] Securities Exchange Act Release No. 67457 (July 18, 2012), 77 Fed. Reg. 45722, 45789 (Aug. 1, 2012) ("Adopting Release").

[3] *See* Adopting Release at 45790. Section B below includes discussions of reasonable alternatives to approaching the creation, implementation, and maintenance of the CAT that the Participants considered. *See* SEC Rule 613(a)(1)(xii).

[4] *See* Adopting Release at 45793.

Early in the process, the Participants concluded that the publication of a request for proposal soliciting Bids from interested parties to serve as the Plan Processor for the CAT was necessary prior to filing the CAT NMS Plan to ensure that potential alternative solutions to creating the CAT could be presented and considered by the Participants and that a detailed and meaningful cost/benefit analysis could be performed, both of which are required considerations to be addressed in the CAT NMS Plan. To that end, the Participants published the RFP on February 26, 2013,[5] and 31 firms formally notified the Participants of their intent to bid.

On September 3, 2013, the Participants filed with the Commission the Selection Plan, a national market system plan to govern the process for Participant review of the Bids submitted in response to the RFP, the procedure for evaluating the Bids, and, ultimately, selection of the Plan Processor. Several critical components of the Participants' process for formulating and drafting the CAT NMS Plan were contingent upon approval of the Selection Plan, which occurred on February 21, 2014.[6] Bids in response to the RFP were due four weeks following approval of the Selection Plan, on March 21, 2014. Ten Bids were submitted in response to the RFP.

The Participants considered each Bid in great detail to ensure that the Participants can address the considerations enumerated in SEC Rule 613, including analysis of the costs and benefits of the proposed solution(s), as well as alternative solutions considered but not proposed, so that the Commission and the public will have sufficiently detailed information to carefully consider all aspects of the CAT NMS Plan the Participants ultimately submit. Soon after receiving the Bids, and pursuant to the Selection Plan, the Participants determined that all ten Bids were "qualified" pursuant to the Selection Plan.[7] On July 1, 2014, after the Participants had hosted Bidder presentations to learn additional details regarding the Bids and conducted an analysis and comparison of the Bids, the Participants voted to select six Shortlisted Bidders.

Under the terms of the Selection Plan, and as incorporated into the CAT NMS Plan, the Plan Processor for the CAT has not been selected and will not be selected until after approval of the CAT NMS Plan.[8] Any one of the six remaining Shortlisted Bidders could be selected as the Plan Processor, and because each Shortlisted Bidder has proposed different approaches to various issues, the CAT NMS Plan does not generally mandate specific technical approaches; rather, it mandates specific requirements that the Plan Processor must meet, regardless of approach. Where possible, this Appendix C discusses specific technical requirements the Participants have deemed necessary for the CAT; however, in some instances, provided the Plan Processor meets certain general obligations, the specific approach taken in implementing aspects of the CAT NMS Plan will be dependent upon the Bidder ultimately selected as the Plan Processor.

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[5] The initial RFP was amended in March 2014. *See* Consolidated Audit Trail National Market System Plan Request for Proposal (last updated Mar. 3, 2014), *available at* http://catnmsplan.com/web/groups/catnms/documents/catnms/p213400.zip (the "RFP").

[6] The SEC has approved two amendments to the Selection Plan. *See* Securities Exchange Act Rel. No. 75192 (June 17, 2015), 80 Fed. Reg. 36028 (June 23, 2015); and Securities Exchange Act Rel. No.75980 (Sept. 24, 2015), 80 Fed. Reg. 58796 (Sept. 30, 2015).

[7] *See* Selection Plan, 78 Fed. Reg. 69910, Ex. A §§ I(Q) (defining "Qualified Bid"), VI(A) (providing the process for determining whether Bids are determined to be "Qualified Bids").

[8] *See* Selection Plan § 6; *see also id.* Article V.

SEC Rule 613 also includes provisions to facilitate input on the implementation, operation, and administration of the Central Repository from the broker-dealer industry.[9] To this end, the Participants formed a Development Advisory Group ("DAG") to solicit industry feedback. Following multiple discussions between the Participants and both the DAG and the Bidders, as well as among the Participants themselves, the Participants recognized that some provisions of SEC Rule 613 would not permit certain solutions to be included in the CAT NMS Plan that the Participants determined advisable to effectuate the most efficient and cost-effective CAT. Consequently, the Participants submitted their original Exemptive Request Letter seeking exemptive relief from the Commission with respect to certain provisions of SEC Rule 613 regarding (1) options market maker quotes; (2) Customer-IDs; (3) CAT-Reporter-IDs; (4) linking of executions to specific subaccount allocations on allocation reports; and (5) timestamp granularity for Manual Order Events.[10] Specifically, the Participants requested that the Commission grant an exemption from:

- Rule 613(c)(7)(ii) and (iv) for options market makers with regard to their options quotes.

- Rule 613(c)(7)(i)(A), (c)(7)(iv)(F), (c)(7)(viii)(B) and (c)(8) which relate to the requirements for Customer-IDs.[11]

- Rule 613(c)(7)(i)(C), (c)(7)(ii)(D), (c)(7)(ii)(E), (c)(7)(iii)(D), (c)(7)(iii)(E), (c)(7)(iv)(F), (c)(7)(v)(F), (c)(7)(vi)(B) and (c)(8) which relate to the requirements for CAT-Reporter-IDs.

- Rule 613(c)(7)(vi)(A), which requires CAT Reporters to record and report the account number of any subaccounts to which the execution is allocated.

- The millisecond timestamp granularity requirement in Rule 613(d)(3) for certain Manual Order Events subject to timestamp reporting under Rules 613(c)(7)(i)(E), 613(c)(7)(ii)(C), 613(c)(7)(iii)(C), and 613(c)(7)(iv)(C).

The Participants supplemented their original Exemptive Request Letter with a supplemental Exemptive Request Letter (together, the "Exemptive Request Letters"), clarifying its original requested exemption from the requirement in Rule 613(c)(7)(viii)(B) (including, in some instances, requesting an exemption from the requirement to provide an account number, account

[9] *See* SEC Rules 613(a)(1)(xi) and 613(b)(7).
[10] *See* original Exemptive Request Letter, *available at* http://catnmsplan.com/web/groups/catnms/@catnms/documents/appsupportdocs/p602383.pdf.
[11] *See* Participants' Proposed RFP Concepts Document (last updated Jan. 16, 2013) (the "Proposed RFP Concepts Document"). The Proposed RFP Concepts Document was posted on the Consolidated Audit Trail NMS Plan website, http:// catnmsplan.com (the "CAT NMS Plan Website").

type and date account opened under Rule 613(c)(7)(viii)(B)).[12] The Participants believe that the requested relief is critical to the development of a cost-effective approach to the CAT.

The Participants also will seek to comply with their obligations related to the CAT under Reg SCI as efficiently as possible. When it adopted Reg SCI, the Commission expressed its belief that the CAT "will be an SCI system of each SCI SRO that is a member of an approved NMS plan under Rule 613, because it will be a facility of each SCI SRO that is a member of such plan."[13] The Participants intend to work together and with the Plan Processor, in consultation with the Commission, to determine a way to effectively and efficiently meet the requirements of Reg SCI without unnecessarily duplicating efforts.

## A. Features and Details of the CAT NMS Plan.

### 1. Reporting Data to the CAT

As required by SEC Rule 613(a)(1)(i), this section describes the reporting of data to the Central Repository, including the sources of such data and the manner in which the Central Repository will receive, extract, transform, load, and retain such data. As a general matter, the data reported to the Central Repository is of two distinct types: (1) reference data (e.g., data concerning CAT Reporters and customer information, issue symbology information, and data from the SIPs); and (2) order and trade data submitted by CAT Reporters, including national securities exchanges, national securities associations and broker-dealers. Each of these types of data is discussed separately below.

#### (a) Sources of Data

In general, data will be reported to the Central Repository by national securities exchanges, national securities associations, broker-dealers, the SIPs for the CQS, CTA, UTP and Plan for Reporting of Consolidated Options Last Sale Reports and Quotation Information("OPRA") Plans, and certain other vendors or appropriate third parties ("Data Submitters").[14] Specifically, in accordance with SEC Rule 613(c)(5) and Sections 6.3 and 6.4 of the CAT NMS Plan, each national securities exchange and its members must report to the

[12] *See* Letter from the Participants to Brent J. Fields, Secretary, SEC re: Supplement to Request for Exemptive Relief from Certain Provisions of SEC Rule 613 of Regulation NMS under the Securities Exchange Act of 1934 (Sept. 2, 2015), available at the CAT NMS Plan Website. Separately, on April 3, 2015, the Participants filed with the Commission examples demonstrating how the proposed request for exemptive relief related to allocations would operate; this filing did not substantively update or amend the Exemptive Request Letter. *See* Letter from the Participants to Brent J. Fields, Secretary, SEC re: Supplement to Request for Exemptive Relief from Certain Provisions of SEC Rule 613 of Regulation NMS under the Securities Exchange Act of 1934 (Apr. 3, 2015), available at the CAT NMS Plan Website.

[13] *See* Securities Exchange Act Release No. 73639 (Nov. 19, 2014), 79 Fed. Reg. 72252, 72275 n. 246 (Dec. 5, 2014) (adopting Reg SCI and citing the Adopting Release at 45774).

[14] *See* Adopting Release at 45748 n.278 (noting that "the Rule does not preclude the NMS plan from allowing broker-dealers to use a third party to report the data required to the central repository on their behalf"). The Participants note that CAT Reporters using third party service providers to submit information on their behalf would still be responsible for all the data submitted on their behalf. The term "CAT Reporters" is generally used to refer to those parties that are required by SEC Rule 613 and the CAT NMS Plan to submit data to the CAT (i.e., national securities exchanges, national securities associations, and members thereof). The term "Data Submitters" includes those third-parties that may submit data to the CAT on behalf of CAT Reporters as well as outside parties that are not required to submit data to the CAT but from which the CAT may receive data (e.g., SIPs). Thus, all CAT Reporters are Data Submitters, but not all Data Submitters are CAT Reporters.

Central Repository the information required by SEC Rule 613(c)(7) for each NMS Security registered or listed for trading on such exchange or admitted to unlisted trading privileged on such exchange (subject to relief pursuant to the Exemptive Request Letters).[15] Similarly, in accordance with SEC Rule 613(c)(6), each national securities association and its members must report to the Central Repository the information required by SEC Rule 613(c)(7) for each NMS Security for which transaction reports are required to be submitted to the association (subject to relief pursuant to the Exemptive Request Letters). Additionally, the Participants, in consultation with the DAG and with industry support, have determined to include OTC Equity Securities in the initial phase-in of the CAT; thus, CAT Reporters must also include order and trade information regarding orders for OTC Equity Securities in addition to those involving NMS Securities.[16]

In addition to order and execution data, SEC Rule 613 requires Industry Members to report customer information, including Customer-IDs, to the CAT so that order and execution data can be associated with particular Customers. However, in the Exemptive Request Letters, the Participants request relief that would permit CAT Reporters to provide information to the Central Repository using Firm Designated IDs instead of Customer-IDs. In addition, Industry Members are permitted to use Data Submitters that are not national securities exchanges, national securities associations, or members thereof to report the required data to the Central Repository on their behalf. The approach proposed in the Exemptive Request Letters also would permit Data Submitters to provide information to the Central Repository using Firm Designated ID for purposes of reporting information to the CAT.

The Central Repository also is required to collect National Best Bid and National Best Offer information, transaction reports reported to an effective transaction reporting plan filed with the SEC pursuant to SEC Rule 601, and Last Sale Reports reported pursuant to the OPRA Plan.[17] Consequently, the Plan Processor must receive information from the SIPs for those plans and incorporate that information into the CAT. Lastly, as set forth in Appendix D, the Plan Processor must maintain a complete symbology database, including historical symbology. CAT Reporters will submit data to the CAT with the listing exchange symbology format, and the CAT must use the listing exchange symbology format in the display of linked data. The Participants will be responsible for providing the Plan Processor with issue symbol information, and issue symbol validation must be included in the processing of data submitted by CAT Reporters.

After reviewing the Bids and receiving industry input, the Participants do not believe there is a need to dictate that the Plan Processor adopt a particular format for the submission of data to the Central Repository. Rather, regardless of the format(s) adopted, the CAT must be

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[15] As noted, the Participants submitted the Exemptive Request Letters to facilitate compliance with the goals and purposes of the rule while minimizing the impact on existing market practices and reducing burdens on both Participants and broker-dealers.

[16] *See* SIFMA Industry Recommendations for the Creation of the Consolidated Audit Trail (CAT) at 70 (Mar. 28, 2013) ("SIFMA Recommendations"), *available at* http://www.sifma.org/workarea/downloadasset.aspx?id=8589942773. Section 1.1 of the CAT NMS Plan includes OTC Equity Securities as "Eligible Securities." As discussed in Appendix C, Plan to Eliminate Existing Rules and Systems (SEC Rule 613(a)(1)(ix)), inclusion of OTC Equity Securities in the initial phase of the CAT should facilitate the retirement of FINRA's Order Audit Trail System ("OATS") and reduce costs to the industry.

[17] SEC Rule 613(e)(7).

able to monitor incoming and outgoing data feeds and be capable of performing the following functions:

- Support daily files from each CAT Reporter;
- Support files that cover multiple days (for re-transmission);
- Support error correction files;
- Capture operational logs of transmissions, success, failure reasons, etc.; and
- Support real-time and batch feeds.

The Plan Processor will be required to ensure that each CAT Reporter is able to access its submissions for error correction purposes and transmit their data to the Central Repository on a daily basis. The Plan Processer must have a robust file management tool that is commercially available, including key management. In addition, at a minimum, the Plan Processor must be able to accept data from CAT Reporters and other Data Submitters via automated means (e.g., Secure File Transfer Protocol ("SFTP")) as well as manual entry means (e.g., GUI interface).

The Plan Processor will be required to ensure that all file processing stages are handled correctly. This will include the start and stop of data reception, the recovery of data that is transmitted, the retransmission of data from CAT Reporters, and the resynchronization of data after any data loss. At a minimum, this will require the Plan Processor to have logic that identifies duplication of files. If transmission is interrupted, the Plan Processor must specify:

- data recovery process for partial submissions;
- operational logs/reporting;
- operational controls for receipt of data; and
- managing/handling failures.

The Plan Processor is required to establish a method for developing an audit trail of data submitted to and received by the Central Repository. This must include a validation of files to identify file corruption and incomplete transmissions. As discussed more fully below, an acknowledgement of data receipt and information on rejected data must be transmitted to CAT Reporters.

(i) Data Submission for Orders and Reportable Events, including Manual Submission

Sections 6.3 and 6.4 of the CAT NMS Plan require CAT Reporters to provide details for each order and each Reportable Event to the Central Repository.[18] In the RFP, the Participants requested that the Bidders describe the following:

- system interfaces, including data submission, data access and user interfaces;[19]
- the proposed messaging and communication protocol(s) used in data submission and retrieval and the advantage(s) of such protocol(s);[20]
- the process and associated protocols for accepting batch submissions; [21] and
- the process and any associated protocols for supporting manual data submissions.[22]

(ii) The Timing of Reporting Data

Pursuant to SEC Rule 613(c)(3), Sections 6.3 and 6.4 of the CAT NMS Plan require that CAT Reporters report certain order and transaction information recorded pursuant to SEC Rule 613 or the CAT NMS Plan to the Central Repository by 8:00 a.m. Eastern Time on the Trading Day following the day such information is recorded.[23] SEC Rule 613(c)(3) notes, however, that the CAT NMS Plan "may accommodate voluntary reporting prior to 8:00 a.m. Eastern Time, but shall not impose an earlier deadline on the reporting parties." Sections 6.3 and 6.4 of the CAT NMS Plan explicitly permit, but do not require, CAT Reporters to submit information to the CAT throughout the day. Because of the amount of data that will ultimately be reported to the CAT, the Participants have decided to permit Data Submitters to report data to the CAT as end of day files (submitted by 8:00 a.m. Eastern Time the following Trading Day) or throughout the day. The Participants believe that permitting Data Submitters to report data throughout the day may reduce the total amount of bandwidth used by the Plan Processor to receive data files and will allow CAT Reporters and other Data Submitters to determine which method is most efficient and cost-effective for them. However, the Plan Processor will still be required to have the capacity to handle two times the historical peak daily volume to ensure that, if CAT Reporters choose to submit data on an end-of-day basis, the Plan Processor can handle the influx of data.[24]

(iii) Customer and Customer Account Information

In addition to the submission of order and trade data, broker-dealer CAT Reporters must also submit customer information to the CAT so that the order and trade data can be matched to

[18] *See* SEC Rule 613(c)(7).
[19] RFP Question 49.
[20] RFP Questions 59-60.
[21] RFP Question 62.
[22] RFP Question 63.
[23] SEC Rule 613 and Sections 6.3 and 6.4 of the CAT NMS Plan permit certain other information to be reported by 8:00 a.m. Eastern Time on the Trading Day following the day the CAT Reporter receives the information. *See* SEC Rule 613(c)(4), (c)(7)(vi)-(viii).
[24] SIFMA's recommendations to the Participants regarding the CAT indicates support for the ability of Data Submitters to submit data in batch or near-real-time reporting. *See* SIFMA Recommendations, at 55.

the specific customer.[25] SEC Rule 613(c)(7) sets forth data recording and reporting requirements that must be included in the CAT NMS Plan. Under SEC Rule 613(c)(7)(i)(A), the CAT NMS Plan must require each CAT Reporter to record and report "Customer-ID(s) for each customer" when reporting to the CAT order receipt or origination information.[26] When reporting the modification or cancellation of an order, the rule further requires the reporting of "the Customer-ID of the Person giving the modification or cancellation instruction."[27] In addition, SEC Rule 613(c)(8) mandates that all CAT Reporters "use the same Customer-ID . . . for each customer and broker-dealer."[28] For purposes of SEC Rule 613, "Customer-ID" means, "with respect to a customer, a code that uniquely identifies such customer for purposes of providing data to the central repository."[29] Also, SEC Rule 613(c)(7)(viii) requires that, for original receipt or origination of an order, CAT Reporters report "customer account information," which is defined as including "account number, account type, customer type, date account opened, and large trader identifier (if applicable)."[30]

After considering the requirements of SEC Rule 613 with respect to recording and reporting Customer-IDs, Customer Account Information, and information of sufficient detail to identify the Customer as well as industry input and the Commission's reasons for adopting these requirements, the Participants requested that Industry Members and other industry participants provide ideas on implementing the Customer-ID requirement. After careful consideration, including numerous discussions with the DAG, the Participants concluded that the CAT NMS Plan should use a reporting model that requires broker-dealers to provide detailed account and Customer information to the Central Repository, including the specific identities of all Customers associated with each account, and have the Central Repository correlate the Customer information across broker-dealers, assign a unique customer identifier to each Customer (i.e., the Customer-ID), and use that unique customer identifier consistently across all CAT Data (hereinafter, the "Customer Information Approach").

Under the Customer Information Approach, the CAT NMS Plan would require each broker-dealer to assign a unique Firm Designated ID to each customer, as that term is defined in SEC Rule 613. For the Firm Designated ID, broker-dealers would be permitted to use an account number or any other identifier defined by the firm, provided each identifier is unique across the firm for each business date (i.e., a single firm may not have multiple separate customers with the same identifier on any given date). Under the Customer Information Approach, broker-dealers must submit an initial set of customer information to the Central Repository, including, as applicable, the Firm Designated ID for the customer, name, address, date of birth, Individual Tax ID ("ITIN")/social security number ("SSN"), individual's role in the account (e.g., primary holder, joint holder, guardian, trustee, person with the power of attorney)

[25] As noted above, the term "customer" means "(i) [t]he account holder(s) of the account at a broker-dealer originating an order, and (ii) [a]ny person from whom the broker-dealer is authorized to accept trading instructions for such account, if different than the account holder(s)." SEC Rule 613(j)(3).
[26] SEC Rule 613(c)(7)(i)(A).
[27] SEC Rule 613(c)(7)(iv)(F).
[28] SEC Rule 613(c)(8).
[29] SEC Rule 613(j)(5).
[30] SEC Rule 613(j)(4).

and Legal Entity Identifier ("LEI"),[31] and/or Large Trader ID ("LTID"), if applicable.[32] Under the Customer Information Approach, broker-dealers would be required to submit to the Central Repository daily updates for reactivated accounts, newly established or revised Firm Designated IDs, or associated reportable Customer information.[33]

Within the Central Repository, each Customer would be uniquely identified by identifiers or a combination of identifiers such as TIN/SSN, date of birth, and, as applicable, LEI and LTID. The Plan Processor would be required to use these unique identifiers to map orders to specific customers across all broker-dealers. Broker-dealers would therefore be required to report only Firm Designated ID information on each new order submitted to the Central Repository rather than the "Customer-ID" as set forth in SEC Rule 613(c)(7), and the Plan Processor would associate specific customers and their Customer-IDs with individual order events based on the reported Firm Designated ID.

The Customer-ID approach is strongly supported by the industry as it believes that to do otherwise would interfere with existing business practices and risk leaking proprietary order and customer information into the market.[34] To adopt such an approach, however, requires certain exemptions from the requirements of SEC Rule 613. Therefore, the Participants included the Customer Information Approach in the Exemptive Request Letters so that this approach could be included in the CAT NMS Plan.

In addition to the approach described above, the CAT NMS Plan details a number of requirements which the Plan Processor must meet regarding Customer and Customer Account Information.

The Plan Processor must maintain information of sufficient detail to uniquely and consistently identify each Customer across all CAT Reporters, and associated accounts from each CAT Reporter. The Plan Processor must document and publish, with the approval of the Operating Committee, the minimum list of attributes to be captured to maintain this association.

The CAT Processor must maintain valid Customer and Customer Account Information for each Trading Day and provide a method for Participants and the SEC to easily obtain historical changes to that information (e.g., name changes, address changes).

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[31] Where a validated LEI is available for a Customer or entity, it may obviate the need to report other identifier information (e.g., Customer name, address).

[32] The Participants anticipate that Customer information that is initially reported to the CAT could be limited to only customer accounts that have, or are expected to have, CAT-reportable activity. For example, accounts that are considered open, but have not traded Eligible Securities in a given timeframe may not need to be pre-established in the CAT, but rather could be reported as part of daily updates after they have CAT-reportable activity.

[33] Because reporting to the CAT is on an end-of-day basis, intra-day changes to information could be captured as part of the daily updates to the information. *See* SEC Rule 613(c)(3). To ensure the completeness and accuracy of Customer information and associations, in addition to daily updates, broker-dealers would be required to submit periodic full refreshes of Customer information to the CAT. The scope of the "full" Customer information refresh would need to be further defined, with the assistance of the Plan Processor, to determine the extent to which inactive or otherwise terminated accounts would need to be reported.

[34] SIFMA Recommendations at 30-31; Financial Industry Forum (FIF) Consolidated Audit Trail (CAT) Working Group Response to Proposed RFP Concepts Document at 12 (Jan. 18, 2013), *available at* http://catnmsplan.com/industryFeedback/P197808 ("FIF Response").

The CAT Processor will design and implement a robust data validation process for submitted Firm Designated ID, Customer Account Information and Customer Identifying Information.

The Plan Processor must be able to link accounts that move from one CAT Reporter to another due to mergers and acquisitions, divestitures, and other events. Under the approach proposed by the Participants, broker-dealers will initially submit full account lists for all active accounts to the Plan Processor and subsequently submit updates and changes on a daily basis.[35] In addition, the Plan Processor must have a process to periodically receive full account lists to ensure the completeness and accuracy of the account database.

In the RFP, the Participants asked for a description of how Customer and Customer Account Information will be captured, updated and stored with associated detail sufficient to identify each Customer.[36] All Bidders anticipated Customer and Customer Account Information to be captured in an initial download of data. The precise method(s) by which CAT Reporters submit Customer data to the Central Repository will be set out in the Technical Specifications provided by the Plan Processor in accordance with Section 6.9 of the CAT NMS Plan. Data capture would occur using both file-based and entry screen methods. Data validation would check for potential duplicates with error messages being generated for follow-up by CAT Reporters. Data Reporters can update data as needed or on a predetermined schedule.

(iv) Error Reporting

SEC Rule 613(e)(6) requires the prompt correction of errors in data submitted to the Central Repository. As discussed in Appendix C, Time and Method by which CAT Data will be Available to Regulators, initial validation, lifecycle linkages, and communications of errors to CAT Reporters will be required to occur by 12:00 p.m. Eastern Time T+1 and corrected data will be required to be resubmitted to the Central Repository by 8:00 a.m. Eastern Time on T+3. Each of the Bidders indicated that it was able to meet these timeframes.

However, the industry expressed concern that reducing the error repair window will constitute a significant burden to Data Submitters and also question whether the proposed error correction timeframe is possible.[37] Financial Information Forum ("FIF") supports maintaining the current OATS Error Handling timelines, which allows for error correction within five OATS business days from the date of original submission.[38] Securities Industry and Financial Markets Association ("SIFMA") also recommends a five-day window for error correction.[39] Nevertheless, the Participants believe that it is imperative to the utility of the Central Repository that corrected data be available to regulators as soon as possible and recommend the three-day window for corrections to balance the need for regulators to access corrected data in a timely manner while considering the industry's concerns.

[35] "Active accounts" are defined as accounts that have had activity within the last six months.
[36] RFP Question 1.
[37] FIF Response at 35.
[38] *Id.*
[39] SIFMA Recommendations at 62.

### (b) The Manner in which the Central Repository will Receive, Extract, Transform, Load, and Retain Data

The Central Repository must receive, extract, transform, load, and retain the data submitted by CAT Reporters and other Data Submitters. In addition, the Plan Processor is responsible for ensuring that the CAT contains all versions of data submitted by a CAT Reporter or other Data Submitter (i.e., the Central Repository must include different versions of the same information, including such things as errors and corrected data).[40]

In the RFP, the Participants requested that each Bidder perform a detailed analysis of current industry systems and interface specifications to propose and develop their own format for collecting data from the various data sources relevant under SEC Rule 613, as outlined in the RFP. Bidders also were requested to perform an analysis on their ability to develop, test and integrate this interface with the CAT.[41] In addition, the Participants sought input from the industry regarding different data submission mechanisms and whether there needs to be a method to allow broker-dealers with very small order volumes to submit their data in a non-automated manner.[42]

As noted above, since the Central Repository is required to collect and transform customer, order and trade information from multiple sources, the RFP requested that Bidders describe:

- how Customer and Customer Account Information will be captured, updated and stored with associated detail sufficient to identify each customer;[43]
- the system interfaces, including data submission, data access and user interfaces;[44]
- the proposed messaging and communication protocol(s) used in data submission and retrieval and the advantage(s) of such protocol(s);[45]
- the process and associated protocols for accepting batch submissions;[46] and
- the process and any associated protocols for supporting manual data submissions.[47]

[40] Data retention requirements by the Central Repository are discussed more fully in Appendix D, Functionality of the CAT System.
[41] RFP § 2.3 at 19.
[42] SEC Rule 613: Consolidated Audit Trail (CAT), Questions for Industry Consideration, *available at* http://catnmsplan.com/QuestionsforIndustryConsideration.
[43] RFP Question 1.
[44] RFP Question 49.
[45] RFP Questions 59-60.
[46] RFP Question 62.
[47] RFP Question 63.

Various Bidders proposed multiple methods by which Data Reporters could report information to the Central Repository. Bidders proposed secure VPN, direct line access through TCP/IP or at co-location centers, and web-based manual data entry.

The RFP also requested that Bidders describe:

- the overall technical architecture;[48] and
- the network architecture and describe how the solution will handle the necessary throughput, processing timeline and resubmissions.[49]

There are two general approaches by which the Central Repository could receive information. Approach 1 described a scenario in which broker-dealers would submit relevant data to the Central Repository using their choice of existing industry messaging protocols, such as the Financial Information eXchange ("FIX") protocol. Approach 2 provided a scenario in which broker-dealers would submit relevant data to the Central Repository using a defined or specified format, such as an augmented version of OATS.

Following receipt of data files, the Plan Processor will be required to send an acknowledgement of data received to CAT Reporters and third party Data Submitters. This acknowledgement will enable CAT Reporters to create an audit trail of their data submissions and allow for tracing of data breakdowns if data is not received. The minimum requirements for receipt acknowledgement are detailed in Appendix D, Receipt of Data from Reporters.

Once the Central Repository has received the data from the CAT Reporters, it will extract individual records from the data, and validate the data through a review process that must be described in the Technical Specifications involving context, syntax, and matching validations. The Plan Processor will need to validate data and report back to any CAT Reporter any data that has not passed validation checks according to the requirements in Appendix D, Receipt of Data from Reporters. To ensure the accuracy and integrity of the data in the Central Repository, data that does not pass the basic validation checks performed by the Plan Processor must be rejected until it has been corrected by the CAT Reporter responsible for submitting the data/file. After the Plan Processor has processed the data, it must provide daily statistics regarding the number of records accepted and rejected to each CAT Reporter.

The Plan Processor also will be required to capture rejected records for each CAT Reporter and make them available to the CAT Reporter. The "rejects" file must be accessible via an electronic file format, and the rejections and daily statistics must also be available via a web interface. The Plan Processor must provide functionality for CAT Reporters to amend records that contain exceptions. The Plan Processor must also support bulk error correction so that rejected records can be resubmitted as a new file with appropriate indicators for rejection repairs. The Plan Processor must, in these instances, reprocess repaired records. In addition, a web GUI must be available for CAT Reporters to make updates, including corrections, to

[48] RFP Question 43.
[49] RFP Question 50.

individual records or attributes. The Plan Processor must maintain a detailed audit trail capturing corrections to and replacements of records.

The Plan Processor must provide CAT Reporters with documentation that details how to amend/upload records that fail the required validations, and if a record does not pass basic validations, such as syntax rejections, then it must be rejected and sent back to the CAT Reporter as soon as possible, so it can be repaired and resubmitted.[50] In order for regulators to have access to accurate and complete data as expeditiously as practicable, the Plan Processor will provide CAT Reporters with their error reports as they become available, and daily statistics must be provided after data has been uploaded and validated. The reports will include descriptive details as to why each data record was rejected by the Plan Processor.

In addition, on a monthly basis, the Plan Processor should produce and publish reports detailing CAT Reporter performance and comparison statistics, similar to the report cards published for OATS presently. These reports should include data to enable CAT Reporters to assess their performance in comparison to the rest of their industry peers and to help them assess the risk related to their reporting of transmitted data.

CAT Reporters will report data to the Central Repository either in a uniform electronic format, or in a manner that would allow the Central Repository to convert the data to a uniform electronic format, for consolidation and storage. The Technical Specifications will describe the required format for data reported to the Central Repository. Results of a study conducted of broker-dealers showed average implementation and maintenance costs for use of a new file format to be lower than those for use of an existing file format (e.g., FIX)[51], although an FIF "Response to Proposed RFP Concepts Document" dated January 18, 2013 did indicate a preference among its members for use of the FIX protocol.

As noted above, the specific formats of data submission and loading will depend upon the Bidder chosen as the Plan Processor. Regardless of the ultimate Plan Processor, however, data submitted to the CAT will be loaded into the Central Repository in accordance with procedures that are subject to approval by the Operating Committee.[52] The Central Repository will retain data, including the Raw Data, linked data, and corrected data, for at least six years. Data submitted to the Central Repository, including rejections and corrections, must be stored in repositories designed to hold information based on the classification of the Data Submitter (e.g., whether the Data Submitter is a Participant, a broker-dealer, or a third party Data Submitter). After ingestion by the Central Repository, the Raw Data must be transformed into a format appropriate for data querying and regulatory output.

SEC Rule 613 reflects the fact that the Participants can choose from alternative methods to link order information to create an order lifecycle from origination or receipt to cancellation or execution.[53] After review of the Bids and discussions with Industry Members, the CAT NMS

[50] The industry supports receiving information on reporting errors as soon as possible to enable CAT Reporters to address errors in a timely manner. *See* FIF Response at 36.
[51] *See* Appendix C, Analysis of Expected Benefits and Estimated Costs for Creating, Implementing, and Maintaining the Consolidated Audit Trail (SEC Rule 613(a)(1)(vii)), for additional details on cost studies.
[52] *See* Section 6.1(c) of the CAT NMS Plan.
[53] *See* SEC Rule 613(j)(1).

Plan reflects the fact that the Participants have determined that the "daisy chain" approach to CAT-Order-ID that requires linking of order events rather than the repeated transmission of an order ID throughout an order's lifecycle is appropriate. This approach is widely supported by the industry, and using the daisy chain approach should minimize impact on existing OATS reporters, since OATS already uses this type of linking.[54] The RFP asked Bidders to propose any additional alternatives to order lifecycle creation; however, all of the Bidders indicated that they would use the daisy chain approach to link order events.[55]

In the daisy chain approach, a series of unique order identifiers assigned by CAT Reporters to individual order events are linked together by the CAT and assigned a single CAT-generated CAT-Order-ID that is associated with each individual order event and used to create the complete lifecycle of an order. Under this approach, each CAT Reporter generates its own unique order ID but can pass a different identifier as the order is routed to another CAT Reporter, and the CAT will link related order events from all CAT Reporters involved in the life of the order.[56]

The Participants believe that the daisy chain approach can handle anticipated order handling scenarios, including aggregation and disaggregation, and generally apply to both equities and options. The Participants created a subcommittee of DAG members and Participants to walk through multiple complex order-handling scenarios to ensure that the daisy chain approach can handle even the most complex of order handling methods.[57]

Additionally, the daisy chain approach can handle representative order reporting scenarios[58] and order handling scenarios sometimes referred to as "complex orders" that are specific to options and may include an equity component and multiple option components (e.g., buy-write, straddle, strangle, ratio spread, butterfly and qualified contingent transactions). Typically, these orders are referenced by exchange systems on a net credit/debit basis, which can cover between two and twelve different components. Such "complex orders" must also be handled and referenced within the CAT. The Bidder must develop, in close consultation with Industry Members, a linking mechanism that will allow the CAT to link the option leg(s) to the related equity leg or the individual options components to each other in a multi-leg strategy scenario.

Once a lifecycle is assembled by the CAT, individual lifecycle events must be stored so that each unique event (e.g., origination, route, execution, modification) can be quickly and easily associated with the originating customer(s) for both targeted queries and comprehensive

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[54] *See* SIFMA Recommendations at 13, 39-42; FIF Response at 19.
[55] *See* RFP Questions 11 and 12.
[56] A detailed example of the application of the daisy chain approach to an order routed to an exchange on an agency basis can be found in the Proposed RFP Concepts Document at 26.
[57] This subcommittee included 21 Industry Members and 16 Participants. It met 11 times over the course of 13 months to discuss order handling and CAT reporting requirements. Examples of order handling scenarios that must be addressed include, in addition to the agency scenario referenced above: orders handled on a riskless principal basis, orders routed out of a national securities exchange through a broker-dealer router to another national securities exchange, orders executed on an average price basis and orders aggregated for further routing and execution. Detailed examples of these types of scenarios can be found in the Proposed RFP Concepts Document at 27-30.
[58] These scenarios, and how the daisy chain approach could be applied, can be found in the Representative Order Proposal (Feb. 2013), *available at* http://catnmsplan.com/web/idcplg?IdcService=SS_GET_PAGE&ssDocName=P197815.

data scans. For example, an execution on an exchange must be linked to the originating customer(s) regardless of how the order may have been aggregated, disaggregated, and routed through multiple broker-dealers before being sent to the exchange for execution.

The Plan Processor must transform and load the data in a way that provides the Participants with the ability to build and generate targeted queries against data in the Central Repository across product classes submitted to the Central Repository. The Participants' regulatory staff and the SEC must be able to create, adjust, and save ad-hoc queries to provide data to the regulators that can then be used for their market surveillance purposes. All data fields may be included in the result set from targeted queries. Because of the size of the Central Repository and its use by multiple parties simultaneously, online queries will require a minimum set of criteria, including data or time range as well as one or more of the parameters specified in Appendix D, Functionality of the CAT System.[59]

Because of the potential size of the possible result sets, the Plan Processor must have functionality to create an intermediate result count of records before running the full query so that the query can be refined if warranted. The Plan Processor must include a notification process that informs users when reports are available, and there should be multiple methods by which query results can be obtained (e.g., web download, batch feed). Regulatory staff also must have the ability to create interim tables for access / further investigation. In addition, the Plan Processor must provide a way to limit the number of rows from a result set on screen with full results being created as a file to be delivered via a file transfer protocol.

The Plan Processor will be reasonably required to work with the regulatory staff at the Participants and other regulators[60] to design report generation screens that will allow them to request on-demand pre-determined report queries. These would be standard queries that would enable regulators quick access to frequently-used information and could include standard queries that will be used to advance the retirement of existing reports, such as Large Trader reporting.

The Central Repository must, at a minimum, be able to support approximately 3,000 active users, including Participants' regulatory staff and the SEC, authorized to access data representing market activity (excluding the PII associated with customers and accounts).[61]

### 2. Time and Method by which CAT Data will be Available to Regulators (SEC Rule 613(a)(1)(ii))

SEC Rule 613(a)(1)(ii) requires the Participants to discuss the "time and method by which the data in the Central Repository will be made available to regulators to perform surveillance or analyses, or for other purposes as part of their regulatory and oversight responsibilities."[62] As the Commission noted, "[t]he time and method by which data will be available to regulators are fundamental to the utility of the Central Repository because the

[59] Although the Plan Processor must account for multiple simultaneous queries, the Central Repository must also support the ability to schedule when jobs are run.
[60] Initially, only the SEC and Participants will have access to data stored in the Central Repository.
[61] The RFP required support for a minimum of 3,000 users. The actual number of users may be higher based upon regulator and Participant usage of the system.
[62] SEC Rule 613(a)(1)(ii).

purpose of the repository is to assist regulators in fulfilling their responsibilities to oversee the securities markets and market participants."[63]

### (a) Time Data will be Made Available to Regulators

At any point after data is received by the Central Repository and passes basic format validations, it will be available to the Participants and the SEC. The Plan Processor must ensure that regulators have access to corrected and linked order and Customer data by 8:00 a.m. Eastern Time on T+5.

As noted above, SEC Rule 613(e)(6) requires the prompt correction of data reported to the Central Repository, and the Participants believe that the timeframes established in Appendix D, Data Availability, meet this requirement. Additionally, each of the Bidders indicated that it would be able to process the reported data within these timeframes. However, the FIF, an industry trade group, expressed concern that the error repair window will constitute a significant burden to CAT Reporters and questioned whether the error repair window "can be reasonably met."[64] FIF supports maintaining the current OATS Error Handling timelines, which allow for error correction within five OATS-business days from the date of original submission.[65] SIFMA also recommends a five-day window for error correction.[66] Nevertheless, the Participants believe that it is imperative to the utility of the Central Repository that corrected data be available to regulators as soon as possible, and therefore the Participants do not support adopting the five-day repair window permitted under OATS, but instead are providing a three-day repair window for the Central Repository.[67]

### (b) Method by which Data will be Available to Regulators

As required by SEC Rule 613(a)(1)(ii), this section describes the ability of regulators to use data stored in the Central Repository for investigations, examinations and surveillance, including the ability to search and extract such data.[68] The utility of the Central Repository is dependent on regulators being able to have access to data for use in market reconstruction, market analysis, surveillance and investigations.[69] The Participants anticipate that the Plan Processor will adopt policies and procedures with respect to the handling of surveillance (including coordinated, SEC Rule 17d-2 or RSA surveillance) queries and requests for data. In the RFP, the Participants asked that the Bidders describe:

- the tools and reports that would allow for the extraction of data search criteria;[70]

[63] Adopting Release at 45790.
[64] FIF Response at 35.
[65] FIF Response at 35.
[66] SIFMA Recommendations at 62.
[67] One example of why the Participants believe a five day repair window is too long is that regulators may need access to the data as quickly as possible in order to conduct market reconstruction.
[68] SEC Rule 613(a)(1)(ii).
[69] Adopting Release at 45790.
[70] RFP Question 81.

- how the system will accommodate simultaneous users from Participants and the SEC submitting queries;[71]

- the expected response time for query results, the manner in which simultaneous queries will be managed and the maximum number of concurrent queries and users that can be supported by the system;[72]

- the format in which the results of targeted queries will be provided to users;[73]

- the methods of data delivery that would be made available to Participant regulatory staff and the Commission;[74]

- any limitations on the size of data that can be delivered at one time, such as number of days or number of terabytes;[75] and

- how simultaneous bulk data requests will be managed to ensure fair and equitable access.[76]

All Bidders provide means for off-line analysis[77] and dynamic search and extraction. The Bids described a variety of tools that could be used for providing access and reports to the Participants and the SEC, including: Oracle Business Intelligence Experience Edition, SAS Enterprises Business Intelligence, and IBM Cognos. The Bids proposed data access via direct access portals and via web-based applications. In addition, the Bids proposed various options for addressing concurrent users and ensuring fair access to the data, including: processing queries on a first in, first out (FIFO) basis; monitoring to determine if any particular user is using more systems resources than others and prioritizing other users' queries; or evaluating each users' demands on the systems over a predetermined timeframe and, if there is an imbalance, working with users to provide more resources needed to operate the system more efficiently.

The Bids included a multitude of options for formatting the data provided to regulators in response to their queries, including but not limited to FIX, Excel, Binary, SAS data sets, PDF, XML, XBRL, CSV, and .TXT. Some Bidders would provide Participants and the SEC with a "sandbox" in which the user could store data and upload its own analytical tools and software to analyze the data within the Central Repository, in lieu of performing off-line analyses.

The Participants anticipate that they will be able to utilize Central Repository data to enhance their existing regulatory schemes. The Participants do not endorse any particular technology or approach, but rather set forth standards which the Plan Processor must meet. By doing so, the Participants are seeking to maximize the utility of the data from the Central

[71] RFP Question 82.
[72] RFP Question 83.
[73] RFP Question 84.
[74] RFP Question 85.
[75] RFP Question 86.
[76] RFP Question 87.
[77] The SEC defined "off-line" analysis as "any analysis performed by a regulator based on data that is extracted from the [CAT] database, but that uses the regulator's own analytical tools, software, and hardware." Adopting Release at 45798 n.853.

Repository without burdening the Plan Processor to comply with specific format or application requirements which will need to be updated over time. In addition, the Participants wanted to ensure that the Bidders have the ability to put forth the ideas they believe are the most effective.

### (c) Report Building - Analysis Related to Usage of Data by Regulators

It is anticipated that the Central Repository will provide regulators with the ability to, for example, more efficiently conduct investigations, examinations, conduct market analyses, and to inform policy-making decisions. The Participants' regulatory staff and the SEC will frequently need to be able to perform queries on large amounts of data. The Plan Processor must provide the Participants and other regulators the access to build and generate targeted queries against data in the Central Repository. The Plan Processor must provide the regulatory staff at the Participants and regulators with the ability to create, adjust, and save any ad-hoc queries they run for their surveillance purposes via online or direct access to the Central Repository.[78] Queries will require a minimum set of criteria that are detailed in Appendix D.[79] The Plan Processor will have controls to manage load, cancel queries, if needed, and create a request process for complex queries to be run.[80] The Plan Processor must have a notification process to inform users when reports are available, provide such reports in multiple formats, and have the ability to schedule when queries are run.[81]

In addition, the Plan Processor will be required to reasonably work with the regulatory staff at the Participants and other regulators to design report generation screens that will allow them to request on-demand pre-determined report queries.[82] These would be standard queries that would enable regulators quick access to frequently-used information. This could include standard queries that will be used to advance the retirement of existing reports, such as Large Trader.[83]

The Plan Processor should meet the following response times for different query types. For targeted search criteria, the minimum acceptable response times would be measured in time increments of less than one minute. For the complex queries that either scan large volumes of data (e.g., multiple trade dates) or return large result sets (>1M records), the response time should generally be available within 24 hours of the submission of the request.

The Central Repository will support a permission mechanism to assign data access rights to all users so that CAT Reporters will only have access to their own reported data, the regulatory staff at the Participants and other regulators will have access to data; except for PII.[84] Regulators that are authorized to access PII will be required to complete additional authentications. The Central Repository will be able to provide access to the data at the working locations of both the Participants' and SEC's regulatory staff as well as other non-office locations. The Central Repository must be built with operational controls to control access to

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[78] *Id.*
[79] *Id.*
[80] *Id.*
[81] *Id.*
[82] *Id.*
[83] *Id.*
[84] As documented in Appendix D, each CAT Reporter will be issued a public key pair ("PKI") that it can use to submit data, and access confirmation that their data has been received.

make requests and to track data requests to support an event-based and time-based scheduler for queries that allows Participants to rely on the data generated.

In addition to targeted analysis of data from the Central Repository, regulators will also need access to bulk data for analysis. The Participants and other regulators will need the ability to do bulk extraction and download of data, based on a specified date or time range, market, security, and Customer-ID. The size of the resulting data set may require the ability to feed data from the Central Repository into analytical "alert" programs designed to detect potentially illegal activity.[85] "For example, the Commission is likely to use data from the Central Repository to calculate detailed statistics on order flow, order sizes, market depth and rates of cancellation, to monitor trends and inform Participant and SEC rulemaking."[86]

The Plan Processor must provide for bulk extraction and download of data in industry standard formats. In addition, the Plan Processor is required to generate data sets based on market event data to the Participants and other regulators. The Central Repository must provide the ability to define the logic, frequency, format, and distribution method of the data. It must be built with operational controls to track data requests to oversee the bulk usage environment and support an event-based and time-based scheduler for queries that allows Participants to rely on the data generated. Extracted data should be encrypted, and PII data should be masked unless users have permission to view the data that has been requested.

The Plan Processor must have the capability and capacity to provide bulk data necessary for the Participants and the other regulators to run and operate their surveillance processing. Such data requests can be very large; therefore, the Plan Processor must have the ability to split large requests into smaller data sets for data processing and handling. All reports should be generated by a configurable workload manager that is cost based, while also ensuring that no single user is using a disproportionate amount of resources for query generation.

#### (d) System Service Level Agreements (SLAs)

As further described in Appendix D, Functionality of CAT Systems, the Participants and the Plan Processor will enter into appropriate SLAs in order to establish system and operational performance requirements for the Plan Processor and help ensure timely Regulator access to Central Repository data. Among the items to be included in the SLA(s) will be specific requirements regarding query performance, linkage and order event processing performance of the Central Repository (e.g., linkage and data availability timelines, linkage errors not related to invalid data, and data retention) as well as system availability requirements (e.g., system uptime and DR/BCP performance). The Operating Committee will periodically review the SLAs according to the terms to be established in negotiation with the Plan Processor.

### 3. The Reliability and Accuracy of the Data (SEC Rule 613(a)(1)(iii))

As required by SEC Rule 613(a)(1)(iii), this section discusses the reliability and accuracy of the data reported to and maintained by the Central Repository throughout its lifecycle, including: transmission and receipt from CAT Reporters; data extraction, transformation and

[85] Adopting Release at 45799. *See also* RFP § 2.8.2.
[86] Adopting Release at 45799.

loading at the Central Repository; data maintenance at the Central Repository; and data access by the Participants and other regulators. In the Adopting Release, the Commission noted that the usefulness of the data to regulators would be significantly impaired if it is unreliable or inaccurate and as such, the Commission requested that the Participants discuss in detail how the Central Repository will be designed, tested and monitored to ensure the reliability and accuracy of the data collected and maintained in it.[87]

### (a) Transmission, Receipt, and Transformation

The initial step in ensuring the reliability and accuracy of data in the Central Repository is the validation checks made by the Plan Processor when data is received and before it is accepted into the Central Repository. In the RFP, the Participants stated that validations must include checks to ensure that data is submitted in the required formats and that lifecycle events can be accurately linked by 12:00 p.m. Eastern Time on T+1, four hours following the submission deadline for CAT Reporters.[88] Once errors are identified, they must be efficiently and effectively communicated to CAT Reporters on a daily basis. CAT Reporters will be required to correct and resubmit identified errors within established timeframes (as discussed in Appendix D, Data Availability).

The Plan Processor must develop specific data validations in conjunction with development of the Central Repository which must be published in the Technical Specifications. The objective of the data validation process is to ensure that data is accurate, timely and complete at or near the time of submission, rather than to identify submission errors at a later time after data has been processed and made available to regulators. To achieve this objective, a comprehensive set of data validations must be developed that addresses both data quality and completeness. For any data that fails to pass these validations, the Plan Processor will be required to handle data correction and resubmission within established timeframes both in a batch process format and via manual web-based entry.

To assess different validation mechanisms and integrity checks, the RFP required Bidders to provide information on the following:

- how data format and context validations for order and quote events submitted by CAT Reporters will be performed and how rejections or errors will be communicated to CAT Reporters;[89]

- a system flow diagram reflecting the overall data format, syntax and context validation process that includes when each types of validation will be completed and errors communicated to CAT Reporters, highlighting any dependencies between the different validations and impacts of such dependencies on providing errors back to CAT Reporters;[90]

[87] Adopting Release at 45790-91, 45799.
[88] RFP Section 2.2.4.
[89] RFP Question 14.
[90] RFP Question 15.

- how related order lifecycle events submitted by separate CAT Reporters will be linked and how unlinked events will be identified and communicated to CAT Reporters for correction and resubmission, including a description of how unlinked records will be provided to CAT Reporters for correction (e.g., specific transmission methods and/or web-based downloads);[91]

- how Customer and Customer Account Information submitted by broker-dealers will be validated and how rejections or errors will be communicated to CAT Reporters;[92] and

- the mechanisms that will be provided to CAT Reporters for the correction of both market data (e.g., order, quotes, and trades) errors, and Customer and account data errors, including batch resubmissions and manual web-based submissions.[93]

Most Bidders indicated that Customer Account Information including SSN, TIN or LEI will be validated in the initial onboarding processing. Additional validation of Customer Account Information, such as full name, street address, etc., would occur across CAT Reporters and potential duplications or other errors would be flagged for follow-up by the CAT Reporters.

All Bidders recommended that order data validation be performed via rules engines, which allow rules to be created and modified over time in order to meet future market data needs. Additionally, all Bidders indicated that data validations will be real-time and begin in the data ingestion component of the system. Standard data validation techniques include format checks, data type checks, consistency checks, limit and logic checks, or data validity checks. Some Bidders mentioned the ability to schedule the data validation at a time other than submission, because there may be a need to have rules engines perform validation in a batch mode or customized schedule during a different time. All Bidders indicated that when errors are found, the Raw Data will be stored in an error database and notifications would be sent to the CAT Reporters. Most Bidders permitted error correction to be submitted by CAT Reporters at any time.

Section 6.3(b) of the CAT NMS Plan sets forth the policies and procedures for ensuring the timeliness, accuracy and completeness of the data provided to the Central Repository as required by SEC Rule 613(e)(4)(ii) and the accuracy of the data consolidated by the Plan Processor pursuant to SEC Rule 613(e)(4)(iii).[94] It also mandates that each Participant and its Industry Members that are CAT Reporters must ensure that its data reported to the Central Repository is accurate, timely, and complete. Each Participant and its Industry Members that are CAT Reporters must correct and resubmit such errors within established timeframes. In furtherance thereof, data related to a particular order will be reported accurately and sequenced from receipt or origination, to routing, modification, cancellation and/or execution. Additionally each Participant and its Industry Members that are CAT Reporters must test their reporting

[91] RFP Question 16.
[92] RFP Question 17.
[93] RFP Question 18.
[94] SEC Rule 613(e)(4)(ii) and (iii).

systems thoroughly before beginning to report data to the Central Repository and Appendix D sets forth that the Plan Processor must make testing facilities available for such testing.

Pursuant to SEC Rule 613(e)(4)(iii), the Plan Processor will design, implement and maintain (1) data accuracy and reliability controls for data reported to the Central Repository and (2) procedures for testing data accuracy and reliability during any system release or upgrade affecting the Central Repository and the CAT Reporters.[95] The Operating Committee will, as needed, but at least annually, review policies and procedures to ensure the timeliness, accuracy, and completeness of data reported to the Central Repository.

In order to validate data receipt, the Plan Processor will be required to send an acknowledgement to each CAT Reporter notifying them of receipt of data submitted to the Central Repository to enable CAT Reporters to create an audit trail of their own submissions and allow for tracking of data breakdowns when data is not received. The data received by the Plan Processor must be validated at both the file and individual record level if appropriate. The required data validations may be amended based on input from the Operating Committee and the Advisory Committee. Records that do not pass basic validations, such as syntax rejections, will be rejected and sent back to the CAT Reporter as soon as possible, so it can repair and resubmit the data.

### (b) Error Communication, Correction, and Processing

The Plan Processor will define and design a process to efficiently and effectively communicate to CAT Reporters identified errors. All identified errors will be reported back to the CAT Reporter and other Data Submitters who submitted the data to the Central Repository on behalf of the CAT Reporter, if necessary. The Central Repository must be able to receive error corrections and process them at any time, including timeframes after the standard repair window. The industry supports a continuous validation process for the Central Repository, continuous feedback to CAT Reporters on error identification and the ability to provide error correction at any time even if beyond the error correction timeframe.[96] The industry believes that this will better align with the reporting of complex transactions and allocations and is more efficient for CAT Reporters.[97] CAT Reporters will be able to submit error corrections through a web-interface or via bulk uploads or file submissions. The Plan Processor must support bulk replacement of records, subject to approval by the Operating Committee, and reprocess such replaced records. A GUI must be available for CAT Reporters to make updates to individual records or attributes. Additionally, the Plan Processor will provide a mechanism to provide auto-correction of identified errors and be able to support group repairs (i.e., the wrong issue symbol affecting multiple reports).

[95] SEC Rule 613(e)(4)(iii).
[96] FIF Consolidated Audit Trail Working Group Processor Proposed Optimal Solution Recommendations at 6 (Sep. 15, 2014), *available at* http://www.sec.gov/comments/4-668/4668-16.pdf (the "FIF Optimal Solution Recommendations").
[97] FIF Response at 36.

SEC Rule 613(e)(6) also requires the Participants to specify a maximum Error Rate for data reported to the Central Repository pursuant to SEC Rule 613(c)(3) and (4).[98] The Participants understand that the Central Repository will require new reporting elements and methods for CAT Reporters and there will be a learning curve when CAT Reporters begin to submit data to the Central Repository.[99] However, the utility of the CAT is dependent on it providing a timely, accurate and complete audit trail for the Participants and other regulators.[100] Therefore, the Participants are proposing an initial maximum Error Rate of 5%, subject to quality assurance testing performed prior to launch, and it is anticipated that it will be reset when Industry Members, excluding Small Industry Members, begin to report to the Central Repository and again when Small Industry Members begin to report to the Central Repository. The Participants believe that this rate strikes the balance of making allowances for adapting to a new reporting regime, while ensuring that the data provided to regulators will be capable of being used to conduct surveillance and market reconstruction. Periodically, the Plan Processor will analyze reporting statistics and Error Rates and make recommendations to the Operating Committee for proposed changes to the maximum Error Rate. Changes to the maximum Error Rate will be approved by the Operating Committee. The maximum Error Rate will be reviewed and reset at least on an annual basis.

In order to help reduce the maximum Error Rate, the Plan Processor will measure the Error Rate on each business day and must take the following steps in connection with error reporting: (1) the Plan Processor will provide CAT Reporters with their error reports as they become available and daily statistics will be provided after data has been uploaded and validated by the Central Repository; (2) error reports provided to CAT Reporters will include descriptive details as to why each data record was rejected by the Central Repository; and (3) on a monthly basis, the Plan Processor will produce and publish reports detailing performance and comparison statistics, similar to the Report Cards published for OATS presently, which will enable CAT Reporters to identify how they compare to the rest of their industry peers and help them assess the risk related to their reporting of transmitted data.

All CAT Reporters exceeding the Error Rate will be notified each time that they have exceeded the maximum allowable Error Rate and will be informed of the specific reporting requirements that they did not fully meet (e.g., timeliness or rejections). Upon request from the Participants or other regulators, the Plan Processor will produce and provide reports containing Error Rates and other metrics as needed on each CAT Reporter's Compliance Thresholds so that

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[98] SEC Rule 613(e)(6)(i) defines "Error Rate" to mean "[t]he percentage of reportable events collected by the central repository for which the data reported does not fully and accurately reflect the order event that occurred in the market." All CAT Reporters, including the Participants, will be included in the Error Rate. CAT Reporters will be required to meet separate compliance thresholds, which will be a CAT Reporter-specific rate that may be used as the basis for further review or investigation into CAT Reporter performance (the "Compliance Thresholds"). Compliance Thresholds will compare a CAT Reporter's error rate to the aggregate Error Rate over a period of time to be defined by the Operating Committee. *See infra* note 109 and accompanying text (discussing Compliance Thresholds). A CAT Reporter's performance with respect to the Compliance Threshold will not signify, as a matter of law, that such CAT Reporter has violated SEC Rule 613 or the rules of any Participant concerning the CAT.

[99] As indicated by FINRA in its comment to the Adopting Release, OATS compliance rates have steadily improved as reporters have become more familiar with the system. When OATS was first adopted compliance rates were 76%, but current compliance rates are 99%. *See* Letter from Marcia E. Asquith, Senior Vice President and Corporate Secretary, FINRA, to Elizabeth M. Murphy, Secretary, Commission (Aug. 9, 2010).

[100] Adopting Release at 45790-91.

the Participants as Participants or the SEC may take appropriate action for failing to comply with the reporting obligations under the CAT NMS Plan and SEC Rule 613.

SEC Rule 613(e)(6) requires the prompt correction of data to the Central Repository. As discussed in the NMS Plan, there are a minimum of three validation processes that will be performed on data submitted to the Central Repository. The Plan Processor will be required to identify specific validations and metrics to define the Data Quality Governance requirements, as defined in Appendix D, Receipt of Data from Reporters.

The Plan Processor will identify errors on CAT file submissions that do not pass the defined validation checks above and conform to the Data Quality Governance requirements. Error Rates will be calculated during the CAT Data and linkage validation processes. As a result, the Participants propose an initial maximum overall Error Rate of 5%[101] on initially submitted data, subject to quality assurance testing period performed prior to launch.[102] It is anticipated that this Error Rate will be evaluated when Industry Members, excluding Small Industry Members, begin to report to the Central Repository and then again when Small Industry Members begin to report to the Central Repository.

In determining the initial maximum Error Rate of 5%, the Participants have considered the current and historical OATS Error Rates, the magnitude of new reporting requirements on the CAT Reporters and the fact that many CAT Reporters may have never been obligated to report data to an audit trail.

The Participants considered industry experience with FINRA's OATS system over the last 10 years. During that timeframe there have been three major industry impacting releases. These three releases are known as (1) OATS Phase III, which required manual orders to be reported to OATS;[103] (2) OATS for OTC Securities which required OTC equity securities to be reported to OATS;[104] and (3) OATS for NMS which required all NMS stocks to be reported to OATS.[105] Each of these releases was accompanied by significant updates to the required formats which required OATS reporters to update and test their reporting systems and infrastructure.

The combined average error rates for the time periods immediately following release across five significant categories for these three releases follow. The average rejection percentage rate, representing order events that did not pass systemic validations, was 2.42%. The average late percentage rate, representing order events not submitted in a timely manner, was 0.36%. The average order / trade matching error rate, representing OATS Execution

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[101] As required by SEC Rule 613(e)(6)(ii), the Error Rate will be calculated on a daily basis as the number of erroneous records divided by the total number of records received on any given day and will be inclusive of validation of CAT Data and linkage validations. Error Rates are calculated for reporting groups as a whole, not for individual firms. Individual firms within a reporting group may have higher or lower Error Rates, though they would still be subject to any penalties or fines for excessive Error Rates to be defined by the Operating Committee. Additionally, this Error Rate will be considered for the purpose of reporting metrics to the SEC and the Operating Committee and individual firms will need to maintain Compliance Thresholds as described below.

[102] The Participants expect that error rates after reprocessing of error corrections will be *de minimis.*

[103] *See* FINRA, OATS Phase III, http://www.finra.org/Industry/Compliance/MarketTransparency/OATS/PhaseIII/.

[104] *See* FINRA, OATS Reporting Requirements to OTC Equity Securities, http://www.finra.org/Industry/Compliance/MarketTransparency/OATS/OTCEquitySecurities/.

[105] *See* FINRA, OATS Expansion to all NMS Stocks, https://www.finra.org/Industry/Compliance/MarketTransparency/OATS/NMS/.

Reports unsuccessfully matched to a TRF trade report was 0.86%. The average Exchange/Route matching error rate, representing OATS Route Reports unsuccessfully matched to an exchange order was 3.12%. Finally, the average Interfirm Route matching error rate, representing OATS Route Reports unsuccessfully matched to a report representing the receipt of the route by another reporting entity was 2.44%. Although the error rates for the 1999 initial OATS implementation were significantly higher than those laid out above, the Participants believe that technical innovation and institutional knowledge of audit trail creation over the past 15 years makes the more recent statistics a better standard for the initial Error Rate.[106] Based upon these historical error rates, and given that reporting to the Central Repository will involve reporting on new products (i.e., options) and reporting by new reporters (including both broker-dealers and Participants who have not previously been required to report to OATS), the Participants believe that the initial Error Rate will be higher than the recent rates associated with OATS releases and that an initial Error Rate of 5% is an appropriate standard.

The Participants believe that to achieve this Error Rate, however, the Participants and the industry must be provided with ample resources, including a stand-alone test environment functionally equivalent to the production environment, and time to test their reporting systems and infrastructure. Additionally, the Technical Specifications must be well written and effectively communicated to the reporting community with sufficient time to allow proper technical updates, as necessary. The Participants believe that the Error Rate strikes the balance of adapting to a new reporting regime, while ensuring that the data provided to regulators will be capable of being used to conduct surveillance and market reconstruction, as well as having a sufficient level of accuracy to facilitate the retirement of existing regulatory reports and systems where possible.

The Participants are proposing a phased approach to lowering the maximum Error Rate. Under the proposed approach, one year after a CAT Reporter's respective filing obligation has begun, their maximum Error Rate would become 1%.[107] Maximum Error Rates under the proposed approach would thus be as follows:

| | One Year[108] | Two Years | Three Years | Four Years |
|---|---|---|---|---|
| Participants | 5% | 1% | 1% | 1% |
| Large broker-dealers | N/A | 5% | 1% | 1% |
| Small broker-dealers | N/A | N/A | 5% | 1% |

In addition to the above mentioned daily Error Rate, CAT Reporters will be required to meet separate Compliance Thresholds,[109] which rather than the Error Rate, will be a CAT Reporter-specific rate that may be used as the basis for further review or investigation into CAT Reporter performance. Although Compliance Thresholds will not be calculated on a daily basis,

[106] The initial rejection rates for OATS were 23% and a late reporting rate of 2.79%.
[107] Error rate reporting will be bifurcated by reporter group (e.g., Large Broker/Dealers) rather than product type to minimize the complexity of Error Rate calculations
[108] As used in this table, "years" refer to years after effectiveness of the NMS Plan.
[109] Compliance Thresholds will be set by the Operating Committee. Compliance Thresholds for CAT Reporters will be calculated at intervals to be set by the Operating Committee. All CAT Reporters, including the Participants, will be subject to Compliance Thresholds. Compliance Thresholds will include, among other items, compliance with clock synchronization requirements.

this does not: (1) relieve CAT Reporters from their obligation to meet daily reporting requirements set forth in SEC Rule 613; or (2) prohibit disciplinary action against a CAT Reporter for failure to meet its daily reporting requirements set forth in SEC Rule 613. The Operating Committee may consider other exceptions to this reporting obligation based on demonstrated legal or regulatory requirements or other mitigating circumstances.

In order to reduce the maximum Error Rate and help CAT Reporters to meet their Compliance Thresholds, the Plan Processor must provide support for CAT Reporter "go-live" dates, as specified in Appendix D, User Support.

**(c) Sequencing Orders and Clock Synchronization**

SEC Rule 613(c)(1) requires the Central Repository to provide "an accurate, time-sequenced record of orders," and SEC Rule 613(d)(1) requires the CAT NMS Plan to require each CAT Reporter "to synchronize its business clocks that are used for the purposes of recording the date and time of any reportable event . . . to the time maintained by the National Institute of Standards and Technology (NIST), consistent with industry standards." As an initial matter, because of the drift between clocks, an accurately-sequenced record of orders cannot be based solely on the time stamps provided by CAT Reporters. As discussed above, the CAT NMS Plan requires that CAT Reporters synchronize their clocks to within 50 milliseconds of the NIST. Because of this permitted drift, any two separate clocks can vary by 100 milliseconds: one clock can drift forward 50 milliseconds while another can drift back 50 milliseconds. Thus, it is possible to have, for example, one firm report the route of an order at 10:40:00.005 while the firm receiving the routed order reports a receipt time of 10:39:59.983 (i.e., the time stamps alone indicate that the routed order was received before it was sent). For this reason, the Participants plan to require that the Plan Processor develop a way to accurately track the sequence of order events without relying entirely on time stamps.[110]

There were several different approaches suggested by the Bidders to accomplish the accurate sequencing of order events. Some Bidders suggested using time stamp-based sequencing; however, most Bidders recognized that, while all CAT Reporters should have their time stamp clocks synchronized, in practice this synchronization cannot be wholly relied upon due to variations in computer systems. These Bidders rely on linkage logic to derive the event sequencing chain, such as parent/child orders. To help resolve time stamp issues, one Bidder proposed adding unique sequence ID numbers as well to the event information to help with time clock issues and a few others would analyze the variations on clock time and notify those CAT Reporters that need to resynchronize their clocks.

The Participants believe that using a linking logic not dependent on time stamps would enable proper sequencing of an order. This decision is supported by the industry since time stamps across disparate systems cannot be guaranteed and are likely to be error-prone.[111] The

[110] Events occurring within a single system that uses the same clock to time stamp those events should be able to be accurately sequenced based on the time stamp. For unrelated events, e.g., multiple unrelated orders from different broker-dealers, there would be no way to definitively sequence order events within the allowable clock drift as defined in Article 6.8.

[111] *See* Letter from Manisha Kimmel, Executive Director, Financial Information Forum, to Participant Representatives of the CAT (June 12, 2013), *available at* http://catnmsplan.com/industryFeedback/P284394 ("FIF Letter").

Participants believe that this type of sequencing can be successfully used for both simple and complex orders that will be reported to the Central Repository. The industry supports using event sequencing that is already built into the exchange protocols, which imposes sequencing and determines the true market environment.[112]

As required by Section 6.8(a) of the CAT NMS Plan, each Participant will synchronize its Business Clocks (other than Business Clocks used solely for Manual Order Events, which will be required to be synchronized to within one second of the time maintained by the NIST) used for the purposes of recording the date and time of any Reportable Event that must be reported under SEC Rule 613 to within 50 milliseconds of the time maintained by the NIST, and will adopt a Compliance Rule requiring its Industry Members to do the same. Furthermore, in order to ensure the accuracy of time stamps for Reportable Events, the Participants anticipate that Participants and Industry Members will adopt policies and procedures to verify such required synchronization each Trading Day (1) before the market opens and (2) periodically throughout the Trading Day.

As noted above, Rule 613(d)(1) requires the CAT NMS Plan to impose a clock synchronization requirement "consistent with industry standards." The Participants believe that the 50 millisecond clock synchronization drift tolerance included in Section 6.8(a) represents the current industry clock synchronization standard and therefore satisfies the Rule. To determine the current industry standard, the Participants relied on survey feedback provided by industry members, as further discussed in Appendix C, D.12.

Importantly, Section 6.8 requires, pursuant to Rule 613(c)(2), that Participants, together with the Plan Processor's Chief Compliance Officer, evaluate the clock synchronization standard on an annual basis to reflect changes in industry standards. Accordingly, to the extent existing technology that synchronizes business clocks with a lower tolerance (i.e., within less than 50 milliseconds drift from NIST) becomes widespread enough throughout the industry to constitute a new standard, the clock synchronization requirement of the CAT NMS Plan would be revised to take account of the new standard.

In accordance with SEC Rule 613(d), Section 6.8(c) of the CAT NMS Plan states that "[i]n conjunction with Participants and other appropriate Industry Member advisory groups, the Chief Compliance Officer shall annually evaluate whether industry standards have evolved such that: (i) the synchronization standard in Section 6.8(a) should be shortened; or (ii) the required time stamp in Section 6.8(b) should be in finer increments."

The Participants anticipate that compliance with this provision will require Participants and Industry Members to perform the following or comparable procedures. The Participants and their Industry Members will document their clock synchronization procedures and maintain a log recording the time of each clock synchronization performed, and the result of such synchronization, specifically identifying any synchronization revealing that the discrepancy between its Business Clock and the time maintained by the NIST exceeded 50 milliseconds. At

[112] FIF Letter at 11.

all times such log will include results for a period of not less than five years ending on the then current date.

In addition to clock synchronization requirements, the Participants considered the appropriate level of time granularity to be required in the CAT NMS Plan. Although millisecond increments are generally the industry standard for trading systems, there is a wide range of time stamp granularity across the industry commonly ranging from seconds to milliseconds to micro-seconds for Latency sensitive applications.[113] The disparity is largely attributed to the age of the system being utilized for reporting, as older systems cannot cost effectively support, finer time stamp granularity.[114] To comply with a millisecond time stamp requirement, the Participants understand that firms may face significant costs in both time and resources to implement a consistent time stamp across multiple systems.[115] This may include a need to upgrade databases, internal messaging applications/protocols, data warehouses, and reporting applications to enable the reporting of such time stamps to the Central Repository.[116] Because of this, FIF recommended to the Participants a two year grace period for time stamp compliance.[117] FIF and SIFMA also supported an exception for millisecond reporting for order events that are manually processed, which is discussed below.[118]

To the extent that any CAT Reporter uses time stamps in increments finer than the minimum required by the CAT NMS Plan, each Participant will, and will adopt a rule requiring its Industry Members that are CAT Reporters to, use such finer increments when providing data to the Central Repository.

With respect to the requirement under SEC Rule 613(c) and (d)(3) that time stamps "reflect current industry standards and be at least to the millisecond," the Participants believe that time stamp granularity to the millisecond reflects current industry standards. However, after careful consideration, including numerous discussions with the DAG, the Participants have determined that time stamp granularity at the level of a millisecond is not practical for order events that involve non-electronic communication of information ("Manual Order Events"). In particular, it is the Participants' understanding that recording Manual Order Events to the millisecond would be both very costly, requiring specialized software configurations and expensive hardware, and inherently imprecise due to the manner in which human interaction is required. The industry feedback that the Participants received through the DAG suggests that the established business practice with respect to Manual Order Events is to manually capture time stamps with granularity at the level of a second because finer increments cannot be accurately captured when dealing with manual processes which, by their nature, take longer to perform than a time increment of under one second. The Participants agree that, due to the nature of transactions originated over the phone, it is not practical to attempt granularity finer than one second, as any such finer increment would be inherently unreliable. Further, the Participants do

[113] Letter from T.R. Lazo, Managing Director, SIFMA, and Thomas Price, Managing Director, SIFMA (June 11, 2013), *available at* http://catnmsplan.com/industryFeedback/P284395 ("SIFMA Letter"); FIF Letter at 10.
[114] FIF Letter at 10.
[115] FIF Letter at 10; SIFMA Comments on Selected Topics at 11.
[116] FIF Letter at 10.
[117] FIF Letter at 10.
[118] FIF Letter at 10; SIFMA Letter at 11.

not believe that recording Manual Order Events to the second will hinder the ability of regulators to determine the sequence in which Reportable Events occur.

As a result of these discussions, the Exemptive Request Letter requested exemptive relief from the Commission to allow the CAT NMS Plan to require Manual Order Events to be captured with granularity of up to and including one second or better, but also require CAT Reporters to report the time stamp of when a Manual Order Event was captured electronically in the relevant order handling and execution system of the party to the event. Granularity of the Electronic Capture Time will be consistent with the SEC Rule 613(d)(3) requirement that time stamps be at least to the millisecond.

Thus, the Participants have determined that adding the Electronic Capture Time would be beneficial for successful reconstruction of the order handling process and would add important information about how the Manual Order Events are processed once they are entered into an electronic system. Additionally, Manual Order Events, when reported, must be clearly identified as such.

### (d) Data Maintenance and Management

Data Maintenance and Management of the Central Repository "refers to the process for storing data at the [C]entral [R]epository, indexing the data for linkages, searches, and retrieval, dividing the data into logical partitions when necessary to optimize access and retrieval, and the creation and storage of data backups."[119]

The Plan Processor must create a formal records retention policy to be approved by the Operating Committee. All of the data (including both corrected and uncorrected or rejected data) in the Central Repository must be kept online for a rolling six year period, which would create a six year historical audit trail. This data must be directly available and searchable by regulators electronically without any manual intervention. Additionally, the Plan Processor is required to create and maintain for a minimum of six years a symbol history and mapping table, as well as to provide a tool that will display a complete issue symbol history that will be accessible to CAT Reporters, Participants and the SEC.

Assembled lifecycles of order events must be stored in a linked manner so that each unique event (e.g., origination, route, execution, modification) can be quickly and easily associated with the originating customer(s) for both targeted queries and comprehensive data scans. For example, an execution on an exchange must be linked to the originating customer(s) regardless of how the order may have been aggregated, disaggregated, or routed through multiple broker-dealers before being sent to the exchange for execution.

Most Bidders recommended dividing data in the Central Repository into nodes based on symbol, date or a combination thereof in order to speed query response times. The Participants are not specifying how the data is divided, but will require that it be partitioned in a logical manner in order to optimize access and retrieval.

[119] Adopting Release at 45790 n.782.

All of the Bidders addressed data loss through data replication and redundancy. Some of the Bidders proposed a hot-hot design for replication for primary and secondary data, so both sites are fully operational at all times and there would be no recovery time necessary in the case of fall-over to the secondary site. However, this is a more costly solution, and many Bidders therefore proposed data loss prevention by operating in a hot-warm design for replication to a secondary site. The Participants are requiring that the Plan Processor implement a disaster recover capability that will ensure no loss of data and will support the data availability requirements for the Central Repository and a secondary processing site will need to be capable of recovery and restoration of services at the secondary site within 48 hours of a disaster event.

**(e) Data Access by Regulators**

As detailed in Appendix C, Time and Method by which CAT Data will be Available to Regulators, the Participants and other regulators will have access to raw unprocessed data that has been ingested by the Central Repository prior to Noon Eastern Time on T +1.[120] Between Noon Eastern Time on T +1 and T+5, the Participants and other regulators should have access to all iterations of processed data.[121] At T+5, the Participants and other regulators should have access to corrected data.[122] The Plan Processor must adopt policies and procedures to reasonably inform Participants and the SEC of material data corrections made after T+5. The Participants and other regulators will be able to build and generate targeted queries against data in the Central Repository. More information about the report, query, and extraction capabilities can be found in Appendix D, Functionality of the CAT System.

**(f) Data Recovery and Business Continuity**

As noted above, in addition to describing data security and confidentiality, all of the Bidders were required to set forth an approach to data loss recovery and business continuity in the event of data loss. All of the Bidders addressed data loss through data replication and redundancy. Some of the Bidders proposed a hot-hot design for replication for primary and secondary data, so both sites are fully operational at all times and there would be no recovery time necessary in the case of fall-over to the secondary site. However, this is a more costly solution, and many Bidders therefore proposed data loss prevention by operating in a hot-warm design for replication to a secondary site.

The Plan Processor must comply with industry best practices for disaster recovery and business continuity planning, including the standards and requirements set forth in Appendix D, BCP / DR Process.

With respect to business continuity, the Participants have developed the following requirements that the Plan Processor must meet. In general, the Plan Processor will implement efficient and cost-effective backup and disaster recovery capability that will ensure no loss of data and will support the data availability requirements and anticipated volumes of the Central Repository. The disaster recovery site must have the same level of availability / capacity / throughput and data as the primary site. In addition, the Plan Processor will be required to

[120] *See* Appendix C, Time and Method by which CAT Data will be Available to Regulators.
[121] *Id.*
[122] *Id*.

design a Business Continuity Plan that is inclusive of the technical and business activities of the Central Repository, including the items specified in Appendix D, BCP / DR Process (e.g., bi-annual DR testing and an annual Business Continuity Audit).

### 4. The Security and Confidentiality of the Information Reported to the Central Repository (SEC Rule 613(a)(1)(iv))

As required by SEC Rule 613(a)(1)(iv), this section describes the security and confidentiality of the information reported to the Central Repository. As the Commission noted in the Adopting Release, keeping the data secure and confidential is critical to the efficacy of the Central Repository and the confidence of market participants. There are two separate categories for purposes of treating data security and confidentiality: (1) PII; and (2) other data related to orders and trades reported to the CAT.[123]

Because of the importance of data security, the Participants included in the RFP numerous questions to Bidders requesting detailed information on their data security approaches. In the RFP, the Participants requested general information regarding the following:

- how the Bidder's solution protects data during transmission, processing, and at rest (i.e., when stored in the Central Repository);[124]
- the specific security governance/compliance methodologies utilized in the proposed solution;[125]
- how access to the data is controlled and how the system(s) confirms the identity of persons (e.g., username/password), monitors who is permitted to access the data and logs every instance of user access;[126]
- what system controls for users are in place to grant different levels of access depending on their role or function;[127]
- the strategy, tools and techniques, and operational and management practices that will be used to maintain security of the system;[128]
- the proposed system controls and operational practices;[129]

[123] Some trade data (e.g., trade data feeds disseminated by the SIPs) is public and therefore of little concern from a security standpoint. However, because this data may be linked to confidential order data or other non-public information, the Participants are requiring the Plan Processor to store this public data in the same manner as the non-public order and trade information submitted to the Central Repository by Data Submitters.
[124] RFP Question 65.
[125] RFP Question 66.
[126] RFP Question 67.
[127] RFP Question 68.
[128] RFP Question 69.
[129] RFP Question 70.

- the organization's security auditing practices, including internal audit, external audit, third-party independent penetration testing, and all other forms of audit and testing;[130]

- how security practices may differ across system development lifecycles and environments that support them (e.g., development, testing, and production);[131]

- experiences in developing policies and procedures for a robust security environment, including the protection of PII;[132]

- the use of monitoring and incident handling tools to log and manage the incident handling lifecycle;[133]

- the approach(es) to secure user access, including security features that will prevent unauthorized users from accessing the system;[134]

- the processes/procedures followed if security is breached;[135]

- the infrastructure security architecture, including network, firewalls, authentication, encryption, and protocols; and[136]

- the physical security controls for corporate, data center and leased data center locations.[137]

All Bidders acknowledged the importance of data security; however, the proposals varied in the details about security policies, data access management, proactive monitoring and intrusion prevention, and how data security will be implemented. Some Bidders intend to leverage their experience in financial services and adopt their policies and technologies to control data, and many Bidders supported such measures as role-based access controls, two factor authentication, detailed system logs, and segmentation of sensitive data that is isolated in both logical and physical layers. Other Bidders indicated that they would use role-based security policies, data and file encryption, and redundant and layered controls to prevent unauthorized access. Additionally, Bidders noted that the physical locations at which data is stored need security measures to ensure data is not compromised. Some Bidders indicated that physical controls would include background checks for employees working with the system; physical building security measures (e.g., locks, alarms, key control programs, CCTV monitoring for all critical areas, and computer controlled access systems with ID badges).

The RFP also requested additional information specific to the treatment and control over PII. The RFP required Bidders to specifically address:

[130] RFP Question 71.
[131] RFP Question 72.
[132] RFP Question 75.
[133] RFP Question 76.
[134] RFP Question 77.
[135] RFP Question 78.
[136] RFP Question 79.
[137] RFP Question 80.

- how PII will be stored;[138] and

- how PII access will be controlled and tracked.[139]

All of the Bidders proposed segregating PII from the other data in the Central Repository. Additionally, all of the Bidders recommended limiting access to PII to only those regulators who need to have access to such information, and requiring additional validations to access PII. Although all Bidders proposed to keep a log of access to the Central Repository by user, the Bidders suggested different methods of authentication and utilized varying security policies, including the use of VPNs or HTTPS.

The RFP also requested information from Bidders on data loss prevention ("DLP") and business continuity to ensure the continued security and availability of the data in the Central Repository. Specifically, the RFP asked Bidders to describe:

- their DLP program;[140] and

- the process of data classification and how it relates to the DLP architecture and strategy.[141]

Based upon the RFP responses, as well as input from the Participants' information security teams and discussions with the DAG, information security requirements were developed and are defined in Appendix D, Data Security. These requirements are further explained below.

**(a) General Security Requirements**

SEC Rule 613 requires that the Plan Processor ensure the security and confidentiality of all information reported to and maintained by the Central Repository in accordance with the policies, procedures, and standards in the CAT NMS Plan.[142] Based on the numerous options and proposals identified by the Bidders, the Participants have outlined multiple security requirements the Plan Processor will be required to meet to ensure the security and confidentiality of data reported to the Central Repository. The Plan Processor will be responsible for ensuring the security and confidentiality of data during transmission and processing as well as data at rest.

The Plan Processor must provide a solution addressing physical security controls for corporate, data center and any leased facilities where any of the above data is transmitted or stored. In addition to physical security, the Plan Processor must provide for data security for electronic access by outside parties, including Participants and the SEC and, as permitted, CAT

[138]RFP Question 5.
[139]RFP Question 6.
[140] RFP Question 73. The Bidders were asked to include information pertaining to strategy, tools and techniques, and operational and management practices that will be used.
[141] RFP Question 74.
[142] SEC Rule 613(e)(4). This section of Appendix C provides an outline of the policies and procedures to be implemented. When adopting this requirement, the Commission recognized "the utility of allowing the [Participants] flexibility to subsequently delineate them in greater detail with the ability to make modifications as needed." Adopting Release at 45782. Additional detail is provided in Appendix D, Data Security.

Reporters or Data Submitters. Specific requirements are detailed in Appendix D, Data Security, and include requirements such as role-based user access controls, audit trails for data access, and additional levels of protection for PII.

Pursuant to SEC Rule 613(i)(C), the Plan Processor has to develop and maintain a comprehensive security program for the Central Repository with dedicated staff: (1) that is subject to regular reviews by the Chief Compliance Officer; (2) that has a mechanism to confirm the identity of all persons permitted to access the data; and (3) that maintains a record of all such instances where such persons access the data. In furtherance of this obligation, the CAT NMS Plan requires the Plan Processor to designate a Chief Compliance Officer and a Chief Information Security Officer, each subject to approval by the Operating Committee. Each position must be a full-time position. Section 6.2(a) of the CAT NMS Plan provides that the Chief Compliance Officer must develop a comprehensive compliance program covering all CAT Reporters, including the Participants and Industry Members.[143] Section 6.2(b) of the CAT NMS Plan provides that the Chief Information Security Officer shall be responsible for creating and enforcing appropriate policies, procedures, standards and control structures to monitor and address data security issues for the Plan Process and the CAT System as detailed in Appendix D, Data Security.

Section 6.12 of the CAT NMS Plan requires that the Plan Processor develop and maintain a comprehensive information technology security program for the Central Repository, to be approved and reviewed at least annually by the Operating Committee. To effectuate these requirements, Appendix D sets forth certain provisions designed to (1) limit access to data stored in the Central Repository to only authorized personnel and only for permitted purposes; (2) ensure data confidentiality and security during all communications between CAT Reporters and the Plan Processor, data extractions, manipulation and transformation, loading to and from the Central Repository, and data maintenance by the Central Repository; (3) require the establishment of secure controls for data retrieval and query reports by Participants' regulatory staff and the SEC; and (4) otherwise provide appropriate database security for the Central Repository. Section 6.2(a) of the CAT NMS Plan provides that the Chief Compliance Officer, in collaboration with the Chief Information Security Officer, will retain independent third parties with appropriate data security expertise to review and audit on an annual basis the policies, procedures, standards, and real time tools that monitor and address data security issues for the Plan Processor and the Central Repository.[144]

The Plan Processor must have appropriate solutions and controls in place to ensure data confidentiality and security during all communication between CAT Reporters and the CAT System, data extraction, manipulation and transformation, loading to and from the Central Repository and data maintenance by the system. The solution must also address secure controls for data retrieval and query reports by Participant regulatory staff and the SEC. The solution must provide appropriate tools, logging, auditing and access controls for different components of

[143] *See* Section 6.2(a)(v) of the CAT NMS Plan for a more detailed list of the activities to be performed by the Chief Compliance Officer.
[144] *See* SEC Rule 613(e)(5).

the system, such as access to the Central Repository, access for CAT Reporters, access to rejected data, processing status and CAT Reporter calculated Error Rates.

In addition, pursuant to SEC Rule 613(e)(4)(i)(C)(2), the Plan Processor will develop and maintain a mechanism to confirm the identity of all persons permitted to access the data. The Plan Processor is responsible for defining, assigning and monitoring CAT Reporter entitlements. Similarly, pursuant to SEC Rule 613(e)(4)(i)(C)(3), the Plan Processor will record all instances where a person accesses the data.

Pursuant to SEC Rule 613(e)(4)(i)(B), Section 6.5(e)(ii) of the CAT NMS Plan requires each Participant to adopt and enforce rules that require information barriers between its regulatory staff and non-regulatory staff with regard to access to and use of data in the Central Repository, and permit only persons designated by such Participants to have access to and use of the data in the Central Repository.

The Plan Processor will also develop a formal cyber incident response plan to provide guidance and direction during security incidents, and will also document all information relevant to any security incidents, as detailed in Appendix D, Data Security.

**(b) PII**

As noted above, because of the sensitivity of PII, the Participants have determined PII should be subject to more stringent standards and requirements than other order and trading data. In response to the RFP questions, many Bidders mentioned that a range of techniques were required to ensure safety of PII. These techniques included development of PII policies and managerial processes for use by Plan Processor as well as Participants' staff and the SEC, physical data center considerations and strong automated levels, such as application, mid-tier, database, and operating systems levels, and use of role-based access and other parameters such as time-limited, case-restricted, and compartmentalized privilege. Most Bidders advocated for separate storage of PII in a dedicated repository to reduce the ability for hacking events to occur.

In accordance with SEC Rule 613(e)(4)(i)(A), all Participants and their employees, as well as all employees of the Plan Processor, will be required to use appropriate safeguards to ensure the confidentiality of data reported to the Central Repository and not to use such data for any purpose other than surveillance and regulatory purposes. A Participant, however, may use the data that it reports to the Central Repository for regulatory, surveillance, commercial, or other purposes.

The Participants anticipate that access to PII will be limited to a "need-to-know" basis. Therefore, it is expected that access to PII associated with customers and accounts will have a much lower number of registered users, and access to this data will be limited to Participants' staff and the SEC who need to know the specific identity of an individual. For this reason, PII such as SSN and TIN will not be made available in the general query tools, reports, or bulk data

extraction.[145] The Participants will require that the Plan Processor provide for a separate workflow granting access to PII (including an audit trail of such requests) that allows this information to be retrieved only when required by specific regulatory staff of a Participant or the SEC, including additional security requirements for this sensitive data. Specifically, the Plan Processor must take steps to protect PII as defined in Appendix D, Data Security and including items such as storage of PII separately from order and transaction data, multi-factor authentication for access to PII data, and a full audit trail of all PII data access.

It is anticipated that the Technical Specifications will set forth additional policies and procedures concerning the security of data reported to the Central Repository; however, any such policies and procedures must, at a minimum, meet the requirements set forth in the CAT NMS Plan and Appendix D.

## 5. The Flexibility and Scalability of the CAT (SEC Rule 613(a)(1)(v))

### (a) Overview

As required by SEC Rule 613(a)(1)(v), this section discusses the flexibility and scalability of the systems used by the Central Repository to collect, consolidate and store CAT Data, including the capacity of the Central Repository to efficiently incorporate, in a cost-effective manner, improvements in technology, additional capacity, additional order data, information about additional Eligible Securities or transactions, changes in regulatory requirements, and other developments.

The Plan Processor will ensure that the Central Repository's technical infrastructure is scalable, adaptable to new requirements and operable within a rigorous processing and control environment. As a result, the technical infrastructure will require an environment with significant throughput capabilities, advanced data management services and robust processing architecture. The technical infrastructure should be designed so that in the event of a capacity upgrade or hardware replacement, the Central Repository can continue to receive data from CAT Reporters with no unexpected issues.

The Plan Processor will perform assessments of the Central Repository's technical infrastructure to ensure the technology employed therein continues to meet the functional requirements established by the Participants. The Plan Processor will provide such assessments to, and review such assessments with, the Operating Committee within one month of completion. The Operating Committee will set forth the frequency with which the Plan Processor is required to perform such assessments. The Operating Committee must approve all material changes / upgrades proposed by the Plan Processor before they can be acted upon. The Operating Committee may solicit feedback from the Advisory Committee for additional comments and/or suggestions on changes to the capacity study as the Operating Committee determines necessary.

[145] As described in Appendix C, Reporting Data to the CAT, general queries can be carried out using the Customer-ID without the need to know specific, personally-identifiable information (i.e., who the individual Person associated with the Customer-ID is). The Customer-ID will be associated with the relevant accounts of that Person; thus, the use of Customer-ID for querying will not reduce surveillance.

The Central Repository will employ optimal technology for supporting (1) scalability to increase capacity to handle a significant increase in the volume of data reported, (2) adaptability to support future technology developments and new requirements and (3) maintenance and upgrades to ensure that technology is kept current, supported and operational.

Participants will provide metrics and forecasted growth to facilitate Central Repository capacity planning. The Plan Processor will maintain records of usage statistics to identify trends and processing peaks. The Central Repository's capacity levels will be determined by the Operating Committee and used to monitor resources, including CPU power, memory, storage, and network capacity.

The Plan Processor will ensure the Central Repository's compliance with all applicable service level agreements concerning flexibility and scalability of the Central Repository, including those specified in the CAT NMS Plan and by the Operating Committee.

**(b) Approaches proposed by Bidders**

Information received from Shortlisted Bidders indicated that all six Shortlisted Bidders considered incoming transaction volumes to be one of their most significant drivers of cost across hardware, software, and full-time employees ("FTEs"), with the expected rate of increase in transaction volumes and retention requirements also being prominent drivers of cost. The approaches described above will facilitate effective management of these factors to provide for a cost-effective and flexible Central Repository.

As noted in the RFP, the Bidders were required to provide comments on how the Central Repository would be scalable for growth in the following aspects: number of issues accepted by the CAT, types of messages accepted by the CAT, addition of fields stored on individual data records or increases in any data type due to market growth. The Bidders were also requested to describe how the system can be scaled up for peak periods and scaled down as needed.

Bidders using a network infrastructure of data collection hubs noted the use of Ethernet links throughout a single hub as a method of handling additional throughput and capacity. Other Bidders note access points will be load balanced, allowing for additional capacity. Some Bidders note the need for continued monitoring to facilitate timely addition of capacity or other upgrades. Other Bidders highlighted the ability to scale processing horizontally by adding nodes to the database structure which will allow for additional capacity. In this instance, adding nodes to an existing clustered environment allows for the preservation of processing speed in the existing processing environment. In a cloud solution, Bidders note the systems will scale automatically. That is, the processing load or capacity is determined at the instance the tool is 'run' by the processer.[146] Some Bidders broadly note that the selection of platform components or features of their proposed solution infrastructure was the key in developing a scalable system. It is further noted that the selection of these elements allows for technological upgrades to incorporate newer technologies without a system replacement. Bidders identify the use of additional server and storage capacity as a key proponent of providing a scalable system.

[146] *See, e.g.,* Google Cloud Platform, https://cloud.google.com/developers/articles/auto-scaling-on-the-google-cloud-platform/.

## 6. The Feasibility, Benefits, and Costs for Broker-Dealers Reporting Allocations in Primary Market Transactions to the Consolidated Audit Trail (SEC Rule 613(a)(1)(vi))

SEC Rule 613(a)(1)(vi) requires the Participants to assess the feasibility, benefits and costs of broker-dealers reporting to the consolidated audit trail in a timely manner:

- The identity of all market participants (including broker-dealers and customers) that are allocated NMS Securities, directly or indirectly, in a Primary Market Transaction;[147]
- The number of such NMS Securities each such market participant is allocated; and
- The identity of the broker-dealer making each such allocation.[148]

The objective of this CAT NMS Plan is to provide a comprehensive audit trail that "allows regulators to efficiently and accurately track all activity in NMS securities throughout the U.S. markets." The Participants believe that an eventual expansion of the CAT to gather complete information on Primary Market Transactions would be beneficial to achieving that objective. However, based on the analysis directed to be completed as part of this plan, the Participants have concluded that it is appropriate to limit CAT submissions related to allocations in Primary Market Transactions to sub-account allocations, as described below.

Specifically, based on comments received by the Participants on this and other topics related to the consolidated audit trail,[149] the Participants believe that information related to sub-account allocations – the allocation of shares in a primary market offering to the accounts that ultimately will own them – currently is maintained by broker-dealers in a manner that would allow for reporting to the Central Repository without unreasonable costs and could assist the Commission and the Participants in their regulatory obligations, including a variety of rulemaking and policy decisions. By contrast, the reporting of so-called "top account" information in Primary Market Transactions to the Central Repository would involve significantly more costs which, when balanced against the marginal benefit, is not justified at this time. These issues are discussed further below.

As a preliminary matter, the analysis required pursuant to this section is limited to Primary Market Transactions in NMS Securities that involve allocations. As the Commission has noted, "'a primary market transaction is any transaction other than a secondary market transaction and refers to any transaction where a person purchases securities in an offering.'"[150] The Participants understand that Primary Market Transactions generally involve two phases that implicate the allocation of shares. The "book building" phase involves the process "by which underwriters gather and assess investor demand for an offering of securities and seek information

[147] All observations and costs as provided in this section include secondary offerings.
[148] SEC Rule 613(a)(1)(vi).
[149] Questions for Public Comment re the CAT NMS Plan (Apr. 22, 2013), *available at* http://catnmsplan.com/web/groups/catnms/@catnms/documents/appsupportdocs/p246652.pdf ("April Request for Comment").
[150] Adopting Release at 45792 n.792.

important to their determination as to the size and pricing of an issue."[151] This process may involve road shows to market an offering to potential investors, typically institutional investors, including the discussion of the prospective issuer, and its management and prospects. The book building phase also involves efforts by the underwriter to ascertain indications of interest in purchasing quantities of the underwritten securities at varying prices from potential investors.[152] Using this and other information, the underwriter will then decide how to allocate IPO shares to purchasers. The Participants understand that these are so-called "top account" allocations – allocations to institutional clients or retail broker-dealers, and that such allocations are conditional and may fluctuate until the offering syndicate terminates. Sub-account allocations occur subsequently, and are made by top account institutions and broker-dealers prior to settlement. Sub-account allocations represent the allocation of IPO shares to the actual account receiving the shares and are based on an allocation process that is similar to secondary market transactions.[153]

**(a) Feasibility**

In the April 2013 Request for Comment, the Participants requested information on how firms handle Primary Market Transactions. In response to the request, FIF, SIFMA and Thomson Reuters submitted comments explaining current industry practice with respect to Primary Market Transactions.[154] Both SIFMA and FIF noted that broker-dealers generally maintain top account allocation information in book building systems that are separate from their systems for secondary market transactions and that differ across the industry, including the use of applications provided by third parties, in house systems and spreadsheets for small firms.[155] The Participants also understand that the investment banking divisions of broker-dealers typically use different compliance systems than those used for secondary market transactions.[156] The DAG also provided feedback[157] indicating that the impacted systems differ across the industry, given differing processes for Primary Market Transactions depending upon the structure of the deal, and that initial allocations are stored in book-building systems with varying levels of sophistication across the industry, including third-party systems, custom-built systems, and spreadsheets. The Participants thus believe that capturing indications of interest and other information about top account allocations in an accurate and consistent manner across the industry would be challenging.

By contrast, the Participants believe that it would be more feasible to gather information relating to sub-account allocations in Primary Market Transactions. The Participants understand

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[151] *See generally*, Securities Act Release No. 8565, 70 Fed. Reg. 19672 (Apr. 13, 2005) (Commission guidance regarding prohibited conduct in connection with IPO allocations) ("IPO Allocation Release").
[152] *Id*.
[153] *See* FIF Letter at 4.
[154] *See* FIF Letter; SIFMA Letter; Thomson Reuters (May 21, 2013) ("Thomson Reuters Letter"), *available at* http://catnmsplan.com/industryFeedback/; *see also* Thomson Reuters Letter, http://catnmsplan.com/industryFeedback/P284396 (systems used for primary market allocations differ from those used for secondary market transactions).
[155] FIF Letter at 4; SIFMA Letter at 3
[156] FIF Letter at 4. The Participants also understand that top account allocation systems do not generally have execution reporting capacity, since reporting of primary market transactions is not currently required under OATS and other transaction reporting systems. SIFMA Letter at 2.
[157] *See* DAG Cost Estimate for Adding Primary Market Transactions into CAT (Feb. 17, 2015), *available at* http://catnmsplan.com/industryFeedback/P602480.

that sub-account allocations are received in a manner and level of detail similar to allocations in secondary market transactions,[158] and that the same middle and back office systems that are used for the processing of sub-account allocations for secondary market transactions generally are also used for the sub-account allocations for Primary Market Transactions.[159] Similarly, sub-account allocations for Primary Market Transactions generally are maintained in an electronic format that could be converted into a reportable format acceptable for the CAT System. Therefore, these systems could more easily report information about sub-account allocations to the Central Repository than systems containing information regarding top-account allocations.

**(b) Benefits**

As the Commission notes, data about the final allocations of NMS Securities in Primary Market Transactions could improve compliance monitoring and market analyses by the Commission and the Participants, which, in turn, could help inform rulemaking and other policy decisions.[160] For example, such data could enhance the Commission's understanding of the role of the allocations in the capital formation process, when and how investors receiving allocations sell their Eligible Securities and how allocations differ among broker-dealers.[161] Such data also could assist the Commission and Participants in conducting their respective examinations and investigations related to Primary Market Transactions.[162]

The Participants believe that most of these potential benefits could be achieved through the gathering of information relating to sub-account allocations rather than top account information. For example, sub-account allocation information would aid the Commission and the Participants in gaining a better understanding of how shares allocated in Primary Market Transactions are sold in the secondary market, or how allocations differ across broker-dealers. By contrast, because top account information of conditional and interim allocations for NMS Securities fluctuates throughout the syndicate process and may vary significantly among firms, the marginal benefits of such information over final sub-account allocations are much less clear.

**(c) Costs**

The cost of reporting Primary Market Transaction information will depend on the scope of allocation information subject to the rule, as well as the related technology upgrades that would be necessary to report such information to the Central Repository. Based on the response of commenters, the Participants believe that reporting top account information about conditional allocations to the Central Repository would require significant technology enhancements. As noted above, current market practices capture top account allocations using systems and data sources that are different and separate from those used in secondary market transactions. Commenters also noted that there may be significant variability among underwriters in terms of the systems and applications used to gather such data.

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[158] FIF Letter at 4.
[159] For example, commenters noted that "firms generally use the same clearance and settlement systems for clearing and settling final allocations in primary market transactions as they do for clearing and settling secondary market trades." SIFMA Letter at 4.
[160] Adopting Release at 45792-93.
[161] *Id*.
[162] *Id*.

The DAG provided cost estimates associated with the reporting of Primary Market Transactions.[163] These estimates indicated that to report both initial and sub-account allocations would cost the industry as a whole at least $234.8 million[164] and require approximately 36 person-months per firm to implement. The DAG's estimate to report sub-account allocations only was approximately $58.7 million[165] for the industry and would require approximately 12 person-months per firm to implement. The DAG commented that given the higher costs associated with reporting initial allocations, if Primary Market Transactions are required to be reported to the Central Repository, that only reporting final sub-account allocations be required.

Based upon this analysis, the Participants are supportive of considering the reporting of Primary Market Transactions, but only at the sub-account level, and will incorporate analysis of this requirement, including how and when to implement such a requirement, into their document outlining how additional Eligible Securities could be reported to the Central Repository, in accordance with SEC Rule 613(i) and Section 6.11 of the Plan.

**B. ANALYSIS OF THE CAT NMS PLAN.** These considerations are intended to help inform the Commission about the cost for development, implementation and maintenance of the CAT and to help determine if such plan is in the public interest.

### 7. Analysis of Expected Benefits and Estimated Costs for Creating, Implementing, and Maintaining the Consolidated Audit Trail (SEC Rule 613(a)(1)(vii))

The analysis of expected benefits and estimated costs presented here is informed by the Commission's public guidance on conducting economic analysis in conjunction with SEC rulemaking.[166] The analysis begins with a statement of the need for regulatory action, describes the sources of information used in the analysis, and provides a description of the economic baseline used to evaluate the impacts associated with the CAT NMS Plan. The analysis then provides estimates of the costs to build, implement, and maintain the CAT, as contemplated, and ends with a description of the alternatives considered.

#### (a) Need for Regulatory Action

SEC Rule 613 further requires the Participants to consider and discuss in the CAT NMS Plan detailed estimated costs for creating, implementing, and maintaining the CAT as contemplated by the CAT NMS Plan. Specifically, SEC Rule 613 requires that the estimated costs should specify: (1) an estimate of the costs to the Participants in establishing and

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[163] *See supra* note 157.

[164] Based upon an assumption of 12 person-months of business analysis, an implementation timeline of 3x the business analysis timeline, 21.741 person-days per month, a $1,200 daily FTE rate, and a multiplier of 250 to reflect the costs of the 250 largest reporting firms. 12 person-months of analysis * 3 * 21.741 person-days per month * $1,200 daily FTE rate = $939,211 * 250 = $234.8 million.

[165] Based upon an assumption of 3 person-months of business analysis, an implementation timeline of 3x the business analysis timeline, 21.741 person-days per month, a $1,200 daily FTE rate, and a multiplier of 250 to reflect the costs of the 250 largest reporting firms. 3 person-months of analysis * 3 * 21.741 person-days per months * $1,200 daily FTE rate = $234,802 * 250 = $58.7 million.

[166] *See*, *e.g.*, Memorandum to File Re: Current Guidance on Economic Analysis in SEC Rulemakings (Mar. 16, 2012), *available at* http://www.sec.gov/divisions/riskfin/rsfi_guidance_econ_analy_secrulemaking.pdf (outlining foundational elements of regulatory economic analysis).

maintaining the Central Repository; (2) an estimate of the costs to broker-dealers, initially and on an ongoing basis, for reporting the data required by the CAT NMS Plan; (3) an estimate of the costs to the Participants, initially and on an ongoing basis, for reporting the data required by the CAT NMS Plan; and (4) the Participants' proposal to fund the creation, implementation, and maintenance of the CAT, including the proposed allocation of such estimated costs among the Participants and broker-dealers. Set forth below is a discussion of cost estimates, including the studies undertaken to obtain relevant data, as well as the proposed funding model.

**(b) Economic Analysis**

(i) Sources of Cost Information

Participants relied on two primary sources of information to estimate current audit trail costs (i.e., costs associated with the economic baseline), the costs incurred to meet the requirements of SEC Rule 613 for both the Participants and other CAT Reporters and the costs associated with the creation, implementation and maintenance of the CAT. First, to assess the costs associated with Participant and CAT Reporter obligations, Participants solicited study responses from Participants, broker-dealers and third party vendors. These three constituencies are the primary parties with direct costs arising from SEC Rule 613, as discussed further below. Second, to assess the costs associated with creating, implementing and maintaining the CAT, this analysis relies on estimated costs submitted by the Bidders as part of the bidding process.

(A) Studies

(1) Costs to Participants Study

The first study undertaken collected information from the Participants about current audit trail reporting costs under the existing regulatory reporting framework and the potential costs of reporting to the Central Repository (the "Costs to Participants Study"). Respondents were asked to estimate separately hardware, FTE staffing costs, and third party provider costs, where applicable. The study also requested information about costs associated with retiring current regulatory systems that would be rendered redundant by the CAT.

The Costs to Participants Study was distributed to the 19 Participants on August 11, 2014. The initial due date for responses was August 25, 2014; however due to the complexity of the data collection effort, the due date for the study was extended to September 24, 2014. Discussions with respondents suggested that at least some of the costs were more appropriate to measure at the level of the group of Affiliated Participants that hold multiple licenses ("Affiliated Participants Group"). Based on this approach, study results are presented for four Participants holding a single exchange registration and FINRA, which also is a Participant but is a registered securities association, and another five Affiliated Participants Groups representing the remaining fourteen registered exchanges. Subsequent to the filing of the CAT NMS Plan, the Participants determined that additional detail about anticipated costs could be provided to enhance the data collected as part of the Costs to Participants Study and a second data collection was conducted.

(2) Costs to CAT Reporters Study

The study sent to broker-dealers (the "Costs to CAT Reporters Study") was distributed to 4,406 broker-dealers,[167] and requested estimates for current costs under the existing regulatory reporting framework as well as future costs for reporting to the Central Repository. Broker-dealer respondents were asked to estimate the future costs to report to the Central Repository under two separate scenarios.[168] Approach 1 described a scenario in which broker-dealers would submit data to the Central Repository using their choice of existing industry messaging protocols, such as the FIX protocol. Approach 2 provided a scenario in which broker-dealers would submit data to the Central Repository using a defined or specified format, such as an augmented version of OATS. For each approach, respondents were asked to estimate separately hardware, FTE staffing costs, and third party provider costs, where applicable. Finally, broker-dealers were requested to provide the cost of retirement of existing systems to be replaced by the CAT.

The development of the Costs to CAT Reporters Study took place over two months, starting in May 2014, and included detailed discussions with the DAG. The Participants developed an initial outline of questions based on the requirements in SEC Rule 613, as well as a detailed assumptions document. To make the Costs to CAT Reporters Study effective and informative, the Participants spent two months formulating the Costs to CAT Reporters Study with detailed input from the DAG. The initial draft of the Costs to CAT Reporters Study was presented to the DAG in May 2014, and was discussed in two additional meetings with the DAG until mid-June 2014. In addition, on June 4, 2014, the Participants received and subsequently incorporated detailed written feedback from DAG members on the Costs to CAT Reporters Study and associated assumptions document.[169]

The study link was sent on June 23, 2014, to the compliance contact at each recipient CAT Reporter identified by the applicable designated examining authority or designated options examining authority to receive regulatory update and information requests. The initial due date for the study was August 6, 2014. On June 25, 2014 and July 9, 2014, the Participants hosted a webinar[170] to review the materials associated with the Costs to CAT Reporters Study, and to answer any questions from the CAT Reporters. On July 17, 2014, July 30, 2014, and August 4, 2014, reminders were sent to the CAT Reporters to submit their final responses to the Costs to CAT Reporters Study by August 6, 2014. In addition, the Participants requested that industry associations that are part of the DAG encourage their members to respond to the Costs to CAT Reporters Study.

[167] A unique study link was distributed to 4,406 broker-dealers. For 381 of the broker-dealers, the distribution email either was undeliverable or the broker-dealer responded that the study did not apply to them.
[168] *See* SEC Rule 613 – Consolidated Audit Trail (CAT) Cost Study Overview and Assumptions, *available at* http://catnmsplan.com/web/groups/catnms/@catnms/documents/appsupportdocs/p535485.pdf.
[169] *See* Past Events and Announcements, SROs Launch Study to Analyze Implementation Cost of the Consolidated Audit Trail (last updated Dec. 10, 2014), *available at* http://catnmsplan.com/PastEvents/.
[170] *See* SEC Rule 613: Consolidated Audit Trail (CAT), SRO Hosted Consolidated Audit Trail Cost Study Webinar (July 9, 2014), *available at* http://catnmsplan.com/PastEvents/P551992.

On August 6, 2014, the first extension was granted for the Costs to CAT Reporters Study, extending the due date to August 20, 2014. On August 20, 2014, an additional extension was granted, extending the due date to September 3, 2014.

During the process of collecting responses to the Costs to CAT Reporters Study, CAT Reporters were informed that all responses were captured on an anonymous basis and would only be reported to the Participants in an aggregated, anonymous format. The third party facilitator of the Costs to CAT Reporters Study reviewed all responses received through the study portal. Study respondents had the option of identifying their firm should additional follow-up be required; any such follow-up was undertaken by the third-party facilitator, as necessary, to enhance the overall quality of responses received.

The Participants received 422 responses. Of those responses, 180 were deemed to be materially incomplete[171] and, thus, they were considered effectively nonresponsive. An additional 75 responses were determined to be clearly erroneous; for example the responses had repeating values that could not be used in analysis, or the magnitude of reported FTEs or other costs was so high as to be considered an outlier[172]. As a result, the Participants excluded these incomplete and clearly erroneous responses from the data set, resulting in a population of 167 responses that was used for purposes of conducting the cost analysis described herein.

(3) Costs to Vendors Study

A study requested information from various service providers and vendors about the potential costs of reporting to the Central Repository (the "Costs to Vendors Study"). The Participants developed the content of the Costs to Vendors Study, based on the structure and content of the Costs to CAT Reporters Study. The distribution list for the Costs to Vendors Study was provided by the DAG, and was distributed to 13 service bureaus and technology vendors on August 13, 2014. The initial due date for responses was September 1, 2014; however, due to the complexity of the data collection effort, the due date for the study was extended to September 12, 2014. The Participants received five completed responses to the Costs to Vendors Study.

(B) Bidder Estimates

To estimate the costs to Participants for creating, implementing and maintaining the CAT, Bidders were asked to provide in their Bid documents total one-year and annual recurring cost estimates. As part of the RFP process, the Bidders were asked to provide a schedule of the anticipated total cost of creating, implementing and maintaining the CAT. As noted above in the Background Section of Appendix C, any one of the six Shortlisted Bidders could be selected as the Plan Processor and each Shortlisted Bidder[173] has proposed different approaches to various issues. The Bidder selected as the Plan Processor must meet the specific requirements set forth in the Plan and Appendix D and may be given the opportunity to revise its Bid prior to the final

[171] Materially incomplete responses were those that provided responses for less than half of the cost-related questions.
[172] Responses were outliers if their values were two times greater than the next highest value.
[173] Section 5.2(b) of the CAT NMS Plan describes how the Participants selected the Shortlisted Bidders.

selection of a Plan Processor. Accordingly, the Participants anticipate that the cost estimates to create, implement and maintain the CAT may differ from what is set forth below.[174]

In its final rule for the Consolidated Audit Trail, the Commission amended its proposal to include enhanced security and privacy requirements. Specifically, SEC Rule 613(e)(4) requires the NMS Plan to include policies and procedures, including standards, to be used by the Plan Processor to ensure the security and confidentiality of all information reported to the Central Repository. Participants did not ask Bidders to separately assess the costs associated with the enhanced security requirements in SEC Rule 613; rather these costs were embedded in the Bids as a component of the total costs.

The RFP requested that Bidders provide an estimate of the total one-time cost to build the CAT, including technological, operational, administrative, and any other material costs. The six Shortlisted Bidders provided estimates ranging from a low of $30,000,000 to a high of $91,600,000, with an average one-time cost of $53,000,000.[175]

The RFP also requested that Bidders provide an estimate of annual recurring operating and maintenance costs for the five year period following the selection of the Plan Processor, and an estimate of the annual peak year costs (i.e., cost for the year during which it will cost the most to operate the CAT). The six Shortlisted Bidders provided estimates ranging from a low of $135,000,000 to a high of $465,100,000 over the course of the first five years of operation, with an average five-year cost of $255,600,000 and an average annual cost of $51,100,000. Estimates of peak year recurring costs range from a low of $27,000,000 to a high of $109,800,000, with an average of $59,400,000. The table presented below reports the low, median, average, and maximum expected costs for the build, maintenance, and peak year maintenance of the Central Repository arising from the Shortlisted Bids. These figures are subject to change as Bidders may update their cost estimates.

| **Bidder Estimates Summary** | | | | |
|---|---|---|---|---|
| | **Minimum** | **Median** | **Mean** | **Maximum** |
| **Build Costs (One-time)** | $30,000,000 | $46,100,000 | $53,000,000 | $91,600,000 |
| **Maintenance Costs (Annual)** | $27,000,000 | $42,200,000 | $51,100,000 | $93,000,000 |
| **Maintenance Costs (5 year)** | $135,000,000 | $211,200,000 | $255,600,000 | $465,100,000 |
| **Peak Year Maintenance** | $27,000,000 | $52,400,000 | $59,400,000 | $109,800,000 |

[174] More specifically, Participants anticipate that technology costs and technological solutions may evolve over the bidding process and may affect the Bids. For instance, one Bidder recently provided an update to the Participants, noting "We expect continued cost reductions as Moore's Law is applied to cloud pricing and to have this bring down total cost to the industry on an ongoing basis." As another example, evolving technologies for data security may either increase or decrease estimated costs.

[175] Due to the complexity of the cost estimation effort, all figures provided in this analysis section have been rounded to a reasonable degree of accuracy and should be considered approximate.

The Participants note, however, that there may be a relation between the initial construction costs and maintenance costs based on technological choices, among other factors. To better compare estimates, the Participants are providing a range based on the reported combined build and annual recurring costs for the five year period following Plan Processor selection, discounted by a factor of 2%.[176] Estimates of total costs range from $159,800,000 to $538,700,000.

Participants sought insight into the economic drivers of the cost estimates from the Shortlisted Bidders. Specifically, Participants asked each Shortlisted Bidder to identify the factors, such as the amount of message traffic, complexity of order life cycles, number and complexity of Participant and Commission data requests and administration and support costs that were material to its Bid. Bidders identified the following as primary drivers of their Bid costs: (1) reportable volumes of data ingested into the Central Repository; (2) number of technical environments that would be have to be built to report to the Central Repository; (3) likely future rate of increase of reportable volumes; (4) data archival requirements; and (5) user support and/or help desk resource requirements.[177]

(ii) Economic Baseline

In publishing SEC Rule 613, the Commission stated that it "believes that the regulatory infrastructure on which the Participants and the Commission currently must rely generally is outdated and inadequate to effectively oversee a complex, dispersed, and highly automated national market system."[178] The purpose of the CAT NMS Plan is to develop, build and maintain a system that provides an infrastructure to appropriately monitor, surveil and oversee the national market system in its current state and provide sufficient flexibility to reasonably adjust for future financial market innovations.

Such a system will necessarily impact the Commission, Participants, potential future Participant entrants, broker-dealers and other market participants, issuers and investors. Each party may derive costs, benefits and other economic impacts, depending upon plan implementation, the relevant economic activities of each entity and the allocation of costs and responsibilities across those entities. These estimated costs, benefits, and other economic impacts must be assessed against the current economic baseline, capturing the existing state of regulatory audit trail activity in the markets. The economic baseline for different affected parties is described in greater detail below.

(A) Description of Current Audit Trail Reporting

Currently, separate audit trails exist within each exchange in addition to the audit trail requirements for FINRA members to report to OATS.[179] For equities, all broker-dealers that are

[176] The discount factor represents an estimate of the average yield on AAA-rated corporate debt for the month period August 28, 2014 to September 27, 2014. Costs anticipated to be accrued after the first year (years 2 through 5) are discounted back to the first year to permit Participants to compare the anticipated costs associated with different Bids on a constant dollar basis.
[177] Bidders indicated that user support costs primarily consisted of FTE costs.
[178] Adopting Release at 45723.
[179] *See* FINRA Rule 7410 *et seq.*

members of FINRA must report their orders in NMS Stocks and OTC Equity Securities, including executions or cancellations, to OATS. Accordingly, for FINRA members, it is possible to match OATS reports to related exchange audit trail entries, provided that the related exchange has a regulatory services agreement with FINRA such that FINRA has access to the exchange data. Broker-dealers that are not FINRA members do not have a regular equity audit trail reporting requirement, although NYSE and NASDAQ member proprietary firms that are not FINRA members have an obligation to record OATS data and report to FINRA upon request. Additionally, each exchange creates its own audit trail for each order received that it receives and processes.

For options, the options exchanges utilize the Consolidated Options Audit Trail System ("COATS") to obtain and review information on options transactions. COATS data includes trades, the National Best Bid and National Best Offer at the time of the trade and clearing information for customers at the clearing firm level. It also identifies clearing firm proprietary trading and individual marker maker transactions if they are reported correctly at the time of the trade. However, COATS does not include adjustment data from the Options Clearing Corporation; these adjustments include changes to either the account type or size of the position. Additionally, order information is only available to the Commission upon request from the options exchanges. Currently reports need to be constructed based on order information received from the various options exchanges. As previously noted, only the National Best Bid and National Best Offer at the time of the trade is included in the COATS data; however, this is optional data that the exchanges may or may not provide. The options exchanges utilize their independent quote information to build their reports.

In sum, each equities and options exchange is built on its own unique platform, utilizes unique entry protocols and requirements and thus creates uniquely formatted audit trails.

The existence of multiple non-integrated audit trails has direct consequences on the accuracy and efficiency of regulatory oversight. The Commission has stated that:

> …there are shortcomings in the completeness, accuracy, accessibility, and timeliness of these existing audit trail systems. Some of these shortcomings are a result of the disparate nature of the systems, which make it impractical, for example, to follow orders through their entire lifecycle as they may be routed, aggregated, re-routed, and disaggregated across multiple markets. The lack of key information in the audit trails that would be useful for regulatory oversight, such as the identity of the customers who originate orders, or even the fact that two sets of orders may have been originated by the same customer, is another shortcoming.[180]

In addition, the Intermarket Surveillance Group's ("ISG") consolidated equity audit trail combines transaction data from all exchanges and is used by all Participants for surveillance

[180] Adopting Release at 45722.

purposes. However, the ISG audit trail is limited because it contains clearing member and executing broker's CRD numbers, but does not contain information about the beneficial owner to a trade. It also does not contain order detail information such as a complete order entry time or routing history.

COATS and the ISG equity audit trails are utilized to generate various option cross market/cross product exception reports, such as front-running and anticipatory hedges. Since the current data is unable to drill down to beneficial owner or order information, these reports are less effective and produce a large number of false positives.

(B) Costs, Benefits, and Other Economic Impacts of Audit Trail Reporting on Regulators and Market Participants

(1) Participants

There are 19 Participants of varying sizes that have established audit trail reporting requirements for NMS Securities. Of these, one is a registered securities association. The other 18 Participants are exchanges. Fourteen of these exchanges permit quotation and transactions in NMS Securities and 12 permit transactions and quotations in Listed Options.

Participants expend resources currently to maintain and update their audit trail reporting systems. Costs for current surveillance programs as indicated by Participants responding to the Costs to Participants Study vary significantly, reflecting the various sizes of Participants: total annual costs associated with meeting current regulatory requirements are estimated to be $6,900,000. Total annual costs for current surveillance programs for all Participants are $147,200,000.

(2) Broker-Dealers

Broker-dealers benefit from the current regime of audit trail reporting to the extent that reporting today permits the Commission and Participants to monitor for rule compliance. Effective regulatory and compliance oversight ensures increased market integrity and supports investor confidence in participating in financial markets. Conversely, if investors believe that regulators are unable to adequately and effectively monitor activities in a complex market (through current audit trail reporting), broker-dealers bear some of the cost in the form of lower market activity.

Broker-dealers that are FINRA members must have systems and processes in place to provide FINRA with the reportable data in the required format. These systems also require resources to ensure that data quality and consistency and timeliness of reporting are maintained, and record-keeping obligations are fulfilled.[181] Additionally, firm trading and order routing systems send orders and quotations to each exchange in the format required by such exchange. In turn, each exchange must store and convert the data for the purposes of creating internal exchange audit trails. Broker-dealers also commit staff to respond to Participant and Commission requests for additional data and related information based upon surveillance.

[181] *See, e.g.,* SEC Rules 17a-3, 17a-4; FINRA Rules 4511-13.

Broker-dealers may take varied approaches to fulfilling their regulatory reporting obligations. For instance, many broker-dealers develop internal systems for the purpose of compiling order and trading data into a reportable format. In these instances, the firms may need to centralize varied and disparate systems. Other broker-dealers typically use third parties to help them comply with their reporting obligations. These third parties may include service bureaus that provide the firms with order management systems. Firms may also contract with their clearing firms to package and submit order data files on their behalf.

Some broker-dealers that are FINRA members may be exempt from OATS reporting, or are excluded under FINRA rules from OATS requirements. Exempt firms go through a formal exemption request process through which they certify that they meet the exemption criteria which includes: (1) the member firm has total annual revenue of less than $2,000,000; (2) the member firm and current control affiliates and associated persons of the member have not been subject within the last five years to any final disciplinary action, and within the last 10 years to any disciplinary action involving fraud; (3) the member does not conduct any clearing or carrying activities for other firms; (4) the member does not conduct any market making activities in NMS Stocks and OTC Equity Securities; and (5) the member does not execute principal transactions with its customers.[182] FINRA also excludes some members from the definition of a reporting member. The criteria to receive this exclusion include: (1) the member must engage in a non-discretionary order routing process where the firm immediately routes all of its orders to a single receiving reporting member; (2) the member cannot direct or maintain control over subsequent routing or execution by the receiving reporting member; (3) the receiving reporting member must record and report all information under applicable FINRA rules; and (4) the member must have a written agreement with the receiving reporting member specifying the respective functions and responsibilities of each party.[183] Approximately 660 broker-dealers are either exempt or excluded from OATS requirements, but will be required to report to the Central Repository. These broker-dealers are included in the estimate of broker-dealers currently quoting or executing trades in NMS Securities and/or Listed Options.

Additionally, the OATS rules do not require that proprietary orders generated in the normal course of market-making be reported.[184] While some firms have chosen to voluntarily report such orders, there may be current gaps in the audit trail.

Broker-dealers that are members of other Participants must also have systems and processes in place to provide the necessary reportable data in the required format. These systems also require resources to ensure data quality and consistency, timeliness of reporting, and record-keeping obligations.[185] Broker-dealers that are members of more than one Participant must maintain and manage systems that provide the relevant audit trail data to each Participant for which they have an obligation to report such data, in the manner and by the rules proscribed by each Participant, as applicable.

Upon request, broker-dealers must submit Electronic Blue Sheet ("EBS") data to the requesting Participant by the specified due date, which is generally ten business days after

[182] *See* FINRA Rule 7470.
[183] *See* FINRA Rule 7410(o).
[184] *See* FINRA Rule 7410(j).
[185] *See, e.g.,* SEC Rules 17a-3, 17a-4; FINRA Rules 4511-13.

receipt of the initial request. An EBS request is made by product and trade date range, with the data providing detailed information about the underlying accounts that transacted in the requested security. EBS requests can only be made for settled transactions in equity, option, or fixed income products, and they include information on allocations and executions of the requested product and may cover a time period of up to seven years from the date requested. Large Trader Reports are similar to EBS reports, except they are requested only by the Commission. Large trader requests may only be requested for NMS Securities, which may include unsettled transactions. In addition to requests being made by security and trade date range, a Large Trader request may be made by a LTID and trade date range. An LTID is an SEC identifier used to identify related entities under the same beneficial ownership structure. Broker-dealers must have systems and processes in place to provide EBS or large trader reportable data in the required format. These systems require resources to ensure that the data quality and timeliness of reporting are maintained, and record-keeping obligations are met. As with OATS, broker-dealers must commit staff to respond to requests for EBS or large trader data and may take varied approaches to fulfilling their regulatory reporting obligations.

PHLX Rule 1022 initially required members to submit specified data to PHLX for all accounts, however this rule was amended in May 2014 to more closely mirror NYSE Rule 757, ARCA Rule 6.39, and CBOE Rule 8.9, and to only require broker-dealers to report data for all of the accounts for which they engage in trading activities or which they exercise investment discretion upon request, rather than on a continuing basis. PHLX Rule 1022 was in place prior to the existence of the compliance data files from ISG (COATS and ECAT) and OCC (position). The remaining requirement for members to provide data upon request is to enable a review if required for regulatory purposes. PHLX Rule 1022 is anticipated to be retired once all CAT Reporters are submitting data to the CAT as the information would be obtainable from CAT, rather than from Industry Members.

CBOE Rule 8.9(b) requires clearing firms to submit, on a daily basis and in a manner prescribed by CBOE, every executed order entered by market makers for securities underlying options traded on CBOE or convertible into such securities or for securities traded on CBOE, as well as for opening and closing positions in all such securities held in each market maker account. To the extent that clearing firms do not report such orders and information, the market maker who entered the order is responsible for reporting the order information. These data files are commonly known as Market Maker Equity Trade (MMET) and Market Maker Stock Position (MMSTK) files. The CBOE daily reporting requirement for market makers is comparable to other option exchange reporting requirements. CBOE Rule 8.9(b) is anticipated to be amended once all CAT Reporters are submitting data to the CAT as the information would be obtainable from CAT rather than from Industry Members.

As of June 30, 2014, there were 4,406 registered broker-dealers that were members of at least one Participant. The Participants determined that, as of July 31, 2014, approximately 1,800 of these registered broker-dealers quoted or executed transactions in NMS Securities, Listed Options or OTC Equity Securities. Of these 1,800 broker-dealers, approximately 1,700 are FINRA members and are either reporting to OATS or were identified as routing firms in OATS reports submitted by other OATS reporting broker-dealers, but are otherwise excluded from the definition of an OATS reporting member or exempt from the OATS rules. In addition, there are

an estimated 100 broker-dealers that reported transactions to another SRO, but that are not FINRA members. This determination was made through a review of the number of broker-dealers that transmitted order information to OATS, reported transaction information or quoted messages to a Participant for each month, over the previous 18 months. The Participants also reviewed message traffic data in the same month in the prior year and found that July 2014 was a reasonable representation of such activity.

Cost components considered in this process included technology costs (hardware / software costs), FTE costs (including, technology, operational, and compliance staffing requirements), and any outsourcing costs.[186] The study also contained questions related to current costs that are intended to capture the baseline costs to broker-dealers for regulatory reporting, including costs related to compliance with OATS, the EBS and Large Trader reporting, and other reporting requirements, such as NYSE Rule 410B, PHLX Rule 1022, FESC/NYSE Rule123(e)/(f), and CBOE Rule 8.9.

(C) Description of Costs to CAT Reporters Study Results

Of the 167 responses to the Costs to CAT Reporters Study used in the analysis of costs associated with reporting to the Central Repository, 49 were from large firms and 118 were from small firms.[187] Fifty-one respondents indicated that they have OATS reporting obligations and 116 respondents[188] stated that they do not currently have OATS reporting obligations.[189] Of these 51 OATS reporters, 21 were large and 30 were small broker-dealers, with one firm completing all reporting using in-house staffing, 26% using a combination of in-house staffing and outsourcing, 44% of firms outsourcing to clearing firms, and the remaining 26% outsourcing their reporting to service bureaus. Of the remaining 116 broker-dealers, self-identified as non-OATS reporters,[190] 28 were large and 88 were small. Figures for each respondent category have

[186] These costs are not mutually exclusive, and respondents may have included a combination of costs across all categories.

[187] Firms were requested to self-select as "small" if they would qualify under Exchange Act Rule 0-10(c) as a broker or dealer that:

(1) had total capital (net worth plus subordinated liabilities) of less than $500,000 on the date in the prior fiscal year as of which its audited financial statements were prepared pursuant to 240.17a5(d) or, if not required to file such statements, a broker or dealer that had total capital (net worth plus subordinated liabilities) of less than $500,000 on the last business day of the preceding fiscal year (or in the time that it has been in business, if shorter); and

(2) is not affiliated with any Person (other than a natural Person) that is not a small business or small organization as defined in this section.

[188] Participants recognize that 116 respondents stated that they do not currently report to OATS and this number is greater than the Participants' estimate of the total number of broker-dealers with reporting obligations to SROs other than FINRA. Participants assume that some broker-dealers who are FINRA members and currently exempt or excluded from OATS reporting requirements identified themselves as having no OATS reporting requirement. Given that these study responses provided data that could not otherwise be presumed to be incomplete or inaccurate, the Participants have chosen to include these responses in the analysis.

[189] The distinction between cost estimates for OATS and non-OATS reporters is being made so that Participants may assess potential differences in estimated costs across the two identified scenarios in order to capture potential differences in costs that might arise from current reporting practices.

[190] The distinction between cost estimates for OATS and non-OATS reporters is made so that Plan Participants may assess potential differences in estimated costs across the two identified scenarios in order to capture potential differences in costs that may arise from current reporting practices.

been provided for reference to support the cost analysis and include the average, median, minimum, maximum, and number of responses received equal to zero (0) or blank.[191]

In analyzing responses to the Costs to CAT Reporters Study, Participants found responses to specific questions to be outliers. However, if the overall response from that respondent was otherwise deemed to be reasonably complete, the response was included in the analysis. As a result, in some cases, this may result in averages or medians being higher or lower than may be expected. In addition, a significant number of firms, in particular large firms, indicated that their current cost for regulatory obligations is $0. It is the Participants' understanding that this is likely due to current operational practices among broker-dealers that do not differentiate between technology and headcount costs that support business functionality and regulatory reporting.

Tables 1 and 2 describe the costs associated with current regulatory reporting requirements. Current costs for study respondents consisted of hardware / software costs, FTE costs consisting of development / maintenance, operational, and compliance staffing as well as third party outsourcing costs. Current average (median) hardware / software costs for the 49 large firms were equal to $310,000 ($0) and the 118 small firms were equal to $130,000 ($0).

Large firms reported that they employ an average (median) of 9.56 (0.00) FTEs for OATS, EBS and other regulatory reporting requirements, while small firms employed 2.36 (0.00) FTEs for the same reporting requirements. Participants estimate the dollar costs associated with these FTEs by applying an annual expenditure of $401,440 per FTE[192] to determine cost. The resulting average (median) FTE costs were equal to $3,800,000 ($0) for the 49 large firms and $950,000 ($0) for the 118 small firms.

Third party / outsourcing costs were also varied by firm size. Average (median) third party / outsourcing costs for large firms was $180,000 ($0) and $130,000 ($0) for small firms.[193]

Based on the costs associated with current regulatory reporting requirements, large firms provided an average cost of $4,290,000, and small firms reported an average cost of $1,210,000 for current reporting costs, with a median estimate of $0 for both large and small firms.

[191] Some respondents provided no response to a specific question, i.e., left that response blank, while providing responses to the other questions in the study. The tables provided throughout this section provide a count of such blank responses for each question.

[192] Participants assume an annual cost per FTE of $401,440, consistent with the rate applied by the Commission in the Adopting Release. Participants do note, however, that as part of the Costs to CAT Reporters Study, respondents were solicited to provide a cost for FTEs. Based on responses, the estimated annual cost per FTE would be $210,000 for large firms and $167,000 for small firms. Applying these estimates instead of the Commission's assumed annual cost would lead to dollar costs for FTEs on the order of half as large as reported here.

[193] One anonymous small firm in the sample reported a total current regulatory reporting cost of $14 million. The Participants are not in a position to verify this number or determine whether it is due to an erroneous response (e.g., the respondent may not have recognized that the study collected responses to the cost questions in $1,000 increments). Therefore, Participants believe median numbers might better represent the typical costs across large and small firms instead of reported averages.

| Table 1: Current Costs: Large Respondents Summary (49 Firms) | | | | |
|---|---|---|---|---|
| | **Hardware / Software** | **FTE Counts** | **FTE Costs** | **Third Party / Outsourcing** |
| **Average** | $310,000 | 9.56 | $3,800,000 | $180,000 |
| **Median** | $0 | 0.00 | $0 | $0 |
| **Minimum** | $0 | 0.00 | $0 | $0 |
| **Minimum (non-zero)** | $1,000 | 0.13 | $52,000 | $1,000 |
| **Maximum** | $6,000,000 | 190.00 | $76,300,000 | $6,000,000 |
| **Count of Zero Responses** | 31 | 25 | 25 | 36 |
| **Count of Blank Responses** | 0 | 0 | 0 | 0 |

| Table 2: Current Costs: Small Respondents Summary (118 Firms) | | | | |
|---|---|---|---|---|
| | **Hardware / Software** | **FTE Counts** | **FTE Costs** | **Third Party / Outsourcing** |
| **Average** | $130,000 | 2.36 | $950,000 | $130,000 |
| **Median** | $0 | 0.00 | $0 | $0 |
| **Minimum** | $0 | 0.00 | $0 | $0 |
| **Minimum (non-zero)** | $1,000 | 0.15 | $60,000 | $1,000 |
| **Maximum** | $14,000,000 | 68.00 | $27,300,000 | $6,500,000 |
| **Count of Zero Responses** | 96 | 89 | 89 | 93 |
| **Count of Blank Responses** | 0 | 0 | 0 | 0 |

Tables 3 to 6 describe the current regulatory costs for respondents who identified themselves as having OATS reporting obligations versus those that do not (referred to as non-OATS). For the 21 large OATS reporters, current hardware / software costs averaged $720,000, with a median cost of $10,000, while the 28 large non-OATS reporters reported an average hardware / software cost of $2,600, with a median cost of $0. For the 30 small OATS reporters, current hardware / software costs averaged $490,000, with a median value of $3,000, with the 88 small non-OATS reporters reporting an average hardware / software cost of $900 and a median cost of $0.

Large OATS reporters stated they required, on average, 17.88 FTEs, with a median value of 7.00 FTEs. Applying the FTE rate described above, this translates into an average FTE cost of $7,200,000, and a median value of $2,800,000. Large non-OATS reporters indicated an average FTE requirement of 3.32 and a median requirement of 0.00, translating into an average cost of $1,300,000 and a median cost of $0. On the other side of the spectrum, small OATS reporters stated they required, on average, 6.11 FTEs, with a median value of 3.50 FTEs. Applying the FTE rate described previously, this translates into an average FTE cost of $2,500,000, and a median value of $1,400,000. Small non-OATS reporters indicated average

FTE requirements of 1.08 and a median requirement of 0.00, translating into an average cost of $430,000 and median cost of $0.

Third party / outsourcing costs for Large OATS reporters averaged $400,000, with a median value of $0; large non-OATS reporters indicated average third party / outsourcing costs of $22,000, with a median value of $0. For small OATS reporters, third party / outsourcing costs averaged $510,000 with a median value of $3,000; small non-OATS reporters provided average costs of $2,900, with median costs of $0.

Based on the cost estimates above, large OATS reporters estimated an average (median) cost equal to $8,320,000 ($2,810,000) while large non-OATS respondents estimated an average (median) cost equal to $1,324,600 ($0). Small OATS reporters estimated an average (median) cost equal to $3,500,000 ($1,406,000) while small non-OATS respondents estimated an average (median) cost equal to $433,800 ($0).

| **Table 3: Current Costs: Large OATS Respondents Summary (21 Firms)** | | | | |
|---|---|---|---|---|
| | **Hardware / Software** | **FTE Counts** | **FTE Costs** | **Third Party / Outsourcing** |
| **Average** | $720,000 | 17.88 | $7,200,000 | $400,000 |
| **Median** | $10,000 | 7.00 | $2,800,000 | $0 |
| **Minimum** | $0 | 0.00 | $0 | $0 |
| **Minimum (non-zero)** | $1,000 | 0.13 | $52,000 | $1,000 |
| **Maximum** | $6,000,000 | 190.00 | $76,300,000 | $6,000,000 |
| **Count of Zero Responses** | 6 | 2 | 2 | 11 |
| **Count of Blank Responses** | 0 | 0 | 0 | 0 |

| **Table 4: Current Costs: Large Non-OATS Respondents Summary (28 Firms)** | | | | |
|---|---|---|---|---|
| | **Hardware / Software** | **FTE Counts** | **FTE Costs** | **Third Party / Outsourcing** |
| **Average** | $2,600 | 3.32 | $1,300,000 | $22,000 |
| **Median** | $0 | 0.00 | $0 | $0 |
| **Minimum** | $0 | 0.00 | $0 | $0 |
| **Minimum (non-zero)** | $5,000 | 1.00 | $400,000 | $60,000 |
| **Maximum** | $50,000 | 60.00 | $24,100,000 | $300,000 |
| **Count of Zero Responses** | 25 | 23 | 23 | 25 |
| **Count of Blank Responses** | 0 | 0 | 0 | 0 |

| Table 5: Current Costs: Small OATS Respondents Summary (30 Firms) | | | | |
|---|---|---|---|---|
| | **Hardware / Software** | **FTE Counts** | **FTE Costs** | **Third Party / Outsourcing** |
| **Average** | $490,000 | 6.11 | $2,500,000 | $510,000 |
| **Median** | $3,000 | 3.50 | $1,400,000 | $3,000 |
| **Minimum** | $0 | 0.00 | $0 | $0 |
| **Minimum (non-zero)** | $1,000 | 0.15 | $60,000 | $1,000 |
| **Maximum** | $14,000,000 | 29.00 | $11,600,000 | $6,500,000 |
| **Count of Zero Responses** | 11 | 6 | 6 | 8 |
| **Count of Blank Responses** | 0 | 0 | 0 | 0 |

| Table 6: Current Costs: Small Non-OATS Respondents Summary (88 Firms) | | | | |
|---|---|---|---|---|
| | **Hardware / Software** | **FTE Counts** | **FTE Costs** | **Third Party / Outsourcing** |
| **Average** | $900 | 1.08 | $430,000 | $2,900 |
| **Median** | $0 | 0.00 | $0 | $0 |
| **Minimum** | $0 | 0.00 | $0 | $0 |
| **Minimum (non-zero)** | $3,000 | 3.00 | $1,200,000 | $3,000 |
| **Maximum** | $72,000 | 68.00 | $27,300,000 | $220,000 |
| **Count of Zero Responses** | 85 | 83 | 83 | 85 |
| **Count of Blank Responses** | 0 | 0 | 0 | 0 |

To understand the current costs associated with regulatory reporting and estimate the direct costs associated with the CAT NMS Plan, the Participants also conducted the Costs to Vendors Study. CAT Reporters may currently rely on third-parties to provide key services necessary to meet the reporting obligations. Smaller broker-dealers may rely wholly or in part on third-party providers for the infrastructure to manage and maintain their electronic records, including all of the data required for audit trail reporting. Larger broker-dealers and Participants may augment their own internal IT capacity and capabilities by purchasing the services of one or more third-party vendor. As a result, it is important to understand the current reporting cost as well as the likely impact of SEC Rule 613 on these vendors and to include them in the estimate of aggregate economic impacts.

The Participants received five completed responses to the Costs to Vendors Study. One of the respondents indicated that the vendor did not currently have any reporting expenses on behalf of its clients and did not expect to face any costs under the CAT. Of the remaining responses, three respondents supported more than 100 clients, and one supported between 50 and 99 clients. Two of the respondents supported up to 25 million accounts, and two supported up to 50 million

accounts. Two of the respondents serviced clients with institutional and retail businesses, while the remaining two supported clients with institutional businesses only.

For equity order reporting, two respondents indicated that they process up to 1 million equity orders per day on behalf of their clients, and two respondents indicated that they process up to 2 million equity orders per day on behalf of their clients. For options order reporting, three respondents indicated that they report up to 1 million options orders per day on behalf of their clients, and one respondent indicated that it reports up to 2 million options orders per day on behalf of its clients. All four respondents indicated that they report between 3 million and 100 million OATS reportable order events[194] per day on behalf of their clients. Three of the four respondents submitted EBS reports for their clients, with two submitting up to 200 responses per month and one submitting up to 400 responses per month.

Reported costs for current regulatory reporting for vendors varied widely across both dollar costs and FTE requirements. Each respondent provided an FTE rate associated with their FTE requirements; therefore, FTE costs for the vendors are reported using rates provided by each respondent. Dollar costs for hardware and software ranged from $50,000 to $15,000,000, and FTE requirements (cost) ranged from 11 ($2,700,000) to 92 ($8,600,000). While the respondent with the largest number of clients reported the highest costs, costs did not always correlate uniformly with the number of clients for other firms.

(iii) Estimated Costs, Benefits, and Other Economic Impacts of the CAT NMS Plan on Affected Parties

As required by SEC Rule 613(a)(1)(vii), this section provides detailed estimated costs for creating, implementing, and maintaining the CAT, specifying (1) an estimate of the costs to Participants for establishing and maintaining the CAT; (2) an estimate of the costs to members of the Participants, initially and on an ongoing basis, for reporting the data required by the CAT NMS Plan; (3) an estimate of the costs to the Participants, initially and on an ongoing basis, for reporting the data required by the CAT NMS Plan; and (4) the Participants' proposal to fund the creation, implementation, and maintenance of the CAT, including the proposed allocation of such estimated costs among the Participants, and between the Participants and members of the Participants. The Participants are sensitive to the economic impacts of SEC Rule 613. Throughout the development of the CAT NMS Plan, the Participants have continued to focus on minimizing the costs associated with the CAT. The Participants note that the figures presented in this analysis are estimates based on research completed and currently available data and are inherently subject to uncertainties.

Through the RFP, review of proposals received, and interaction with industry, the Participants have identified the sources of the costs associated with the CAT NMS Plan. These include direct costs associated with creating, implementing and maintaining the CAT necessary to meet the requirements of the CAT NMS Plan. There are also direct costs associated with developing and adapting applicable CAT Reporter systems to meet the requirements of the CAT NMS Plan and comply with the Plan on an ongoing basis. Additionally, Participants and broker-

[194] *See* FINRA, OATS Frequently Asked Questions at D8 (last updated July 6, 1998), *available at* http://www.finra.org/Industry/Compliance/MarketTransparency/OATS/FAQ/P085541.

dealers may incur direct costs associated with the retirement of redundant reporting systems, although there may also be significant savings to broker-dealers associated with retiring those systems over time.

In order to meet the responsibilities outlined in SEC Rule 613, the Participants have accrued, and will continue to accrue, direct costs associated with the development of the CAT NMS Plan. These costs include staff time contributed by each Participant to, among other things, determine the technological requirements for the Central Repository, develop the RFP, evaluate Bids received, design and collect the data necessary to evaluate costs and other economic impacts, meet with Industry Members to solicit feedback, and complete the CAT NMS Plan submitted to the Commission for consideration. The Participants estimate that they have collectively contributed 20 FTEs in the first 30 months of the CAT NMS Plan development process. In addition, the Participants have incurred public relations, legal, and consulting costs in the preparation of the CAT NMS Plan. The Participants estimate the costs of these services to be $8,800,000. These public relations, legal, and consulting costs are considered reasonably associated with creating, implementing, and maintaining the CAT upon the Commission's adoption of the CAT NMS Plan.

Given the size and scope of the CAT initiative, estimating the costs of the creation, implementation and maintenance of the CAT is a complex task, and one that necessarily relies on input from parties not directly charged under SEC Rule 613 with the responsibility to create and file the CAT NMS Plan. In light of this, the Participants have used a multi-pronged approach to assess the potential costs of the CAT. Among other things, the Participants have evaluated the many cost-related comments received in response to the Commission's rule proposal for SEC Rule 613 and during the CAT NMS Plan development process. In addition, the Participants have considered cost analyses and considerations provided by Bidders as well as the views and related information provided by the DAG and written feedback from the SIFMA and the FIF.

The economic baseline against which the potential costs and benefits of the CAT must be compared are discussed above in Section B(7)(b)(ii). The potential impacts and estimated costs of the CAT are discussed separately below, presenting study results where applicable.

(A) Investors

Approximately 52% of Americans hold individual stocks, stock mutual funds or stocks through their retirement plan,[195] and the retail options industry continues to grow.[196]

Investors benefit from the protections provided through the use of audit trail data, permitting regulators to adequately and effectively monitor activities in today's complex securities markets. In SEC Rule 613, the Commission identified several ways that the CAT would enhance the protections to investors. These include: facilitating risk-based examinations, better identification of potentially manipulative trading activity, improved processes for evaluating tips, complaints and referrals of potential misconduct made to regulators, increased

[195] *See* Hibah Yousuf, *Only Half of All Americans Invested in Stocks*, CNN Money (May 9, 2014), http://money.cnn.com/2013/05/09/investing/american-stock-ownership/ (includes Gallup Poll results).
[196] *See, e.g.*, Andy Nybo, *The Retail Options Renaissance*, TABB Forum (Jan. 27, 2014), http://tabbforum.com/opinions/the-retail-options-reneissance.

efficiency of cross-market and principal order surveillance, improved analysis and reconstruction of broad-based market events, improved ability to monitor and evaluate changes to market structure, and efficiencies from a potential reduction in disparate reporting requirements and data requests.

For instance, as shown in academic literature, surveillance has been demonstrated to increase investor confidence, by mitigating manipulative behavior and increasing trading activity.[197] Academic literature provides support for the notion that investors associate enhanced surveillance with greater investment opportunity across a larger number of listed companies and with higher market capitalizations.[198] Cross-market surveillance – an opportunity expected to be improved by CAT – is likely more effective in detecting manipulative behavior than single-market surveillance. A more recent study provides evidence that better surveillance is associated with reduced insider trading, as it would be harder to hide such trades.[199]

To the extent that better surveillance leads to more effective rulemaking,[200] investors should also benefit from the improvements in market quality that might arise from such rulemaking. For example, one study shows that detailed trading rules are positively correlated with liquidity measures evidenced by lower volatility and bid-ask spreads.[201] Similarly, a separate study finds that European Union countries that have more effective rules to prevent market abuse and enhance transparency experience higher market liquidity.[202]

Investors may also bear the costs associated with maintaining and enhancing the current audit trail systems. In some cases, broker-dealers may pass on regulatory charges that support Participant supervision, such as with respect to Section 31 fees.[203] In other cases, broker-dealers may cover some of their regulatory charges through commissions and other charges. Similarly, broker-dealers may seek to pass on to investors their costs to build and maintain the CAT, which may include their own costs and any costs passed on to them by Participants. This analysis does not measure either the likelihood of these costs being passed through to investors nor the potential dollar impact on investors. The extent to which these costs are passed on to investors depends on the materiality of the costs and the ease with which investors can substitute away from any given broker-dealer.

(B) Participants

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[197] Cumming et al., *Global Market Surveillance*, 10(2) Am. Law & Econ. Rev. at 454-506 (July 24, 2008).
[198] *See, e.g.*, La Porta, et al., *Legal Determinants of External Finance*, 52(3) J. Finance 1131-1150 (1997).
[199] Cumming et al., *Exchange Trading Rules, Surveillance and Insider Trading* (working paper, Oct. 29, 2013), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2101826.
[200] Where better surveillance identifies behaviors and practices that are manipulative and harmful to the investing public more quickly and more accurately, the Commission and Participants may be able to adopt rules to stop these practices more quickly and in a more tailored fashion.
[201] Cumming et al., *Exchange Trading Rules and Stock Market Liquidity*, 99(3) J. Financial Economics 651-71 (Mar. 2011).
[202] Christensen et al., *Capital-Market Effects of Securities Regulation: Prior Conditions, Implementation, and Enforcement* (Dec. 31, 2013), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1745105.
[203] Pursuant to Section 31 of the Exchange Act, Participants are required to pay transaction fees and assessments to the Commission that are designed to recover the costs related to the government's supervision and regulation of the securities markets and securities professionals. Participants, in turn, may collect their Section 31 fees and assessments from their broker-dealer members. 15 U.S.C. § 78ee.

Participants are expected to benefit from the requirements to report to the Central Repository. To the extent that the CAT enhances comparability of audit trail data – thereby enhancing order lifecycle comparability across different trading venues – Participants may better fulfill their obligations to "prevent fraudulent and manipulative acts and practices, to promote just and equitable principles of trade, to foster cooperation and coordination with persons engaged in regulating, clearing, settling, processing information with respect to, and facilitating transactions in securities" as set forth in Section 6 of the Exchange Act.

Participants would also incur direct costs associated with creating, implementing and maintaining the CAT infrastructure. The full cost associated with the build and maintenance of the CAT would be shared among Participants and Industry Members, consistent with the CAT NMS Plan. Participants would also be subject to costs associated with updating and maintaining their own systems to comply with their obligations to report to the Central Repository.

(1) Central Repository Build and Maintenance Costs

The CAT NMS Plan provides that the costs arising from the build and maintenance of the CAT will be collected from all CAT Reporters, which includes Participants. As described in Article XI of the CAT NMS Plan and in Section C(b)(7)(iii)below, Participants will be required to pay their allocated portion of these costs on an annual basis.

The CAT NMS Plan also contemplates that Participants may impose greater requirements on the Central Repository based on their use of information in the repository for regulatory purposes. These requirements may take the form of frequent and complex analyses of data which may likely require more resources from the Central Repository. It is critical that the Company recover its costs in a manner consistent with the principles articulated in the CAT NMS Plan, which include both the need to allocate costs in a manner consistent with the cost to operations and that the CAT NMS Plan not create significant disincentives to Participants in seeking to meet their regulatory obligations. As such, the CAT NMS Plan permits the Company to assess additional charges to Participants associated with their use of the Central Repository's data and reporting facilities as it deems necessary.

(2) Costs to Participants to Meet Reporting Requirements

The Costs to Participants Study was distributed to the Participants to collect information about the potential costs of the CAT to the Participants. The Costs to Participants Study was designed to provide insight into the current total costs associated with regulatory reporting and surveillance programs discussed above, as well as expected implementation and maintenance costs associated with reporting to and surveillance through the Central Repository.

The anticipated costs associated with the implementation of regulatory reporting to the Central Repository were estimated to be a total of $17,900,000 across all ten Participants. Included in this cost, Participants reported a total of $770,000 in legal and consulting costs, as well as total FTE costs of $10,300,000 for operational, technical/development and compliance-type functions.

Maintenance costs associated with regulatory reporting to Central Repository were estimated to be a total of $14,700,000 across all ten Participants. Included in this estimate are legal, consulting, and other costs associated with maintenance, a total of $720,000, and $7,300,000 to FTEs for operational, technical/development, and compliance functions regarding the maintenance of regulatory reporting associated with CAT.

The Participants were also asked to identify the costs associated with the implementation of surveillance programs within the Central Repository. The estimated total costs across all ten Participants were $23,200,000 including estimated legal, consulting, and other costs of $560,000. Also included in the total, Participants reported that they would allocate a total of $17,500,000 to FTEs to operational, technical/development, and compliance staff to be engaged in the creation of surveillance programs.

The estimated total costs associated with the maintenance of surveillance programs were $87,700,000, including $1,000,000 for legal, consulting, and other costs. Of the total cost, the Participants estimated that they would allocate a total of $66,700,000 to FTEs to operational, technical/development and compliance staff.

Retirement costs for current systems were estimated to be $310,000 across all Participants. However, Participants expect that by no longer needing to maintain these legacy systems due to adoption of the CAT, they will realize aggregate savings of $10,600,000, which will partially offset some of the costs expected to be borne by the Participants as described further below. To the extent that the Participants are able to retire legacy systems and replace them with more efficient and cost effective technologies, they may experience additional cost savings. The Costs to Participants Study does not attempt to quantify any such additional cost savings to broker-dealers.

(C) Broker-Dealers

The CAT is expected to provide a more resilient audit trail system that may benefit broker-dealers. For instance, as noted above, more effective oversight of market activity may increase investor confidence and help expand the investment opportunity set through increased listings. Broker-dealers may benefit from increased investor confidence, provided that it results in increased trading activity. In addition, broker-dealers may experience less burden, to the extent that, data provided to the Central Repository reduces the number of direct requests by regulators for their surveillance, examination and enforcement programs. For example, after the implementation of CAT, regulators seeking to identify activity for NMS Securities at the customer account level, would access that information from the Central Repository, rather than making a Blue Sheet request.

More broadly, one benefit identified to broker-dealers of the CAT may arise from consolidating the collection and transmission of audit trail data into a uniform activity, regardless of where the quoting and trading occur. Such a consolidation may permit some broker-dealers to reduce the number of systems they operate to provide audit trail data to Participants and to retire legacy systems, at an appropriate time. Additionally, technological advances may make the operation of the new CAT Systems more efficient than those associated with the legacy systems. The Costs to CAT Reporters Study did not attempt to quantify any such cost savings to firms,

and as such, the cost estimates provided here do not include consideration that such cost savings may be low.

Broker-dealers would also incur costs associated with creating, implementing and maintaining the CAT infrastructure. These costs would arise from building and maintaining the CAT and updating and maintaining their own systems to comply with their reporting obligations.

(1) CAT Build and Maintenance Costs

Broker-dealers will also be required to contribute their portion of the direct costs associated with building and maintaining the CAT, as required by SEC Rule 613 and implemented by the CAT NMS Plan. Broker-dealers with CAT reporting obligations will be required to pay their allocated portion of these costs on an annual basis, pursuant to the Funding Model.

The Funding Model acknowledges that the operating models of broker-dealers and Execution Venues are substantially different. Therefore, the Funding Model imposes different fee structures for broker-dealers and Executions Venues. ATSs that execute orders, which are operated by registered broker-dealers pursuant to Regulation ATS, are considered Execution Venues, for purposes of the CAT NMS Plan.

(2) CAT Reporters Costs to Meeting Reporting Requirements

Responses to the Costs to CAT Reporters Study provide estimates of the direct costs to broker-dealers associated with meeting requirements to report to the Central Repository. The Costs to CAT Reporters Study contained questions related to future costs related to both the retirement of existing systems and compliance with requirements of SEC Rule 613.

Respondents were asked to evaluate the future costs under two separate approaches.[204] For each approach, respondents were asked to estimate both for CAT implementation and maintenance: (1) the associated hardware and software costs; (2) the number of required FTEs; and (3) third-party provider costs.

a. Implementation Phase of Approach 1

Tables 7 and 8 describe the costs associated with the implementation of Approach 1. Based on the 167 study responses for the implementation of Approach 1, large firms provided an average (medium) hardware / software cost of $580,000 ($0) and small firms provided an average (median) cost estimates of $5,200 ($0).

Large firms provided an average (median) FTE count of 11.00 (0.00). Multiplying these counts by the rate employed by the Commission in SEC Rule 613 as described above, FTE costs are estimated as $4,400,000, with a median FTE cost of $0. Small firms provided an average FTE count requirement of 1.17, with the median response provided by small respondents equal

[204] The two approaches are described in detail in Appendix C, Analysis of Expected Benefits and Estimated Costs for Creating, Implementing, and Maintaining the Consolidated Audit Trail (SEC Rule 613(a)(1)(vii)).

to 0.00. Participants estimate a dollar cost for the small respondent FTE requirements to be on average $470,000, with a median estimated cost of $0.

Participants estimate large firms would incur average (median) third party / outsourcing costs of $72,000 ($0) and small firms would incur an estimated average (median) cost of $76,000 ($0).

Total average (median) costs for Approach 1 Implementation are estimated to be $5,052,000 ($0) for large firms, and $551,200 ($0) for small firms.

**Table 7: Approach 1 Implementation Costs: Large Respondents Summary (49 Firms)**

| | Hardware / Software | FTE Counts | FTE Costs | Third Party / Outsourcing |
|---|---|---|---|---|
| **Average** | $580,000 | 11.00 | $4,400,000 | $72,000 |
| **Median** | $0 | 0.00 | $0 | $0 |
| **Minimum** | $0 | 0.00 | $0 | $0 |
| **Minimum (non-zero)** | $5,000 | 0.02 | $8,000 | $1,000 |
| **Maximum** | $10,000,000 | 142.00 | $57,000,000 | $2,000,000 |
| **Count of Zero Responses** | 28 | 27 | 27 | 41 |
| **Count of Blank Responses** | 0 | 0 | 0 | 0 |

**Table 8: Approach 1 Implementation Costs: Small Respondents Summary (118 Firms)**

| | Hardware / Software | FTE Counts | FTE Costs | Third Party / Outsourcing |
|---|---|---|---|---|
| **Average** | $5,200 | 1.17 | $470,000 | $76,000 |
| **Median** | $0 | 0.00 | $0 | $0 |
| **Minimum** | $0 | 0.00 | $0 | $0 |
| **Minimum (non-zero)** | $1,000 | 0.20 | $80,000 | $1,000 |
| **Maximum** | $500,000 | 20.00 | $8,000,000 | $8,000,000 |
| **Count of Zero Responses** | 95 | 94 | 94 | 95 |
| **Count of Blank Responses** | 2 | 0 | 0 | 1 |

Tables 9 and 10 describe the costs associated with the implementation of Approach 1 for large respondents with current OATS and non-OATS reporting obligations. Large OATS respondents provided an average (median) hardware / software cost estimate of $750,000 ($0), and large non-OATS respondents providing average (median) estimated costs of $450,000 ($0).

Large OATS reporters provided an average (median) FTE requirement of 14.92 (7.00), translating into estimated costs of $6,000,000 ($2,800,000), while large non-OATS respondents provided an average (median) FTE requirement of 8.05 (0.00), translating into an average (median) estimated cost of $3,200,000 ($0).

Large OATS respondents estimated an average (median) third party / outsourcing cost of $150,000 ($0), while large non-OATS respondents provided an average (median) estimate of $9,500 ($0).

**Table 9: Approach 1 Implementation Costs: Large OATS Respondents Summary (21 Firms)**

| | Hardware / Software | FTE Counts | FTE Costs | Third Party / Outsourcing |
|---|---|---|---|---|
| **Average** | $750,000 | 14.92 | $6,000,000 | $150,000 |
| **Median** | $60,000 | 7.00 | $2,800,000 | $0 |
| **Minimum** | $0 | 0.00 | $0 | $0 |
| **Minimum (non-zero)** | $5,000 | 0.02 | $8,000 | $1,000 |
| **Maximum** | $7,000,000 | 63.00 | $25,300,000 | $2,000,000 |
| **Count of Zero Responses** | 6 | 5 | 5 | 15 |
| **Count of Blank Responses** | 0 | 0 | 0 | 0 |

**Table 10: Approach 1 Implementation Costs: Large Non-OATS Respondents Summary (28 Firms)**

| | Hardware / Software | FTE Counts | FTE Costs | Third Party / Outsourcing |
|---|---|---|---|---|
| **Average** | $450,000 | 8.05 | $3,200,000 | $9,500 |
| **Median** | $0 | 0.00 | $0 | $0 |
| **Minimum** | $0 | 0.00 | $0 | $0 |
| **Minimum (non-zero)** | $5,000 | 1.00 | $400,000 | $15,000 |
| **Maximum** | $10,000,000 | 142.00 | $57,000,000 | $250,000 |
| **Count of Zero Responses** | 22 | 22 | 22 | 26 |
| **Count of Blank Responses** | 0 | 0 | 0 | 0 |

Tables 11 and 12 describe the costs associated with the implementation of Approach 1 for small respondents with current OATS and non-OATS reporting obligations, small OATS respondents provided an average (median) hardware / software cost estimate of $21,000 ($1,000), with small non-OATS respondents providing an estimated average (median) cost of $100 ($0).

Small OATS reporters provided an average (median) FTE requirement of 3.51 (2.00), translating into estimated an average (median) costs of $1,400,000 ($800,000), while small non-OATS respondents provided an average (median) FTE requirement of 0.38 (0.00), translating into an estimated average (median) cost of $150,000 ($0).

Finally, small OATS respondents estimated an average (median) third party / outsourcing cost of $300,000 ($1,000), while small non-OATS respondents provided an average (median) estimate of $1,100 ($0).

| **Table 11: Approach 1 Implementation Costs: Small OATS Respondents Summary (30 Firms)** | | | | |
|---|---|---|---|---|
| | **Hardware / Software** | **FTE Counts** | **FTE Costs** | **Third Party / Outsourcing** |
| **Average** | $21,000 | 3.51 | $1,400,000 | $300,000 |
| **Median** | $1,000 | 2.00 | $800,000 | $1,000 |
| **Minimum** | $0 | 0.00 | $0 | $0 |
| **Minimum (non-zero)** | $1,000 | 0.20 | $80,000 | $1,000 |
| **Maximum** | $500,000 | 20.00 | $8,000,000 | $8,000,000 |
| **Count of Zero Responses** | 12 | 12 | 12 | 12 |
| **Count of Blank Responses** | 1 | 0 | 0 | 1 |

| **Table 12: Approach 1 Implementation Costs: Small Non-OATS Respondents Summary (88 Firms)** | | | | |
|---|---|---|---|---|
| | **Hardware / Software** | **FTE Counts** | **FTE Costs** | **Third Party / Outsourcing** |
| **Average** | $100 | 0.38 | $150,000 | $1,100 |
| **Median** | $0 | 0.00 | $0 | $0 |
| **Minimum** | $0 | 0.00 | $0 | $0 |
| **Minimum (non-zero)** | $1,000 | 3.00 | $1,200,000 | $1,000 |
| **Maximum** | $5,000 | 15.00 | $6,000,000 | $72,000 |
| **Count of Zero Responses** | 83 | 82 | 82 | 83 |
| **Count of Blank Responses** | 1 | 0 | 0 | 0 |

b. Maintenance Phase of Approach 1

Tables 13 and 14 describe the costs associated with the maintenance of CAT reporting obligations for the full set of study responses under Approach 1. Based on the 167 study responses for the maintenance of Approach 1, large firms reported an average (median) hardware / software cost estimate of $210,000 ($0), and small firms reported an estimated cost of $1,600 ($0).

Large firms provided an average FTE count requirement of 8.54, with the median response provided by large firms equaled to 0.00. Multiplying these counts by the rate employed by the Commission in SEC Rule 613 as described above, FTE costs are estimated to be $3,400,000, with a median FTE cost of $0. Small firms provided an average FTE count requirement of 1.12, with the median response provided by small respondents equal to 0.00. Participants estimated the average dollar cost for the small respondent FTE requirement l to be $450,000, and a median cost of $0.

Large firms estimated that the average (median) third party / outsourcing cost is equal to $52,000 ($0) and small firms estimated average (median) costs to be equal to $24,000 ($0).

Total average (median) costs for Approach 1 Maintenance are estimated to be $3,662,000 ($0) for large firms and $475,600 ($0) for small firms.

| **Table 13: Approach 1 Maintenance Costs: Large Respondents Summary (49 Firms)** | | | | |
|---|---|---|---|---|
| | **Hardware / Software** | **FTE Counts** | **FTE Costs** | **Third Party / Outsourcing** |
| **Average** | $210,000 | 8.54 | $3,400,000 | $52,000 |
| **Median** | $0 | 0.00 | $0 | $0 |
| **Minimum** | $0 | 0.00 | $0 | $0 |
| **Minimum (non-zero)** | $2,000 | 0.02 | $8,000 | $1,000 |
| **Maximum** | $5,200,000 | 152.00 | $61,000,000 | $1,000,000 |
| **Count of Zero Responses** | 28 | 27 | 27 | 41 |
| **Count of Blank Responses** | 1 | 0 | 0 | 0 |

| **Table 14: Approach 1 Maintenance Costs: Small Respondents Summary (118 Firms)** | | | | |
|---|---|---|---|---|
| | **Hardware / Software** | **FTE Counts** | **FTE Costs** | **Third Party / Outsourcing** |
| **Average** | $1,600 | 1.12 | $450,000 | $24,000 |
| **Median** | $0 | 0.00 | $0 | $0 |
| **Minimum** | $0 | 0.00 | $0 | $0 |
| **Minimum (non-zero)** | $500 | 0.15 | $60,000 | $500 |
| **Maximum** | $120,000 | 18.00 | $7,200,000 | $1,500,000 |
| **Count of Zero Responses** | 96 | 93 | 93 | 96 |
| **Count of Blank Responses** | 0 | 0 | 0 | 0 |

Tables 15 and 16 show the costs associated with the maintenance of CAT reporting obligations for Approach 1 for large respondents with current OATS and non-OATS reporting obligations. Large OATS respondents provided estimated average (median) hardware / software

requirements of $380,000 ($22,000), with large non-OATS respondents providing estimated average (median) costs of $80,000 ($0).

Large OATS reporters provided average (median) FTE requirements of 10.03 (4.00), translating to estimated costs of $4,000,000 ($1,600,000), while large non-OATS respondents provided average (median) FTE requirements of 7.41 (0.00), translating to estimated costs of $3,000,000 ($0).

Large OATS respondents estimated average (median) third party / outsourcing costs of $120,000 ($0), while large non-OATS respondents provided estimates of $1,300 ($0).

**Table 15: Approach 1 Maintenance Costs: Large OATS Respondents Summary (21 Firms)**

| | Hardware / Software | FTE Counts | FTE Costs | Third Party / Outsourcing |
|---|---|---|---|---|
| **Average** | $380,000 | 10.03 | $4,000,000 | $120,000 |
| **Median** | $22,000 | 4.00 | $1,600,000 | $0 |
| **Minimum** | $0 | 0.00 | $0 | $0 |
| **Minimum (non-zero)** | $2,000 | 0.02 | $8,000 | $1,000 |
| **Maximum** | $5,200,000 | 50.00 | $20,100,000 | $1,000,000 |
| **Count of Zero Responses** | 6 | 5 | 5 | 14 |
| **Count of Blank Responses** | 1 | 0 | 0 | 0 |

**Table 16: Approach 1 Maintenance Costs: Large Non-OATS Respondents Summary (28 Firms)**

| | Hardware / Software | FTE Counts | FTE Costs | Third Party / Outsourcing |
|---|---|---|---|---|
| **Average** | $80,000 | 7.41 | $3,000,000 | $1,300 |
| **Median** | $0 | 0.00 | $0 | $0 |
| **Minimum** | $0 | 0.00 | $0 | $0 |
| **Minimum (non-zero)** | $8,000 | 1.00 | $400,000 | $35,000 |
| **Maximum** | $900,000 | 152.00 | $61,000,000 | $35,000 |
| **Count of Zero Responses** | 22 | 22 | 22 | 27 |
| **Count of Blank Responses** | 0 | 0 | 0 | 0 |

Tables 17 and 18 describe the costs associated with the maintenance of CAT reporting obligations for Approach 1 for small respondents with current OATS and non-OATS reporting obligations. Small OATS respondents provided estimated average (median) hardware / software requirements of $6,000 ($1,000), with small non-OATS respondents providing estimated average (median) costs of $100 ($0).

Small OATS reporters provided average (median) FTE requirements of 3.52 (2.00), translating to estimated costs of $1,400,000 ($800,000), while small non-OATS respondents provided average (median) FTE requirements of 0.31 (0.00), translating to estimated costs of $120,000 ($0).

Finally, small OATS respondents estimated average (median) third party / outsourcing costs of $90,000 ($1,000), while small non-OATS respondents provided estimates of $1,100 ($0).

**Table 17: Approach 1 Maintenance Costs: Small OATS Respondents Summary (30 Firms)**

| | Hardware / Software | FTE Counts | FTE Costs | Third Party / Outsourcing |
|---|---|---|---|---|
| **Average** | $6,000 | 3.52 | $1,400,000 | $90,000 |
| **Median** | $1,000 | 2.00 | $800,000 | $1,000 |
| **Minimum** | $0 | 0.00 | $0 | $0 |
| **Minimum (non-zero)** | $500 | 0.15 | $60,000 | $500 |
| **Maximum** | $120,000 | 18.00 | $7,200,000 | $1,500,000 |
| **Count of Zero Responses** | 12 | 10 | 10 | 12 |
| **Count of Blank Responses** | 0 | 0 | 0 | 0 |

**Table 18: Approach 1 Maintenance Costs: Small Non-OATS Respondents Summary (88 Firms)**

| | Hardware / Software | FTE Counts | FTE Costs | Third Party / Outsourcing |
|---|---|---|---|---|
| **Average** | $100 | 0.31 | $120,000 | $1,100 |
| **Median** | $0 | 0.00 | $0 | $0 |
| **Minimum** | $0 | 0.00 | $0 | $0 |
| **Minimum (non-zero)** | $1,000 | 3.00 | $1,200,000 | $1,000 |
| **Maximum** | $2,000 | 14.00 | $5,600,000 | $72,000 |
| **Count of Zero Responses** | 84 | 83 | 83 | 84 |
| **Count of Blank Responses** | 0 | 0 | 0 | 0 |

c. Implementation Phase of Approach 2

Tables 19 and 20 show the costs associated with the implementation phase of Approach 2 for the full set of study responses. Based on the 167 study responses for the implementation phase of Approach 2, large firms provided average (median) hardware / software costs of $570,000 ($0), and small firms provided costs estimates of $5,000 ($0).

Large firms provided average FTE count requirements of 10.15, with the median response provided by a large firm equal to 0.00. Multiplying these counts by the rate employed by the Commission in SEC Rule 613 as described above, FTE costs can be estimated to be $4,100,000, with a median FTE cost of $0. Small firms provided average FTE count requirements of 1.08, with the median response provided by a small respondent equal to 0.00. Participants estimate the dollar cost for the small respondent FTE requirements to be $440,000, and a median cost of $0.

Large firms estimated that average (median) third party / outsourcing costs are equal to $68,000 ($0) and small firms estimated average (median) costs to be equal to $16,000 ($0).

Total average (median) costs for Approach 2 Implementation are estimated to be $4,738,000 ($0) for large firms, and $461,000 ($0) for small firms.

**Table 19: Approach 2 Implementation Costs: Large Respondents Summary (49 Firms)**

| | Hardware / Software | FTE Counts | FTE Costs | Third Party / Outsourcing |
|---|---|---|---|---|
| **Average** | $570,000 | 10.15 | $4,100,000 | $68,000 |
| **Median** | $0 | 0.00 | $0 | $0 |
| **Minimum** | $0 | 0.00 | $0 | $0 |
| **Minimum (non-zero)** | $5,000 | 0.02 | $8,000 | $1,000 |
| **Maximum** | $10,000,000 | 116.00 | $46,600,000 | $2,000,000 |
| **Count of Zero Responses** | 28 | 28 | 28 | 41 |
| **Count of Blank Responses** | 0 | 0 | 0 | 0 |

**Table 20: Approach 2 Implementation Costs: Small Respondents Summary (118 Firms)**

| | Hardware / Software | FTE Counts | FTE Costs | Third Party / Outsourcing |
|---|---|---|---|---|
| **Average** | $5,000 | 1.08 | $440,000 | $16,000 |
| **Median** | $0 | 0.00 | $0 | $0 |
| **Minimum** | $0 | 0.00 | $0 | $0 |
| **Minimum (non-zero)** | $1,000 | 1.00 | $400,000 | $1,000 |
| **Maximum** | $500,000 | 20.00 | $8,000,000 | $1,000,000 |
| **Count of Zero Responses** | 98 | 96 | 96 | 97 |
| **Count of Blank Responses** | 1 | 0 | 0 | 1 |

Tables 21 and 22 show the costs associated with the implementation phase of Approach 2 for large respondents with current OATS and non-OATS reporting obligations. Large OATS

respondents provided estimated average (median) hardware / software requirements of $740,000 ($60,000), with large non-OATS respondents providing estimated average (median) costs of $450,000 ($0).

Large OATS reporters provided average (median) FTE requirements of 14.81 (7.00), translating to estimated costs of $5,900,000 ($2,800,000), while large non-OATS respondents provided average (median) FTE requirements of 6.66 (0.00), translating to estimated costs of $2,700,000 ($0).

Finally, large OATS respondents estimated average (median) third party / outsourcing costs of $140,000 ($0), while large non-OATS respondents provided estimates of $10,000 ($0).

**Table 21: Approach 2 Implementation Costs: Large OATS Respondents Summary (21 Firms)**

| | Hardware / Software | FTE Counts | FTE Costs | Third Party / Outsourcing |
|---|---|---|---|---|
| **Average** | $740,000 | 14.81 | $5,900,000 | $140,000 |
| **Median** | $60,000 | 7.00 | $2,800,000 | $0 |
| **Minimum** | $0 | 0.00 | $0 | $0 |
| **Minimum (non-zero)** | $5,000 | 0.02 | $8,000 | $1,000 |
| **Maximum** | $7,000,000 | 63.00 | $25,300,000 | $2,000,000 |
| **Count of Zero Responses** | 6 | 5 | 5 | 15 |
| **Count of Blank Responses** | 0 | 0 | 0 | 0 |

**Table 22: Approach 2 Implementation Costs: Large Non-OATS Respondents Summary (28 Firms)**

| | Hardware / Software | FTE Counts | FTE Costs | Third Party / Outsourcing |
|---|---|---|---|---|
| **Average** | $450,000 | 6.66 | $2,700,000 | $10,000 |
| **Median** | $0 | 0.00 | $0 | $0 |
| **Minimum** | $0 | 0.00 | $0 | $0 |
| **Minimum (non-zero)** | $5,000 | 1.00 | $400,000 | $35,000 |
| **Maximum** | $10,000,000 | 116.00 | $46,600,000 | $250,000 |
| **Count of Zero Responses** | 22 | 23 | 23 | 26 |
| **Count of Blank Responses** | 0 | 0 | 0 | 0 |

Tables 23 and 24 show the costs associated with the implementation of Approach 2 for small respondents with current OATS and non-OATS reporting obligations. Small OATS respondents provided estimated average (median) hardware / software requirements of $20,000

($1,000), with small non-OATS respondents providing estimated average (median) costs of $100 ($0).

Small OATS reporters provided average (median) FTE requirements of 3.33 (2.00), translating to estimated costs of $1,300,000 ($800,000), while small non-OATS respondents provided average (median) FTE requirements of 0.32 (0.00), translating to estimated costs of $130,000 ($0).

Finally, small OATS respondents estimated average (median) third party / outsourcing costs of $60,000 ($1,000), while small non-OATS respondents provided estimates of $1,100 ($0).

**Table 23: Approach 2 Implementation Costs: Small OATS Respondents Summary (30 Firms)**

| | Hardware / Software | FTE Counts | FTE Costs | Third Party / Outsourcing |
|---|---|---|---|---|
| **Average** | $20,000 | 3.33 | $1,300,000 | $60,000 |
| **Median** | $1,000 | 2.00 | $800,000 | $1,000 |
| **Minimum** | $0 | 0.00 | $0 | $0 |
| **Minimum (non-zero)** | $1,000 | 1.00 | $400,000 | $1,000 |
| **Maximum** | $500,000 | 20.00 | $8,000,000 | $1,000,000 |
| **Count of Zero Responses** | 14 | 13 | 13 | 13 |
| **Count of Blank Responses** | 1 | 0 | 0 | 1 |

**Table 24: Approach 2 Implementation Costs: Small Non-OATS Respondents Summary (88 Firms)**

| | Hardware / Software | FTE Counts | FTE Costs | Third Party / Outsourcing |
|---|---|---|---|---|
| **Average** | $100 | 0.32 | $130,000 | $1,100 |
| **Median** | $0 | 0.00 | $0 | $0 |
| **Minimum** | $0 | 0.00 | $0 | $0 |
| **Minimum (non-zero)** | $1,000 | 3.00 | $1,200,000 | $1,000 |
| **Maximum** | $5,000 | 15.00 | $6,000,000 | $72,000 |
| **Count of Zero Responses** | 84 | 83 | 83 | 84 |
| **Count of Blank Responses** | 0 | 0 | 0 | 0 |

d. Maintenance Phase of Approach 2

Tables 25 and 26 show the costs associated with the maintenance of CAT reporting obligations for Approach 2 for the full set of study responses. Based on the 167 study responses for the maintenance phase of Approach 2, large firms provided average (median) hardware / software costs of $200,000 ($0) and small firms provided costs estimates of $1,500 ($0).

Large firms provided average FTE count requirements of 7.27, with the median response provided by a large firm equal to 0.00. Multiplying these counts by the rate employed by the Commission in SEC Rule 613 as described above, FTE costs can be estimated to be $2,900,000, with a median FTE cost of $0. Small firms provided average FTE count requirements of 1.06, with the median response provided by a small respondent equal to 0.00. Participants estimate the dollar cost for the small respondent FTE requirements to be $430,000, with a median cost of $0.

Large firms estimated that average (median) third party / outsourcing costs are equal to $48,000 ($0) and small firms estimated average (median) costs to be equal to $10,000 ($0).

Total average (median) costs for Approach 2 Maintenance are estimated to be $3,148,000 ($0) for large firms, and $441,500 ($0) for small firms.

**Table 25: Approach 2 Maintenance Costs: Large Respondents Summary (49 Firms)**

| | Hardware / Software | FTE Counts | FTE Costs | Third Party / Outsourcing |
|---|---|---|---|---|
| **Average** | $200,000 | 7.27 | $2,900,000 | $48,000 |
| **Median** | $0 | 0.00 | $0 | $0 |
| **Minimum** | $0 | 0.00 | $0 | $0 |
| **Minimum (non-zero)** | $2,000 | 0.00 | $0 | $1,000 |
| **Maximum** | $5,200,000 | 102.00 | $40,900,000 | $1,000,000 |
| **Count of Zero Responses** | 28 | 28 | 28 | 41 |
| **Count of Blank Responses** | 1 | 0 | 0 | 0 |

**Table 26: Approach 2 Maintenance Costs: Small Respondents Summary (118 Firms)**

| | Hardware / Software | FTE Counts | FTE Costs | Third Party / Outsourcing |
|---|---|---|---|---|
| **Average** | $1,500 | 1.06 | $430,000 | $10,000 |
| **Median** | $0 | 0.00 | $0 | $0 |
| **Minimum** | $0 | 0.00 | $0 | $0 |
| **Minimum (non-zero)** | $500 | 1.00 | $400,000 | $500 |
| **Maximum** | $100,000 | 18.00 | $7,000,000 | $1,000,000 |
| **Count of Zero Responses** | 97 | 94 | 94 | 93 |
| **Count of Blank Responses** | 2 | 0 | 0 | 5 |

Tables 27 and 28 provide the costs associated with the maintenance of CAT reporting obligations for Approach 2 for large respondents with current OATS and non-OATS reporting obligations. Large OATS respondents provided estimated average (median) hardware / software requirements of $370,000 ($14,000), with large non-OATS respondents providing estimated average (median) costs of $79,000 ($0).

Large OATS reporters provided average (median) FTE requirements of 9.79 (5.60), translating to estimated costs of $3,900,000 ($2,200,000), while large non-OATS respondents provided average (median) FTE requirements of 5.38 (0.00), translating to estimated costs of $2,200,000 ($0).

Finally, large OATS respondents estimated average (maximum) third party / outsourcing costs of $110,000 ($0), while large non-OATS respondents provided estimates of $1,300 ($0).

**Table 27: Approach 2 Maintenance Costs: Large OATS Respondents Summary (21 Firms)**

| | Hardware / Software | FTE Counts | FTE Costs | Third Party / Outsourcing |
|---|---|---|---|---|
| **Average** | $370,000 | 9.79 | $3,900,000 | $110,000 |
| **Median** | $14,000 | 5.60 | $2,200,000 | $0 |
| **Minimum** | $0 | 0.00 | $0 | $0 |
| **Minimum (non-zero)** | $2,000 | 0.02 | $8,000 | $1,000 |
| **Maximum** | $5,200,000 | 50.00 | $20,100,000 | $1,000,000 |
| **Count of Zero Responses** | 6 | 5 | 5 | 14 |
| **Count of Blank Responses** | 1 | 0 | 0 | 0 |

**Table 28: Approach 2 Maintenance Costs: Large Non-OATS Respondents Summary (28 Firms)**

| | Hardware / Software | FTE Counts | FTE Costs | Third Party / Outsourcing |
|---|---|---|---|---|
| **Average** | $79,000 | 5.38 | $2,200,000 | $1,300 |
| **Median** | $0 | 0.00 | $0 | $0 |
| **Minimum** | $0 | 0.00 | $0 | $0 |
| **Minimum (non-zero)** | $3,000 | 1.00 | $400,000 | $36,000 |
| **Maximum** | $900,000 | 102.00 | $40,900,000 | $36,000 |
| **Count of Zero Responses** | 22 | 23 | 23 | 27 |
| **Count of Blank Responses** | 0 | 0 | 0 | 0 |

Tables 29 and 30 show the costs associated with the maintenance of CAT reporting obligations for Approach 2 for small respondents with current OATS and non-OATS reporting obligations. Small OATS respondents provided estimated average (median) hardware / software requirements of $6,000 ($500), with small non-OATS respondents providing estimated average (median) costs of $100 ($0).

Small OATS reporters provided average (median) FTE requirements of 3.28 (2.00), translating to estimated costs of $1,300,000 ($800,000), while small non-OATS respondents provided average (median) FTE requirements of 0.31 (0.00), translating to estimated costs of $120,000 ($0).

Finally, small OATS respondents estimated average (median) third party / outsourcing costs of $42,000 ($1,000), while small non-OATS respondents provided estimates of $1,100 ($0).

**Table 29: Approach 2 Maintenance Costs: Small OATS Respondents Summary (30 Firms)**

| | Hardware / Software | FTE Counts | FTE Costs | Third Party / Outsourcing |
|---|---|---|---|---|
| **Average** | $6,000 | 3.28 | $1,300,000 | $42,000 |
| **Median** | $500 | 2.00 | $800,000 | $1,000 |
| **Minimum** | $0 | 0.00 | $0 | $0 |
| **Minimum (non-zero)** | $500 | 1.00 | $400,000 | $500 |
| **Maximum** | $120,000 | 18.00 | $7,000,000 | $1,000,000 |
| **Count of Zero Responses** | 14 | 11 | 11 | 12 |
| **Count of Blank Responses** | 1 | 0 | 0 | 2 |

**Table 30: Approach 2 Maintenance Costs: Small Non-OATS Respondents Summary (88 Firms)**

| | Hardware / Software | FTE Counts | FTE Costs | Third Party / Outsourcing |
|---|---|---|---|---|
| **Average** | $100 | 0.31 | $120,000 | $1,100 |
| **Median** | $0 | 0.00 | $0 | $0 |
| **Minimum** | $0 | 0.00 | $0 | $0 |
| **Minimum (non-zero)** | $1,000 | 3.00 | $1,200,000 | $1,000 |
| **Maximum** | $2,000 | 14.00 | $5,600,000 | $72,000 |
| **Count of Zero Responses** | 83 | 83 | 83 | 81 |
| **Count of Blank Responses** | 1 | 0 | 0 | 3 |

e. Implementation and Maintenance Costs for Approach 1 vs. Approach 2

Participants compared the estimated implementation and maintenance costs for Approach 1 and Approach 2 to determine if one solution would be more cost effective for the industry than the other. In general, respondents indicated that Approach 1 would lead to larger costs than Approach 2. Large firms estimated that it will cost approximately $5,052,000 to implement Approach 1, versus an estimated $4,738,000 for Approach 2, a cost difference of $314,000. From a maintenance perspective, large firms estimated that it would cost $3,662,000 for Approach 1 versus $3,148,000 for Approach 2, a cost difference of $514,000. Small firms also indicated that Approach 1 would be more expensive to implement and maintain than Approach 2. Small firms indicated that it would cost $551,200 to implement Approach 1 versus $475,600 for Approach 2, indicating a cost difference of $90,200. For the maintenance phases, small firms estimated it would cost approximately $475,600 for Approach 1 maintenance, versus $441,500 for Approach 2 maintenance, a cost difference of $34,100 between approaches. However, the cost estimates between these two approaches are not statistically significant and Participants conclude that there would likely be no incremental costs associated with either Approach.[205]

f. Retirement of Systems Costs

Participants recognize that in implementing the anticipated requirements in the CAT NMS Plan, broker-dealers would likely replace some components of their current systems. The costs associated with retiring current systems were considered as part of the impacts associated with the CAT NMS Plan.

Tables 31 and 32 describe the cost associated with retirement of systems for the full set of study responses. Based on the 167 study responses for the retirement of systems large firms provided average (median) hardware / software costs of $120,000 ($0) and small firms provided cost estimates of $31,000 ($0).

Large firms provided average FTE count requirements of 6.80, with the median response provided by a large firm equal to 0.00. Multiplying these counts by the rate employed by the Commission in SEC Rule 613 as described above, FTE costs are estimated to be $2,700,000, with a median FTE cost of $0. Small firms provided average FTE count requirements of 1.92, with the median response provided by a small respondent of 0.00. Participants estimate the dollar cost for the small respondent FTE requirements to be an average costs of $770,000, and a median cost of $0.

Large firms estimated that average (median) third party / outsourcing costs to be $10,000 ($0) and small firms estimated average (median) costs to be $63,000 ($0).

[205] Participants arrive at this conclusion on the basis of a standard t-test of the hypothesis that the difference between Approach 1 and Approach 2 costs is different from zero. The t-test is unable to reject the null hypothesis (i.e., that the difference in costs between the two approaches is not distinguishable from zero) at the 0.05% level. The t-test rejects the null hypothesis for estimates of hardware / software costs, FTE costs, vendor costs, and total costs. The t-test also rejects any significant difference in estimated costs under the two approaches separately for large OATS reporters, small OATS reporters, large non-OATS reporters, and small non-OATS reporters.

Total average (median) costs for the Retirement of Systems are estimated to be $2,830,000 ($0) for large firms and $864,000 ($0) for small firms.

| Table 31: Retirement of Systems Costs: Large Respondents Summary (49 Firms) | | | | |
|---|---|---|---|---|
| | **Hardware / Software** | **FTE Counts** | **FTE Costs** | **Third Party / Outsourcing** |
| **Average** | $120,000 | 6.80 | $2,700,000 | $10,000 |
| **Median** | $0 | 0.00 | $0 | $0 |
| **Minimum** | $0 | 0.00 | $0 | $0 |
| **Minimum (non-zero)** | $1,500 | 0.06 | $24,000 | $5,000 |
| **Maximum** | $4,000,000 | 206.00 | $82,700,000 | $360,000 |
| **Count of Zero Responses** | 37 | 32 | 32 | 44 |
| **Count of Blank Responses** | 0 | 0 | 0 | 0 |

| Table 32: Retirement of Systems Costs: Small Respondents Summary (118 Firms) | | | | |
|---|---|---|---|---|
| | **Hardware / Software** | **FTE Counts** | **FTE Costs** | **Third Party / Outsourcing** |
| **Average** | $31,000 | 1.92 | $770,000 | $63,000 |
| **Median** | $0 | 0.00 | $0 | $0 |
| **Minimum** | $0 | 0.00 | $0 | $0 |
| **Minimum (non-zero)** | $1,000 | 1.00 | $400,000 | $1,000 |
| **Maximum** | $3,500,000 | 68.00 | $27,300,000 | $7,000,000 |
| **Count of Zero Responses** | 98 | 100 | 100 | 97 |
| **Count of Blank Responses** | 0 | 0 | 0 | 0 |

Tables 33 and 34 describe the costs associated with the retirement of systems for large respondents with current OATS and non-OATS reporting obligations. Large OATS respondents provided estimated average (median) hardware / software requirements of $270,000 ($0), with large non-OATS respondents providing estimated average (median) costs of $4,300 ($0).

Large OATS reporters provided average (median) FTE requirements of 4.92 (3.10), translating to estimated costs of $2,000,000 ($1,200,000), while large non-OATS respondents provided average (median) FTE requirements of 8.21 (0.00), translating to estimated costs of $3,300,000 ($0).

Finally, large OATS respondents estimated average (median) third party / outsourcing costs of $18,000 ($0), while large non-OATS respondents provided estimates of $4,800 ($0).

**Table 33: Retirement of Systems Costs: Large OATS Respondents Summary (21 Firms)**

| | Hardware / Software | FTE Counts | FTE Costs | Third Party / Outsourcing |
|---|---|---|---|---|
| **Average** | $270,000 | 4.92 | $2,000,000 | $18,000 |
| **Median** | $0 | 3.10 | $1,200,000 | $0 |
| **Minimum** | $0 | 0.00 | $0 | $0 |
| **Minimum (non-zero)** | $1,500 | 0.06 | $24,000 | $5,000 |
| **Maximum** | $4,000,000 | 33.00 | $13,200,000 | $360,000 |
| **Count of Zero Responses** | 11 | 6 | 6 | 18 |
| **Count of Blank Responses** | 0 | 0 | 0 | 0 |

**Table 34: Retirement of Systems Costs: Large Non-OATS Respondents Summary (28 Firms)**

| | Hardware / Software | FTE Counts | FTE Costs | Third Party / Outsourcing |
|---|---|---|---|---|
| **Average** | $4,300 | 8.21 | $3,300,000 | $4,800 |
| **Median** | $0 | 0.00 | $0 | $0 |
| **Minimum** | $0 | 0.00 | $0 | $0 |
| **Minimum (non-zero)** | $10,000 | 24.00 | $9,600,000 | $60,000 |
| **Maximum** | $110,000 | 206.00 | $82,700,000 | $75,000 |
| **Count of Zero Responses** | 26 | 26 | 26 | 26 |
| **Count of Blank Responses** | 0 | 0 | 0 | 0 |

Tables 35 and 36 show the costs associated with the retirement of systems for small respondents with current OATS and non-OATS reporting obligations for the full set of study respondents. Small OATS respondents provided estimated average (median) hardware / software requirements of $3,600 ($500), with small non-OATS respondents providing estimated average (median) costs of $40,000 ($0).

Small OATS reporters provided average (median) FTE requirements of 4.60 (0.00), translating to estimated costs of $1,800,000 ($0), while small non-OATS respondents provided average (median) FTE requirements of 1.00 (0.00), translating to estimated costs of $400,000 ($0).

Finally, small OATS respondents estimated average (median) third party / outsourcing costs of $240,000 ($1,500), while small non-OATS respondents provided estimates of $3,000 ($0).

**Table 35: Retirement of Systems Costs: Small OATS Respondents Summary (30 Firms)**

| | Hardware / Software | FTE Counts | FTE Costs | Third Party / Outsourcing |
|---|---|---|---|---|
| **Average** | $3,600 | 4.60 | $1,800,000 | $240,000 |
| **Median** | $500 | 0.00 | $0 | $1,500 |
| **Minimum** | $0 | 0.00 | $0 | $0 |
| **Minimum (non-zero)** | $1,000 | 1.00 | $400,000 | $1,000 |
| **Maximum** | $39,000 | 30.00 | $12,000,000 | $7,000,000 |
| **Count of Zero Responses** | 15 | 16 | 16 | 13 |
| **Count of Blank Responses** | 0 | 0 | 0 | 0 |

**Table 36: Retirement of Systems Costs: Small Non-OATS Respondents Summary (88 Firms)**

| | Hardware / Software | FTE Counts | FTE Costs | Third Party / Outsourcing |
|---|---|---|---|---|
| **Average** | $40,000 | 1.00 | $400,000 | $3,000 |
| **Median** | $0 | 0.00 | $0 | $0 |
| **Minimum** | $0 | 0.00 | $0 | $0 |
| **Minimum (non-zero)** | $1,000 | 3.00 | $1,200,000 | $3,000 |
| **Maximum** | $3,500,000 | 68.00 | $27,300,000 | $220,000 |
| **Count of Zero Responses** | 83 | 84 | 84 | 84 |
| **Count of Blank Responses** | 0 | 0 | 0 | 0 |

In comparing the two approaches and their costs to the current costs incurred by a broker-dealer for current regulatory reporting, respondents have indicated that they estimate both Approach 1 and Approach 2 to be less expensive than current regulatory reporting requirements. Overall, firms estimated that current costs would be $4,290,000 for large firms versus $1,210,000 for small firms, while maintenance costs of Approach 1 for large firms would cost $3,662,000 and $475,600 for small firms, indicating cost savings of $628,000 for large firms and cost savings of $734,400 for small firms. For maintenance costs related to Approach 2, large firms indicated costs of $3,148,000 with an expected savings of $1,142,000 while small firms estimated maintenance costs of $441,500 with expected savings of $768,500.

Although there are differences in the current and anticipated maintenance costs discussed above, the Participants conclude that there would be no statistical difference in costs associated with the maintenance of the CAT, compared to maintenance costs for existing regulatory reporting requirements. Participants arrive at this conclusion on the basis of a standard t-test of the hypothesis that the difference in costs to broker-dealers between Approach 1 and Approach 2 is different from zero. The t-test is unable to reject the null hypothesis (i.e., that the difference in costs between the two approaches is not distinguishable from zero) at the 0.05% level separately for estimates of hardware / software costs, FTE costs, vendor costs, and total costs across large

OATS reporters, small OATS reporters, large non-OATS reporters, and small non-OATS reporters.

g. Industry Feedback on Costs to CAT Reporters Study

Participants' understanding of broker-dealer costs has been enhanced through frequent dialogue with Industry Members. The DAG has largely provided written feedback on costs through the industry association members. In March 2013, SIFMA provided feedback on industry costs in its Consolidated Audit Trail White Paper.[206] The association group stated that the industry is likely to face costs related to upgrading the regulatory reporting infrastructure. SIFMA highlighted that additional costs borne will be distributed across the front office, middle office, customer master data, compliance and risk and data management. Additionally, in February 2012, the FIF conducted a study to assess the costs associated with the implementation of OATS.[207] In a summary of the study, FIF highlights that "future estimates of cost should consider the FIF cost model, most importantly the effort expended on business analysis and testing as part of the implementation effort." One key view presented by the DAG was that retiring legacy systems will likely reduce costs to the industry, given their redundancies with the CAT. However, the FIF highlighted that existing timelines do not take into account costs associated with concurrent reporting for existing regulatory reporting and new regulatory requirements associated with the Central Repository.[208] Additional detail around the plan to retire existing regulatory reports can be found in Appendix C, Section C.9.

(D) Vendors

The Costs to Vendors Study requested information regarding various third party service provider and vendor costs to comply with the requirements of SEC Rule 613.

Based upon the responses to the Costs to Vendors Study, the expected dollar costs for implementation and maintenance of the CAT are largely the same for both approaches, and ranged widely between $0 and $20,000,000 for implementation and $50,000 and $6,000,000 for ongoing maintenance. One firm did indicate that Approach 1 would have substantially higher maintenance costs ($400,000 for Approach 1 versus $50,000 for Approach 2). For headcount and costs associated with implementation and maintenance of the CAT, all respondents indicated that Approach 1 would require more FTE resources (costs) to implement (ranging from 14 ($9,600,000) to 170 ($35,900,000) FTEs for Approach 1 and from 4 ($2,700,000) to 45 ($24,200,000) for Approach 2), while Approach 2 would require more FTE resources to maintain (ranging from 4.5 ($4,100,000) to 35 ($9,300,000) for Approach 1 and from 2 ($2,500,000) to 56 ($11,200,000) for Approach 2). As with current regulatory reporting costs, the firm with the largest number of clients reported the highest costs, but number of clients did not always correlate uniformly with higher expected costs for the other firms.

[206] *See* SIFMA Recommendations.
[207] *See* SEC Memorandum to File No. S7-11-10, Re: Staff Meeting with the Financial Information Forum (Feb. 29, 2012), *available at* http://www.sec.gov/comments/s7-11-10/s71110-112.pdf.
[208] *See* FIF, Comment Letter Re: Consolidated Audit Trail National Market System Plan Submission (Nov. 19, 2014), *available at* http://catnmsplan.com/web/groups/catnms/@catnms/documents/appsupportdocs/p601972.pdf.

Three of the four respondents to the vendor study indicated that they would incur costs to retire current regulatory reporting systems, with costs ranging from $500,000 to $5,000,000, with the firm with the highest expected retirement costs also having the highest current reporting costs. FTE requirements ranged from 1.5 ($250,000) to 23 ($7,200,000) FTEs.

Under Approach 1, two respondents expected ongoing maintenance to cost less than the maintenance of current regulatory reporting requirements, with the remaining two expecting higher costs. Under Approach 2, two respondents expected ongoing maintenance to cost less than the maintenance of current regulatory reporting requirements, one expected costs to be the same, and the final firm expected costs to be greater. All firms expected headcount associated with ongoing maintenance of the CAT to be less than under current reporting requirements.

(E) Issuers

Issuers also benefit from an effective regulatory regime supported by a reliable and complete audit trail. Specifically, issuers may benefit from enhanced investor confidence associated with better and more efficient oversight. The increase in investor confidence may draw more investors into the market, relative to other investment opportunities that do not provide the same protections. Increasing the pool of investors willing to invest in a primary offering may manifest itself in a lower cost of capital. Increased investor participation in secondary trading may also increase demand in the primary market, as the increased interest would be associated with greater efficiency in pricing and lower adverse selection costs. To the extent that the issuers do not have independent reporting obligations to the Central Repository (i.e., they are not otherwise CAT Reporters), they are not anticipated to incur direct costs associated with the CAT NMS Plan.

(F) Indirect Costs

The Participants recognize that in addition to direct costs, there may be indirect costs borne by parties as a result of the implementation of the CAT NMS Plan. As discussed further below, it is not possible for the Participants to quantify these costs, and as such, we present a qualitative discussion.

The Participants have identified at least three distinct ways for indirect costs to arise as a result of the implementation of the CAT NMS Plan. First, all CAT Reporters are subject to direct fees to pay for the creation, implementation, and maintenance of the CAT along with other direct costs to meet CAT NMS Plan obligations. CAT Reporters may endeavor to shift these fees and other costs to their clients. Where CAT Reporters can do so successfully, the clients bear an indirect cost arising from the CAT NMS Plan. Second, to the extent that the Commission and the Participants amend their surveillance programs in the presence of the Central Repository, the broker-dealers may incur costs to adjust their internal compliance programs. And third, as described more fully in Appendix C, Analysis of the Impact on Competition, Efficiency and Capital Formation, broker-dealer competition may be impacted if the direct and indirect costs associated with meeting the CAT NMS Plan's requirements materially impact the provision of their services to the public. Such a reduction in the provision of these services may impose an indirect cost on the public as well.

The Participants considered the potential for CAT Reporters to shift fees and other costs associated with the CAT NMS Plan. Participants may charge their members to cover the CAT NMS Plan costs either explicitly or subsume those costs in other fees or assessments. Broker-dealers may charge their clients for their own costs, whether incurred directly or indirectly, either through explicit fees associated with CAT or through their existing fee structures. This analysis does not measure either the likelihood of costs being passed from the Participant to the broker-dealers or from the broker-dealers to their clients, or the potential associated dollar impacts. The extent to which these costs may be passed on to clients is related to alternative sources of revenue available to the CAT Reporters, the materiality of those costs, and the ease with which clients can substitute away from any given Participant or broker-dealer. Participants note, however, that Participants and broker-dealers may currently have incentives and opportunity to shift regulatory compliance costs to their customers and that nothing in the CAT NMS Plan alters those incentives or the likelihood of those costs being passed on.

In addition, indirect costs to broker-dealers may arise as a result of the implementation of the CAT NMS Plan. First, broker-dealers may incur additional costs related to training and professional development, to equip the staff with the necessary knowledge necessary for compliance with the SEC Rule 613. Broker-dealers were specifically asked to consider these costs as part of their study response. Second, the enhanced and standardized data to be captured by the Central Repository is anticipated to increase the effectiveness of surveillance by regulators, which may impact broker-dealer compliance programs.

(iv) Estimate of Aggregate Direct Costs and the Allocation of Costs across CAT Reporters

(A) Estimate of Aggregate Costs

In order to create the regulatory data infrastructure required by SEC Rule 613, this Plan proposes to build and maintain the CAT, along with resources necessary to generate regulatory reports and related analysis. CAT Reporters, including Participants and broker-dealers engaging in trading and quoting activities in Eligible Securities, will be jointly responsible for providing the capital to build and maintain the CAT. Costs eligible to be allocated jointly include any associated liabilities accrued during the planning and building phases of the project that are directly attributable to the CAT NMS Plan, for example, legal and consulting fees, and will be allocated according to the funding model described in Article XI of the CAT NMS Plan.

In order to calculate to the implementation and annual maintenance costs of the CAT, the Participants considered the relevant cost factors for the following entities: Plan Processor, Participants, broker-dealers (large and small) and vendors. All implementation costs reflected below are in dollar costs for the year they are expected to be incurred, while all maintenance costs are estimated for the fifth year after the approval of the CAT NMS Plan, when all CAT Reporters are expected to be live.

(1) Plan Processor

*Implementation Costs.* For implementation costs associated with the Plan Processor, the Participants reviewed the build costs received from the Shortlisted Bidders and identified the

high and low costs to use as a component of the overall industry cost. The lowest cost received was $30,000,000 and the highest estimate received was $91,600,000.

*Maintenance Costs*. For maintenance costs associated with the Plan Processor, the Participants also reviewed the cost schedules received from the Shortlisted Bidders to build the range. To define the range of maintenance costs, the Participants reviewed the peak year maintenance costs from the Shortlisted Bidders. In addition to the costs received from the Shortlisted Bidders associated with the maintenance of operating and running the CAT, the Participants also included a yearly technical upgrade estimate to conservatively take into account changes in technology that may take place during the maintenance of the CAT. These additional costs begin at approximately 20% in year one, and slowly decrease to 5% during year five of operation. As such, the annual maintenance costs are estimated to range from $35,200,000 to $134,900,000.

*Retirement of Systems Costs*. The Plan Processor is not expected to incur costs related to the retirement of systems.

(2) Participants

Upon review of the requirements associated with Approach 1 and Approach 2, the Participants identified that they do not favor one approach over the other.

*Implementation Costs*. To estimate implementation costs for the Participants, the Participants used the aggregated results from the Costs to Participants Study. Based on the responses received from the Participants, the implementation of regulatory reporting is expected to cost $17,900,000 and the implementation of surveillance functions is estimated to cost $23,200,000.

*Maintenance Costs*. To estimate the maintenance costs for the Participants, the Participants reviewed the results from the Costs to Participants Study for regulatory reporting and surveillance costs. The Participants estimated that annual aggregate regulatory reporting costs would be equal to $14,700,000 and that annual aggregate surveillance maintenance costs would cost $87,700,000.

*Retirement of Systems Costs*. To estimate the costs related to the retirement of systems for the Participants, the Participants reviewed the results from the Costs to Participants Study for retirement of systems costs. The Participants estimated that costs associated with retirement of systems would be equal to $310,000.

(3) Broker-Dealers

Implementation and maintenance costs related to the CAT for broker-dealers were extrapolated from the results of the Costs to CAT Reporters Study. As described above, the Participants believe there to be approximately 1,800 broker-dealers that would be CAT Reporters. Of the 167 respondents to the Costs to CAT Reporters Study, 49 were large firms, and 118 were small firms, indicating a large to small firm ratio in the overall population of 29% to 71%. Applying this ratio to the total population of 1,800 broker-dealers, results in 522 large

firms and 1,278 small firms. In comparing the costs between the two approaches, the Participants have identified that Approach 1 is more expensive than the Approach 2, which causes Approach 1 to form the upper bound of the broker-dealer cost range, and Approach 2 to form the lower bound of the broker-dealer cost range.

*Implementation Costs.* For Approach 1, large firm respondents estimated that implementation costs would be equal to $5,052,000 per firm, for a total estimated implementation cost of approximately $2.6 billion. Small firm respondents estimated that implementation costs for Approach 1 would be equal to $551,200 per firm, for a total estimated implementation cost of $740 million.[209] For Approach 2, large firm respondents estimated that implementation costs would be equal to $4,738,000 per firm, for a total estimated implementation cost of approximately $2.5 billion, while small firms estimated implementation costs for Approach 2 to be equal to $461,000 per firm, for a total cost of $619 million.[210] This results in a cost range of $2.5 billion to $2.6 billion for large firms, and a cost range of $619 million to $740 million for small firms for the implementation of the CAT.

*Maintenance Costs.* For Approach 1, large firm respondents estimated that maintenance costs would be equal to $3,662,000 per firm per year, for a total estimated annual maintenance cost of approximately $2.3 billion.[211] Small firm respondents estimated that maintenance costs for Approach 1 would be equal to $475,600 per firm per year, for a total estimated annual maintenance cost of approximately $739 million.[212] For Approach 2, large firm respondents estimated that maintenance costs would be equal to $3,148,000 per firm per year, for a total estimated annual maintenance cost of approximately $2.0 billion,[213] while small firms estimated maintenance costs for Approach 2 to be equal to $441,500 per firm per year, for a total annual cost of approximately $686 million.[214] This implies an annual cost range of approximately $2.0 billion to $2.3 billion for large firms, and an annual cost range of approximately $686 million to $739 million for small firms for maintenance of reporting to the Central Repository. These maintenance costs are discrete costs for the maintenance of CAT reporting, and are not intended to show incremental costs against current regulatory reporting requirements. Based on the Costs to CAT Reporters Study, Participants estimate these incremental costs to be negligible.

*Retirement of Systems Costs*. To estimate the costs related to the retirement of systems for the broker dealers, the Participants reviewed the results from the Costs to CAT Reporters Study for retirement of systems costs. Large firm respondents estimated costs to be equal to $2,830,000, for a total retirement of systems cost equal to approximately $1.47 billion. Small

[209] Small firm total estimated implementation costs include a compound annual growth rate of 5% to account for increases in labor and operational costs over time. The rate was applied for one year, from the beginning of CAT reporting in year 1 through the expected incurring of build costs by small firms in the year prior to the start of their reporting (i.e., year 2). Because large firms report a year earlier than small firms and would incur most implementation costs in year 1, a similar rate has not been applied to their implementation costs.
[210] *Id.*
[211] Large and small firm total estimated maintenance costs are estimated in year 5 to account for a steady state of reporting, and include a compound annual growth rate of 5% to account for increases in labor and operational costs over time. The rate was applied for four years, from the beginning of CAT reporting in year 1 through year 5.
[212] *Id.*
[213] *Id.*
[214] *Id.*

firms estimated that costs related to the retirement of systems would cost $864,000, for a total retirement of systems cost of approximately $1.10 billion.

(4) Vendors

*Implementation Costs.* For implementation costs associated with Vendors, the Participants reviewed the aggregate build costs received from the Costs to Vendors Study and identified that Approach 1 would cost $118,200,000 to implement, while it would cost $51,600,000 to implement Approach 2.[215]

*Maintenance Costs.* For maintenance costs associated with Vendors, the Participants also reviewed the cost schedules received from the Costs to Vendors Study. Vendors indicated an aggregate estimated annual cost of $38,600,000 for maintenance of Approach 1, and annual estimated maintenance costs of $48,700,000 for Approach 2.[216]

*Retirement of Systems Costs.* Vendors indicated an aggregate cost of $21,300,000 for the retirement of existing regulatory reporting systems.

(5) Total Aggregate Costs

Based on the analysis of responses to the studies described above, and cost estimates provided by the Shortlisted Bidders, the Participants estimate the initial aggregate cost to the industry related to building and implementing the CAT would range from $3.2 billion to $3.6 billion. Estimated annual aggregate costs for the maintenance and enhancement of the CAT would range from $2.8 billion and $3.4 billion. Additionally, costs to retire existing systems would be approximately $2.6 billion.

(B) Impacts of Not Receiving Requested Exemptions

On January 30, 2015, the Participants submitted a letter to request that the Commission grant exemptions, pursuant to its authority under Section 36 of the Exchange Act, from the requirement to submit a national market system plan that meets certain reporting requirements specified in SEC Rule 613(c) and (d). Specifically, the Participants requested exemptive relief related to: (1) options market maker quotes; (2) Customer-IDs; (3) CAT-Reporter-IDs; (4) linking executions to specific subaccount allocations on Allocation Reports; and (5) time stamp granularity. On September 2, 2015, the Participants supplemented their request with a supplemental request, clarifying its original requested exemption from the requirement in Rule 613(c)(7)(viii)(B) (including, in some instances, requesting an exemption from the requirement to provide an account number, account type and date account opened under Rule 613(c)(7)(viii)(B)).

First, SEC Rule 613(c)(7) requires both options market makers and the options exchanges to record and report the details of options market maker quotes received by the options

[215] Vendor cost estimates assume an annual cost per FTE of $401,440, consistent with the rate applied by the Commission in the Adopting Release.

[216] The total estimated vendor maintenance costs include a compound annual growth rate of 5% to account for increases in labor and operational costs over time. The rate was applied for four years, from the beginning of broker-dealer CAT reporting in year one through year five.

exchanges to the Central Repository. The Participants requested that the Commission provide the Participants with an exemption so that only options exchanges would record and report details for each options market maker quote and related Reportable Event to the Central Repository, while options market makers would be relieved of their obligation to record and report their quotes and related Reportable Events to the Central Repository. The Participants estimated that having both parties report options market maker quotes to the CAT would impose significant costs on the Plan Processor due to increased data storage and technical infrastructure, and on the options market makers due to a higher volume of reporting obligations. The Participants estimated that having both parties report options market maker quotes to the CAT would increase the size of data submitted to the CAT by approximately 18 billion records each day. Bidders estimated that requiring dual reporting of options market maker quotes would, over a five year period, lead to additional costs of between $2 million and $16 million for data storage and technical infrastructure for the Plan Processor. In addition, according to the results of a cost study conducted by three industry associations,[217] the cost to options market makers to meet their quote reporting obligations ranges from $307 million to $382 million over a five year period.

Second, Rule 613(c)(7) requires each CAT Reporter to record and report "Customer-ID(s) for each customer" when reporting order receipt or origination information to the Central Repository. The Commission noted that including a unique customer identifier could enhance the efficiency of surveillance and regulatory oversight. The Participants, however, favor the Customer Information Approach, that would require broker-dealers to provide detailed account and Customer information to the CAT, and have the Plan Processor correlate the Customer information across broker-dealers, assign a unique Customer identifier to each Customer and use that unique Customer identifier consistently across all CAT Data. The Participants believe that the Customer-ID approach imposes a significant cost burden on market participants and on the Plan Processor. According to cost estimates provided by the DAG,[218] the cost for the top 250 CAT reporters to implement the Customer-ID as required in SEC Rule 613 would be at least $195 million. The Participants believe that this cost estimate is conservative, since it only represents the cost estimate for 11% of the total broker-dealers that are expected to be CAT Reporters.

Third, SEC Rule 613(c)(7) requires that a CAT-Reporter-ID be reported to the Central Repository for each order and Reportable Event, so that regulators can determine which market participant took action with respect to an order at each Reportable Event. The Participants, however, have proposed to leverage existing business practices and identifiers ("Existing Identifier Approach"), rather than requiring new identifiers be established, as the former is deemed more efficient and cost-effective in implementing the CAT-Reporter-ID. The Participants believe that the CAT-Reporter-ID approach would impose a material cost burden on broker-dealers and Participants, as compared to the Existing Identifier Approach, since it would require major changes to broker-dealer systems. According to cost estimates provided by the

[217] Cost Survey Report on CAT Reporting of Options Quotes by Market Makers, conducted by the Financial Information Forum, Securities Industry and Financial Markets Association and Securities Traders Association (Nov. 5, 2013); *available at* http://catnmsplan.com/web/groups/catnms/@catnms/documents/appsupportdocs/p601771.pdf.
[218] Cost estimates provided by the DAG on topics where the Participants have requested exemptive relief can be found at: http://catnmsplan.com/web/groups/catnms/@catnms/documents/appsupportdocs/p602494.pdf

DAG, the cost for the 250 largest CAT Reporters to implement the CAT-Reporter-ID as required by SEC Rule 613 would be $78 million.

Fourth, Rule 613(c)(7) requires each CAT Reporter to record and report the "the account number for any subaccounts to which the execution is allocated (in whole or part)" if an order is executed. The Participants acknowledge that this information is useful to regulators to fulfill their obligations to protect investors. However, the Participants estimate that meeting the obligations of the Rule would be unduly burdensome and costly to achieve given the existing allocation practices. As an alternative, the Participants proposed that allocations will be reported by CAT Reporters via a tool described as an Allocation Report. To create linkages from the order execution to the allocation process by means of an order identifier, the broker-dealers would be required to perform extensive re-engineering of their front, middle, and back office systems, and thus incur significant costs. According to cost estimates provided by the DAG, the cost for the 250 largest CAT Reporters to link allocations to executions would be $525 million.

Finally, Rule 613(d) requires the recording and reporting of the time of certain Reportable Events to the Central Repository with time stamps at least to the millisecond. The Participants understand that time stamp granularity to the millisecond reflects current industry standards with respect to electronically-processed events in the order lifecycle. However, due to the lack of precision, the industry practice with respect to manual orders is to capture manual time stamps with granularity at the level of one second. The Participants believe that compliance with the time stamp granularity requirements of the Plan for Manual Order Events would result in added costs to the industry as there may be a need to upgrade databases, internal messaging applications/ protocols, data warehouses, and reporting applications to enable the reporting of such time stamps to the Central Repository. The Participants estimate that the total minimum cost to the industry to comply with a singular time stamp requirement for all CAT reporting would be approximately $10.5 million. This estimate is based on a current cost of $1,050 per manual timestamp clock which stamps to the second, with approximately 10,000 clocks requiring replacement across the industry. Upgrading this to millisecond granularity would likely add to the cost to the industry.

(C) Allocation of Costs Across CAT Reporters

Article XI of the CAT NMS Plan provides the process for determining the funding of the Company. In general, the Participants' approach to funding of the Company is: (A) to operate the Company on a break-even basis, which means having fees imposed and collected that cover the Company's costs and an appropriate reserve; and (B) to establish a fee structure that is equitable based on funding principles.[219] Such equitable funding principles include: (1) to create transparent, predictable revenue streams aligned with anticipated costs; (2) to allocate costs among Participants and Industry Members taking into account the timeline for implementation of the CAT and the distinctions in the securities trading operations of Participants and Industry Members and their impact on the Company's resources and operations; (3) to establish a tiered fee structure in which there is general comparability in the level of fees charged to CAT Reporters with the most CAT-related activity as measured by market share for Execution Venues, including ATSs, and by message traffic for non-ATS activities of Industry Members,

[219] *See* Section 11.2 of the CAT NMS Plan.

where, for these comparability purposes, the tiered fee structure takes into consideration affiliations between or among CAT Reporters, whether Execution Venues and/or Industry Members; (4) to provide ease of administrative functions; (5) to avoid disincentives such as burdens on competition and reduction in market quality; and (6) to build financial stability for the Company as a going concern.[220]

Based on these principles, the Operating Committee will establish the Company's funding, which is expected to arise primarily from fees charged to Participants and Industry Members. The Participants have sought input from the DAG as to the specific types of fees. Accordingly, the Participants propose to include the following fee types: (i) fixed fees payable by each Execution Venue that trades NMS Securities and OTC Equity Securities based on its market share (establishing two to five tiers of fixed fees); (ii) fixed fees payable by each Execution Venue that trades Listed Options (as defined in Rule 600(b)(35) of Regulation NMS) based on its market share (establishing two to five tiers of fixed fees); (iii) fixed fees payable by each Industry Member based on message traffic generated by such Industry Member (for the avoidance of doubt, the fixed fees payable by Industry Members pursuant to this paragraph shall, in addition to any other applicable message traffic, include message traffic generated by: (i) an ATS that does not execute orders that is sponsored by such Industry Member; (ii) routing orders to and from any ATS sponsored by such Industry Member); and (iii) ancillary fees (e.g., fees for late or inaccurate reporting, corrections, and access and use of the CAT for regulatory and oversight purposes).[221]

The Operating Committee will use two different criteria to establish fees – market share[222] for Execution Venues, including ATSs, and message traffic for Industry Members' non-ATS activities – due to the fundamental differences between the two types of entities. While there are multiple factors that contribute to the cost of building, maintaining and using the CAT, Bidders stated during workshops and in response to specific questions posed by the Participants that processing and storage of incoming message traffic is one of the most significant cost drivers for the CAT. Thus, the Participants believe that basing fees on message traffic for non-Execution Venue Industry Members is consistent with an equitable allocation of the costs of the CAT. On the other hand, message traffic would not provide the same degree of differentiation between Participants that it does for Industry Members. Because the majority of message traffic at the Participants consists of quotations, and Participants usually disseminate quotations in all instruments they trade, regardless of execution volume, Execution Venues that are Participants generally disseminate similar amounts of message traffic. In contrast, execution volume more accurately delineates the different levels of trading activity of the Participants. For these reasons, the Participants believe that market share is the appropriate metric to use in establishing fees for Participants. Moreover, given the similarity between the activity of exchange Participants and ATSs, both of which meet the definition of an "exchange" as set forth in the Exchange Act, the Participants believe that ATSs should be treated in the same manner as the exchange Participants for the purposes of determining the level of fees associated with the CAT.

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[220] *See id*.
[221] *See* Section 11.3 (a)-(c) of the CAT NMS Plan.
[222] Market share for Execution Venues is defined as the total trade volume executed on an individual Execution Venue as a percentage of total trades executed across all Venues.

Costs are allocated across the different types of CAT Reporters (broker-dealers, Execution Venues) on a tiered basis, in order to equitably allocate costs to those CAT Reporters that contribute more to the costs of creating, implementing and maintaining the CAT. The fees to be assessed at each tier are calculated so as to recoup a proportion of costs appropriate to the message traffic from firms in each tier. Therefore, larger broker-dealers, generating the majority of message traffic, will be in the higher tiers, and therefore be charged a higher fee. Smaller broker-dealers with low levels of message traffic will be in lower tiers and will be assessed a minimal fee for the CAT. The Participants estimate that up to 75% of broker-dealers will be in the lower tiers of the Funding Model.

All fees under Article XI charged directly to Participants and indirectly to Industry Members will be reviewed by the Operating Committee at least annually.[223] All proposed fees to be charged to Industry Members by Participants will be filed with the Commission pursuant to Section 19(b) of the Exchange Act.[224] In addition, all disputes with respect to the fees the Company charges Participants will be resolved by the Operating Committee or a Subcommittee designated by the Operating Committee, subject to the right of Participants to seek redress from the Commission pursuant to SEC Rule 608 or in any other appropriate forum.[225] The Participants will adopt rules requiring that disputes with respect to fees charged to Industry Members will be resolved by the Operating Committee or a Subcommittee, subject to the right of any Industry Member to seek redress from the SEC pursuant to SEC Rule 608 or in any other appropriate forum.[226]

The CAT NMS Plan contemplates that the Plan Processor will be responsible for developing and executing administrative processes and procedures to effectuate the smooth functioning of the CAT, consistent with the principles articulated in Article XI. These processes and procedures would include, but are not limited to, establishing budget, notice, billing and collection cycles that provide transparency, predictability and ease of administrative functions to CAT reporters. Criteria and schedules for ancillary fees that might be collected pursuant to Article XI are also anticipated to be published by the Operating Committee.

In articulating the funding principles of the CAT NMS Plan, Participants have established the need for the CAT NMS Plan to, among other things: (1) create transparent, predictable revenue streams for the Company that are aligned with the anticipated costs to build, operate, and administer the CAT and the other costs of the Company; and (2) provide for ease of billing and other administrative functions. The funding principles articulated in Article XI should also inform the policies and procedures adopted by the Operating Committee in executing the associated functions. To that end, to promote fairness and transparency with respect to fees, the Participants expect that the Operating Committee will adopt policies, procedures, and practices around budgeting, assignment of tiers, adjudicating disputes, billing, and collection of fees that provide appropriate transparency to all CAT Reporters. Participants expect that policies or procedures adopted to implement the administration of fee allocation and collection among CAT Reporters would be subject to comment by impacted parties before adoption.

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[223] *See* Section 11.3(d) of the CAT NMS Plan.
[224] *See* Section 11.1(b) of the CAT NMS Plan.
[225] *See* Section 4.1 and Section 11.5 of the CAT NMS Plan.
[226] *See id.*

(v) Alternatives Considered

(A) Technical Solution

SEC Rule 613(a)(1)(xii) directs Participants to discuss reasonable alternative approaches to creating, implementing and maintaining the CAT. As part of the development of the CAT NMS Plan, the Participants considered a variety of alternatives with respect to technical and user support considerations. The technical considerations include: primary storage, data ingestion format, development process, quality assurance staffing and user support staffing. The analysis presented in Appendix C, D.12, below, describes alternative approaches considered for each technical consideration and the ultimate choice of the CAT NMS Plan based on factors that consider feasibility, cost and efficiency.

In addition, the questions included in the Costs to CAT Reporters Study described above permitted the Participants to evaluate cost considerations to Industry Members associated with two different technical formats for reporting audit trail data to the Central Repository. One approach might permit broker-dealers to submit information data to the Central Repository using their choice among existing industry protocols, such as FIX. The second approach provided a scenario where CAT Reporters would submit relevant data to the Central Repository using a defined or specified format, such as an augmented version of OATS.

(B) Funding Model

As discussed above, Article XI of the CAT NMS Plan sets forth the provisions for establishing the funding of the Company and recovering the costs of operating the CAT. The Participants recognize that there are a number of different approaches to funding the CAT and have considered a variety of different funding and cost allocation models. Each model has its potential advantages and disadvantages. For example, a structure in which all CAT Reporters are charged a fixed fee regardless of reportable activity would provide CAT Reporters greater certainty regarding their fee obligations, but may place undue burden on small CAT Reporters. A variable fee structure focused on specific reportable information may make it easier for Industry Members to pass fees to their customers. However, such fees would be more complex and difficult to administer. Participants were particularly sensitive to the possibility that the fee structure might create distortions to the economic activities of CAT Reporters if not set appropriately.

The Participants considered alternatives to cost allocation ranging from a strict pro-rata distribution, regardless of the type or size of the CAT Reporters, to a distribution based purely on CAT Reporter activity. Participants also considered a variety of ways to measure activity, including notional value of trading (as currently used for purposes of Section 31 fees), number of trades or quotations, and all message traffic sent. Further, Participants considered the comparability of audit trail activity across different Eligible Securities. The Participants discussed the potential approaches to funding, including the principles articulated in Article XI and an illustrative funding model, with the DAG multiple times, beginning on September 3, 2014.

After extensive analysis and taking into consideration feedback from the DAG, the Participants determined that a tiered fixed fee structure would be fair and relatively uncomplicated. The Participants discussed several approaches to developing a tiered model, including defining fee tiers based on such factors as size of firm, message traffic or trading dollar volume. For example, a review of OATS data for a recent month shows the wide range in activity among broker-dealers, with a number of broker-dealers submitting fewer than 1,000 orders for the month and other broker-dealers submitting millions and even billions of orders in the same period. The Participants also considered a tiered model where CAT Reporters would be charged different variable fees based on tier assignment. However, the Participants believe a tiered fixed fee model is preferable to a variable model because a variable model would lack the transparency, predictability, and ease of calculation afforded by fixed fees. Such factors are crucial to estimating a reliable revenue stream for the Company and to permitting CAT Reporters to reasonably predict their obligations. Moreover, the Participants believe that the tiered approach would help ensure that fees are equitably allocated among similarly situated CAT Reporters and would further the goal of the Participants to lessen the impact on smaller firms. Irrespective of the approach taken with fees, the Participants believe that revenues generated should be aligned to the costs of building, implementing and maintaining the CAT, and if revenues collected are in excess of costs for any given year, such excess should be considered in setting fees for the following year.

Finally, the Participants believe that it is important to establish a simple fee structure that is easy to understand and administer. The Participants are committed to establishing and billing fees so that Industry Members will have certainty and the ability to budget for them. In that regard, the CAT NMS Plan expressly provides that the Operating Committee shall not make any changes to any fees on more than a semi-annual basis unless, pursuant to a Supermajority Vote, the Operating Committee concludes that such change is necessary for the adequate funding of the Company.[227]

### 8. An Analysis of the Impact on Competition, Efficiency, and Capital Formation (SEC Rule 613(a)(1)(viii))

As required by SEC Rule 613(a)(1)(viii), this section provides an analysis of the impact on competition, efficiency and capital formation of creating, implementing, and maintaining the CAT NMS Plan. In recognition of the complexity of this analysis, the Participants have evaluated a variety of sources of information to assist in the analysis of the impact of the CAT NMS Plan on competition, efficiency and capital formation. Specifically, the Participants have evaluated the many comments related to competition, efficiency and capital formation received in response to the Commission's proposal of SEC Rule 613 and during the CAT NMS Plan development process. In addition, the Participants considered the input of the DAG. Finally, the Participants used information derived from three cost studies described in the prior section on costs. Based on a review and analysis of these materials, the Participants believe that the CAT NMS Plan, as submitted, is justified given its estimated impacts on competition, efficiency and capital formation.

[227] *See* Section 11.3(d) of the CAT NMS Plan.

### (a) Impact on Competition

Through an analysis of the data and information described above, the Participants have evaluated the potential impact of the CAT NMS Plan on competition, including the competitive impact on the market generally and the competitive impact on each type of Person playing a role in the market (e.g., Participants, broker-dealers, vendors, investors). Potential negative impacts on competition could arise if the CAT NMS Plan were to burden a group or class of CAT Reporters in a way that would harm the public's ability to access their services, either through increasing costs or decreased provision of those services. These impacts may be direct, as in the provision of brokerage services to individual investors, or indirect, as in the aggregate costs of managing, trading and maintaining a securities holding. These impacts should be measured relative to the economic baseline, described above.

The Participants have identified a series of potential impacts on competition that may arise as a result of the terms and conditions of the CAT NMS Plan. These potential impacts may be related to: (1) the technology ultimately used by the CAT and differences across CAT Reporters in their efforts necessary to meet the CAT NMS Plan's requirements; (2) the method of cost allocation across CAT Reporters; and (3) changes in regulatory reporting requirements, and their attendant costs, particularly to smaller entities, who may previously have benefited from regulatory exemptions.

In general, the Participants believe that the CAT NMS Plan will avoid disincentives such as placing an inappropriate burden on competition in the U.S. securities markets. The discussion below focuses on competition in the Participant and broker-dealer communities, where the Participants believe there is the greatest potential for impact on competition.

#### (i) Participants

The Participants already incur significant costs to maintain and surveil an audit trail of activity for which they are responsible. Each Participant bears these costs whether it expends internal resources to monitor relevant activity itself, or whether it contracts with others to perform these services on its behalf. The CAT NMS Plan, through the funding principles it sets forth in Section 11.2, seeks to distribute the regulatory costs associated with the development and maintenance of a meaningful and comprehensive audit trail in a principled manner. By calibrating the CAT NMS Plan's funding according to these principles, the Participants sought to avoid placing undue burden on exchanges relative to their core characteristics, including market share and volume of message traffic. Thus, the Participants do not believe that any particular exchange in either the equities or options markets would be placed at a competitive disadvantage in a way that would materially impact the respective Execution Venue marketplaces for either type of security.

In addition, because the CAT NMS Plan seeks to allocate costs in a manner consistent with the Participants' activities, the Participants do not believe that it would discourage potential new entrants. For instance, an equity ATS – which would already incur costs under the CAT NMS Plan as a reporting broker-dealer – should not be discouraged from becoming a national securities exchanges because of the costs it would incur as a Participant based on its business model or pricing structure. As proposed here, the entity would be assessed exactly the same

amount for a given level of activity whether it acted as an ATS or as an exchange. Accordingly, the Participants do not believe that adoption of the CAT NMS Plan would favor existing exchanges or types of exchanges vis-à-vis potential new competitors in a way that would degrade available Execution Venue services or pricing. For similar reasons, the Participants also do not believe that the costs of the CAT NMS Plan would distort the marketplace for existing or potential registered securities associations.

(ii) Broker-Dealers

Broker-dealer competition may be impacted if the direct and indirect costs associated with meeting the CAT NMS Plan's requirements materially impact the provision of their services to the public. Further, competition may be harmed if a particular class or group of broker-dealers bears the costs disproportionately, and as a result, investors have more limited choices or increased costs for certain types of broker-dealer services.

For larger broker-dealers, the Participants rely on the information obtained from the Costs to CAT Reporters Study and discussions with the industry to preliminarily conclude that the CAT NMS Plan will not likely have an adverse impact on competition. Under the CAT NMS Plan, broker-dealers would be assessed charges, as determined by the Operating Committee, for the build and maintenance of the CAT. They would also incur costs to build and maintain systems and processes necessary to submit and retain their own information to the Central Repository. The Participants' efforts to align costs with market activity leads to an outcome where dollar costs are borne significantly more by larger entities.

Additionally, large broker-dealers may view themselves as direct competitors to large Participants, in that they may provide similar execution services. The CAT NMS Plan seeks to mitigate competitive impacts by aligning the cost allocation in a manner that seeks comparability among the largest CAT Reporters regardless of their regulatory status.[228]

According to the Costs to CAT Reporters Study, for large broker-dealers, the average decrease in maintenance costs associated with the CAT (i.e., the cost that CAT would impose on firms beyond the current economic baseline) would be $651,924, and the average decrease in maintenance costs for small firms would be $726,216 using Approach 1. For Approach 2, large broker-dealers would see a decrease in maintenance costs associated with the CAT of $1,170,548, and small firms would see a decrease in the same costs of $763,371. These averages could suggest that the decreased costs imposed by the CAT would represent a benefit to both large and small broker-dealers' regulatory budgets. The Participants believe that the CAT NMS Plan would not materially disadvantage small broker-dealers versus large broker-dealers.

For small broker-dealers, the Participants considered their contribution to market activity as an important determinant of the amount of the cost of the CAT that they should bear. While

[228] There is empirical evidence that firms' order routing decisions respond to changes in trading fees. Such evidence finds that an increase in the level of an exchange's net fee is associated with a decrease in trading volume and market share relative to other exchanges. This evidence suggests that there is sufficient competition among Execution Venues such that where the Participant's costs for the CAT are material it may be difficult for Execution Venues to fully pass those costs to broker-dealers. This argument holds as long as broker-dealers are not able to pass such costs on to their customers. *See* Cardella et al., *Make and Take Fees in the U.S. Equity Market* (working paper, Apr. 29, 2013), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2149302.

this allocation of costs may be significant for some small firms, and may even impact their business models materially, SEC Rule 613 requires these entities to report. The Participants have not identified a way to further minimize the costs to these firms within the context of the funding principles established as part of the CAT NMS Plan.

The Participants were particularly sensitive during the development of the CAT NMS Plan to the potential burdens it could place on small broker-dealers. These broker-dealers may incur minimal costs under existing audit trail requirements because they are OATS-exempt or excluded broker-dealers or limited purpose broker-dealers. The Participants note that the CAT NMS Plan contemplates steps to diffuse the potential cost differential between large and small firms. For instance, small broker-dealers generally will have an additional year before they are required to start reporting data under the CAT NMS Plan to the Central Repository. This will permit these firms greater time to implement the changes to their own systems necessary to comply with the Plan. Furthermore, the Participants have sought exemptive relief concerning time stamps for recording the time of Manual Order Events.

The Participants are cognizant that the method by which costs are allocated to broker-dealers may have implications for their business models that might ultimately impact competition. For instance, if the method of cost allocation created disincentives to quoting activity, certain broker-dealer's business models might be affected more greatly than others. The Participants are unable to determine whether and how changing these incentives may impact competition. Participants intend to monitor changes to overall market activity and market quality and consider appropriate changes to the cost allocation model where merited.

The Participants note that if the exemption requests that have been submitted to the Commission are not granted, the requirements of SEC Rule 613 may impose significantly greater costs that could potentially cause small broker-dealers to exit the marketplace, discourage new entrants to the small broker-dealer marketplace, or impact the broker-dealer landscape in other ways that may dampen competitive pressures.

**(b) Impact on Efficiency**

Through an analysis of the data and information described above, the Participants have evaluated the impact of the CAT NMS Plan on efficiency, including the impact on the time, resources and effort needed to perform various regulatory and other functions. In general, the Participants believe that the CAT NMS Plan should have a net positive effect on efficiency.

Overall, the Participants believe that the CAT NMS Plan could improve market efficiency by reducing monitoring costs and increasing efficiency in the enforcement of Participant and Commission rules. Additionally, the Participants believe that the CAT will enable the Participants and the Commission to detect more quickly wrongdoing on a cross-market basis, which may deter some market participants from taking such actions. For example, FINRA's equity cross-market surveillance patterns have already demonstrated the value of integrating data from multiple markets. FINRA has found that approximately 44 percent of the manipulation-based alerts it generated involved conduct on two or more equity markets and 43

percent of the alerts involved conduct by two or more market participants.[229] A reduction in prohibited activity, as well as faster identification of such activity by regulators, would lead to a reduction in losses to investors and increased efficiency.

The CAT could also create more focused efficiencies for broker-dealers and Participants by reducing the redundant and overlapping systems and requirements identified above. For all CAT Reporters, the standardization of various technology systems will provide, over time, improved process efficiencies, including efficiencies gained through the replacement of outdated processes and technology with cost saving and related staffing reductions. Standardization of systems will improve efficiency, for both Participants and broker-dealers, in the form of resource consolidation, sun-setting of systems, consolidated legacy systems and processes and consolidated data processing. In addition, more sophisticated monitoring may reduce the number of ad hoc information requests, thereby reducing the overall burden and increasing the operational efficiency of CAT Reporters.

CAT Reporters may also experience various long term efficiencies from the increase in surveillance capabilities, such as greater efficiencies related to administrative functions provided by enhanced regulatory access, superior system speed and reduced system downtime. Moreover, the Commission and the Participants expect to have more fulsome access to unprocessed regulatory data and timely and accurate information on market activity, thus providing the opportunity for improved market surveillance and monitoring.

Note, however, that uniform reporting of data to the Central Repository may require the development of data mapping and data dictionaries that will impose burdens in the short term. CAT Reporters also may incur additional time and direct costs to comply with new encryption mechanisms in connection with the transmission of PII data (although the quality of the process will improve).

The Participants are cognizant that the method by which costs are allocated to broker-dealers may have implications for their business models that might ultimately impact efficiency. For instance, if the method of cost allocation created disincentives to the provision of liquidity, there may be an impact on the quality of the markets and an increase in the costs to investors to transact. As a result, the Participants set forth the funding principles that will guide the selection of the cost allocation model. The Participants have also sought out evidence available to best understand how cost allocation models may impact market participation, and more importantly, ultimately market outcomes.[230]

The Participants intend to monitor changes to overall market activity and market quality and will consider appropriate changes to the cost allocation model where merited.

**(c) Impact on Capital Formation**

[229] Remarks of Robert Ketchum, Chairman and Chief Executive Officer, FINRA (Sept. 17. 2014), *available at* http://www.finra.org/Newsroom/Speeches/Ketchum/P600785.
[230] *See, e.g.,* IIROC's analysis of its market regulation fee model, *available at* http://www.iiroc.ca/Documents/2011/5f95e549-10d1-473e-93cf-3250e026a476_en.pdf and http://www.iiroc.ca/Documents/2012/bf393b26-7bdf-49ff-a1fc-3904d1de3983_en.pdf.

Through an analysis of the data and information described above, the Participants also have assessed the impact of the CAT NMS Plan on capital formation, including the impact on both investments and the formation of additional capital. In general, the Participants believe that the CAT NMS Plan will have no deleterious effect on capital formation.

In general the Participants believe that the enhanced surveillance of the markets may instill greater investor confidence in the markets, which, in turn, may prompt greater participation in the markets. It is possible that greater investor participation in the markets could bolster capital formation by supporting the environment in which companies raise capital.

Moreover, the Participants believe that the CAT NMS Plan would not discourage capital formation. As discussed in greater detail above, the Participants have analyzed the degree to which the CAT NMS Plan should cover Primary Market Transactions. Based on this analysis, the Participants believe that the CAT NMS Plan has been appropriately tailored so it does not create an undue burden on the primary issuances that companies may use to raise capital.

In addition, the Participants do not believe that the costs of the CAT NMS Plan would come to bear on investors in a way that would materially limit their access to or participation in the capital markets.

Finally, the Participants believe that, given the CAT NMS Plan's provisions to secure the data collected and stored by the Central Repository, the CAT NMS Plan should not discourage participation by market participants who are worried about data security and data breaches. As described more fully in the CAT NMS Plan and Appendix C, The Security and Confidentiality of the Information Reported to the Central Repository, and Appendix D, Data Security, the Plan Processor will be responsible for ensuring the security and confidentiality of data during transmission and processing, as well as at rest, and for ensuring that the data is used only for permitted purposes. The Plan Processor will be required to provide physical security for facilities where data is transmitted or stored, and must provide for the security of electronic access to data by outside parties, including Participants and the Commission, CAT Reporters, or Data Submitters. The Plan Processor must include in these measures heightened security for populating, storing, and retrieving particularly sensitive data such as PII. Moreover, the Plan Processor must develop and maintain this security program with a dedicated staff including, among others, a Chief Information Security Officer dedicated to monitoring and addressing data security issues for the Plan Processor and Central Repository, subject to regular review by the Chief Compliance Officer. The Plan Processor also will be required to provide regular reports to the Operating Committee on a number of items, including any data security issues for the Plan Processor and Central Repository.

**(d) Impacts of the CAT NMS Plan Governance on Efficiency, Competition, and Capital Formation**

Participants considered the impacts of the CAT NMS Plan governance on efficiency, competition, and capital formation. Participants recognize that without effective governance, it will become harder for the CAT NMS Plan to achieve its intended outcome, namely, enhanced investor protection, in an efficient manner. Participants specifically considered two areas where ineffective governance might lead to economic distortions or inefficiencies: (i) the voting

protocols defined in the CAT NMS Plan both for Participants in developing the CAT, and for the Operating Committee after the adoption of the CAT NMS Plan; and (ii) the role of industry advisors within the context of CAT NMS Plan governance.

Participants understand that there may be detrimental impacts to adopting voting protocols that might impede the effective administration of the CAT System. For instance, too high a threshold for decision making may limit the ability of the body to adopt broadly agreed upon provisions. The extreme form of this would have been for the CAT NMS Plan to require unanimity on all matters. In such case, one dissenting opinion could effectively derail the entire decision-making apparatus. The inability to act in a timely way may create consequences for efficiency, competition, and capital. Conversely, if Participants set a voting threshold that is too low, it might have the impact of not giving sufficient opportunity to be heard or value to dissenting opinions and alternative approaches. As an example, if Participants were to set voting thresholds too low, it might be possible for a set of Participants to adopt provisions that might provide them a competitive advantage over other Participants. Either forms (a too high or too low threshold) could result in negative impacts to efficiency, competition, and capital formation. These issues apply in the context of efforts of the Participants to develop the CAT NMS Plan submitted here or in the context of the Operating Committee's responsibilities after approval of the CAT NMS Plan.

To address these concerns, Participants carefully considered which matters should require a Supermajority Vote and which matters should require a Majority Vote.[231] The decision required Participants to balance the protection of rights of all parties with the interest of avoiding unnecessary deadlock in the decision making process. As a result, Participants have determined that use of a Supermajority Vote should be for instances considered by the Participants to have a direct and significant impact on the functioning, management, and financing of the CAT System. This formulation, relying on Majority Vote for routine decisions and Supermajority Vote for significant matters, is intended to meet the Commission's direction for "efficient and fair operation of the NMS plan governing the consolidated audit trail."[232]

Participants also considered the role of industry representation as part of the governance structure. Participants recognize the importance of including industry representation in order to assure that all affected parties have a representative in discussing the building, implementation, and maintenance of the CAT System. Participants actively sought insight and information from the DAG and other industry representatives in developing the CAT NMS Plan. The CAT NMS Plan also contemplates continued industry representation through an Advisory Committee, intended to support the Operating Committee and to promote continuing efficiency in meeting the objective of the CAT.

## C. IMPLEMENTATION AND MILESTONES OF THE CAT.

[231] Further discussion of the Participants' consideration of the use of the Majority Vote and Supermajority Vote is contained in Appendix C, 11, Process by Which Participants Solicited Views of Members and Other Appropriate Parties Regarding Creation, Implementation, and Maintenance of CAT; Summary of Views; and How Sponsors Took Views Into Account in Preparing NMS Plan (SEC Rule 613(a)(1)(xi)).
[232] Adopting Release at 45787.

## 9. A Plan to Eliminate Existing Rules and Systems (SEC Rule 613(a)(1)(ix))

As required by SEC Rule 613(a)(1)(ix), this section sets forth a plan to eliminate rules and systems (or components thereof) that will be rendered duplicative by the consolidated audit trail, including identification of such rules and systems (or components thereof); to the extent that any existing rules or systems related to monitoring quotes, orders and executions provide information that is not rendered duplicative by the consolidated audit trail, an analysis of, among other things, whether the collection of such information remains appropriate; if still appropriate whether such information should continue to be separately collected or should instead be incorporated into the CAT; or if no longer appropriate, how the collection of such information could be efficiently terminated.

| **Milestone** | **Completion Date** |
|---|---|
| Identification of Duplicative Rules and Systems | |
| Each Participant will initiate an analysis of its rules and systems to determine which require information that is duplicative of the information available to the Participants through the Central Repository. Examples of Participants' rules to be reviewed include:<br>• The Participants' rules that implement the exchange-wide Consolidated Options Audit Trail System (e.g., CBOE Rule 6.24, etc.)<br>• FINRA rules that implement the Order Audit Trail System (OATS) including the relevant rules of the NASDAQ Stock Market, NASDAQ OMX BX, NASDAQ OMX PHLX, New York Stock Exchange, NYSE MKT, and NYSE ARCA<br>• Option exchange rules that require the reporting of transactions in the | The Participants with duplicative systems have completed gap analyses for systems and rules identified for retirement in full,[233] and have confirmed that data that would need to be captured by the CAT to support retirement of these systems will be included in the CAT. |

[233] The systems and rules identified for retirement (in full or in part) include: FINRA's OATS Rules (7400 Series), the rules of other Participants that incorporate FINRA's OATS requirements (e.g. NASDAQ Rule 7000A Series, BX Rule 6950 Series, PHLX Rule 3400 Series, NYSE Rule 7400 Series, NYSE Arca Equities Rule 7400 Series, and NYSE MKT Rule 7400 Series), COATS and associated rules, NYSE Rule 410(b), PHLX Rule 1022, CBOE Rule 8.9, EBS and associated rules, C2 Rule 8.7, and CHX BrokerPlex reporting (Rule 5).

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| equity underlier for options products listed on the options exchange (e.g., PHLX Rule 1022, portions of CBOE Rule 8.9, etc.) | |
| Identification of Partially Duplicative Rules and Systems | |
| Each Participant will initiate an analysis of its rules and systems to determine which rules and/ or systems require information that is partially duplicative of the information available to the Participants through the Central Repository. The analysis should include a determination as to (1) whether the duplicative information available in the Central Repository should continue to be collected by the Participant; (2) whether the duplicative information made available in the Central Repository can be used by the Participant without degrading the effectiveness of the Participant's rules or systems; and (3) whether the non-duplicative information should continue to be collected by the Participant or, alternatively, should be added to information collected by the Central Repository.<br><br>Examples of Participants' rules to be reviewed include:<br><br>• Options exchange rules that require the reporting of large options positions (e.g., CBOE Rule 4.13, etc.)<br><br>• NYSE Rule 410B which requires the reporting of transactions effected in NYSE listed securities by NYSE members which are not reported to the consolidated reporting systems<br><br>• Portions of CBOE Rule 8.9 concerning position reporting details | The Participants with duplicative systems have completed gap analyses for systems and rules identified for retirement in part, and have confirmed that data that would need to be captured by the CAT to support retirement of these systems will be included in the CAT. |

| Identification of Non-Duplicative Rules or System related to Monitoring Quotes, Orders and Executions | |
|---|---|
| Each Participant will initiate an analysis of its rules and systems to determine which of the Participant's rules and systems related to monitoring quotes, orders, and executions provide information that is not rendered duplicative by the consolidated audit trail. Each Participant must analyze (1) whether collection of such information should continue to be separately collected or should instead be incorporated into the consolidated audit trail; (2) if still appropriate, whether such information should continue to be separately collected or should instead be incorporated into the consolidated audit trail.; and (3) if no longer appropriate, how the collection of such information could be efficiently terminated, the steps the Participants propose to take to seek Commission approval for the elimination of such rules and systems (or components thereof), and a timetable for such elimination, including a description of the phasing-in of the consolidated audit trail and phasing-out of such existing rules and systems (or components thereof). | The Participants with duplicative systems have completed gap analyses for systems and rules identified for retirement in full or in part, and have confirmed that data that would need to be captured by the CAT to support retirement of these systems will be included in the CAT. |
| Identification of Participant Rule and System Changes Due to Elimination or Modification of SEC Rules | |
| To the extent the SEC eliminates SEC rules that require information that is duplicative of information available through the Central Repository, each Participant will analyze its rules and systems to determine whether any modifications are necessary (e.g., delete references to outdated SEC rules, etc.) to support data requests made pursuant to such SEC rules. Examples of rules the SEC | Each Participant should complete its analysis within three (3) months after the SEC approves the deletion or modification of an SEC rule related to the information available through the Central Repository.<br><br>The Participants will coordinate with the SEC regarding modification of the CAT NMS Plan to include information sufficient to eliminate or modify those |

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| might eliminate or modify as a result of the implementation of CAT include:<br><br>• SEC Rule 17a-25 which requires brokers and dealers to submit electronically to the SEC information on Customers and firms securities trading<br><br>• SEC Rule 17h-1 concerning the identification of large traders and the required reporting obligations of large traders | Exchange Act rules or systems that the SEC deems appropriate.<br><br>With respect to SEC Rule 17a-25, such coordination will include, among other things, consideration of EBS data elements and asset classes that would need to be included in the Plan, as well as the timing of when all Industry Members will be subject to the Plan.[234]<br><br>Based on preliminary industry analyses, broker-dealer large trader reporting requirements under SEC Rule 13h-1 could be eliminated via the CAT. The same appears true with respect to broker-dealer large trader recordkeeping. Large trader reporting responsibilities on Form 13H and self-identification would not appear to be covered by the CAT.[235] |
| Participant Rule Changes to Modify or Eliminate Participant Rules | |
| Each Participant will prepare appropriate rule change filings to implement the rule modifications or deletions that can be made based on the Participant's analysis of duplicative or partially duplicative rules. The rule change filing should describe the process for phasing out the requirements under the relevant rule. | Each Participant will file with the SEC the relevant rule change filing to eliminate or modify its duplicative rules within six (6) months of the SEC's approval of the CAT NMS Plan, the elimination of such rules and the retirement of the related systems to be effective at such time as CAT Data meets minimum standards of accuracy and reliability. In this filing, each Participant shall discuss:<br><br>(i) specific accuracy and reliability standards that will determine when duplicative systems will be retired, including, but not limited to, whether the |

[234] *See* SEC Rule 613 – Consolidated Audit Trail (CAT) Preliminary EBS-CAT Gap Analysis, *available at* http://catnmsplan.com/web/groups/catnms/@catnms/documents/appsupportdocs/p450537.pdf.
[235] *See* FIF CAT WG: Preliminary Large Trader Rule (Rule 13h-1) – CAT (Rule 613) Gap Analysis (Feb. 11, 2014), *available at* https://fif.com/fif-working-groups/consolidated-audit-trail/member-resources/current-documents?download=1221:february-11-2014-fif-cat-wg-preliminary-large-trader-rule-rule-13h-1-cat-rule-613-gap-analysis&start=35.

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| | attainment of a certain Error Rate should determine when a system duplicative of the CAT can be retired;<br><br>(ii) whether the availability of certain data from Small Industry Members two years after the Effective Date would facilitate a more expeditious retirement of duplicative systems; and<br><br>(iii) whether individual Industry Members can be exempted from reporting to duplicative systems once their CAT reporting meets specified accuracy and reliability standards, including, but not limited to, ways in which establishing cross-system regulatory functionality or integrating data from existing systems and the CAT would facilitate such Individual Industry Member exemptions.<br><br>Between the Effective Date and the retirement of the Participants' duplicative systems, each Participant, to the extent practicable, will attempt to minimize changes to those duplicative systems. |
| Elimination (including any Phase-Out) of Relevant Existing Rules and Systems | |
| After each Participant completes the above analysis of its rules and systems, each Participant will analyze the most appropriate and expeditious timeline and manner for eliminating such rules and systems. | Upon the SEC's approval of relevant rule changes, each Participant will implement such timeline. One consideration in the development of these timelines will be when the quality of CAT Data will be sufficient to meet the surveillance needs of the Participant (i.e., to sufficiently replace current reporting data) before existing rules and systems can be eliminated. |

**Order Audit Trail System ("OATS")**

The OATS Rules impose obligations on FINRA members to record in electronic form and report to FINRA, on a daily basis, certain information with respect to orders originated, received, transmitted, modified, canceled, or executed by members relating to OTC equity securities[236] and NMS Securities.[237] OATS captures this order information and integrates it with quote and transaction information to create a time-sequenced record of orders, quotes, and transactions. This information is then used by FINRA staff to conduct surveillance and investigations of member firms for potential violations of FINRA rules and federal securities laws. In general, the OATS Rules apply to any FINRA member that is a "Reporting Member," which is defined in Rule 7410 as "a member that receives or originates an order and has an obligation to record and report information under Rules 7440 and 7450."

Although FINRA is committed to retiring OATS in as efficient and timely a manner as practicable, its ability to retire OATS is dependent on a number of events. Most importantly, before OATS can be retired, the Central Repository must contain CAT Data sufficient to ensure that FINRA can effectively conduct surveillance and investigations of its members for potential violations of FINRA rules and federal laws and regulations, which includes ensuring that the CAT Data is complete and accurate. Consequently, one of the first steps taken by the Participants to address the elimination of OATS was an analysis of gaps between the informational requirements of SEC Rule 613 and current OATS recording and reporting rules. In particular, SEC Rule 613(c)(5) and (6) require reporting of data only for each NMS Security that is (a) registered or listed for trading on a national securities exchange; (b) or admitted to unlisted trading privileges on such exchange; or (c) for which reports are required to be submitted to the national securities association. SEC Rule 613(i) requires the Participants to provide to the Commission within six months after the Effective Date a document outlining how the Participants could incorporate into the consolidated audit trail information with respect to equity securities that are not NMS Securities ("OTC Equity Securities") and debt securities (and Primary Market Transactions in such securities). Even though SEC Rule 613 does not require reporting of OTC Equity Securities, the Participants have agreed to expand the reporting requirements to include OTC Equity Securities to facilitate the elimination of OATS.[238]

Next, the Participants performed a detailed analysis of the current OATS requirements and the specific reporting obligations under SEC Rule 613 and concluded that there are 42 data elements found in both OATS and SEC Rule 613; however, there are 33 data elements currently captured in OATS that are not specified in SEC Rule 613.[239] The Participants believe it is appropriate to incorporate data elements into the Central Repository that are necessary to retire OATS and the OATS Rules. The Participants believe that these additional data elements will increase the likelihood that the Central Repository will include sufficient order information to

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[236] *See* FINRA Rule 7410(l).

[237] Other SROs have rules requiring their members to report information pursuant to the OATS Rules. *See, e.g.,* NYSE Rule 7400 Series; NASDAQ Rule 7400 Series.

[238] This expansion of the CAT reporting requirements to OTC Equity Securities was generally supported by members of the broker-dealer industry and was discussed with the DAG on July 24, 2013.

[239] SEC Rule 613(c)(7) lists the minimum order information that must be reported to the CAT and specifies the information that must be included in the CAT NMS Plan. The Commission noted in the Adopting Release that "the SROs are not prohibited from proposing additional data elements not specified in Rule 613 if the SROs believe such data elements would further, or more efficiently, facilitate the requirements of [SEC Rule 613]." Adopting Release at 45750.

ensure FINRA can continue to perform its surveillance with CAT Data rather than OATS data and can, thus, more quickly eliminate OATS and the OATS Rules.

The purpose of OATS is to collect data to be used by FINRA staff to conduct surveillance and investigations of member firms for potential violations of FINRA rules and federal securities laws and regulations. SEC Rule 613 requires the Participants to include in the CAT NMS Plan a requirement that all Industry Members report information to the Central Repository within three years after the Effective Date. Consistent with this provision, under the terms of Sections 6.4 and 6.7 of the CAT NMS Plan, some Reporting Members will not be reporting information to the Central Repository until three years after the Effective Date. Because FINRA must continue to perform its surveillance obligations without interruption, OATS cannot be entirely eliminated until all FINRA members who currently report to OATS are reporting CAT Data to the Central Repository. However, FINRA will monitor its ability to integrate CAT Data with OATS data to determine whether it can continue to perform its surveillance obligations. If it is practicable to integrate the data in a way that ensures no interruption in FINRA's surveillance capabilities, FINRA will consider exempting firms from the OATS Rules provided they report data to the Central Repository pursuant to the CAT NMS Plan and any implementing rules.

FINRA's ability to eliminate OATS reporting obligations is dependent upon the ability of the Plan Processor and FINRA to work together to integrate CAT Data with the data collected by OATS. FINRA is committed to working diligently with the Plan Processor to ensure this process occurs in a timely manner; however, it is anticipated that Reporting Members will have to report to both OATS and the Central Repository for some period of time until FINRA can verify that the data into the Central Repository is of sufficient quality for surveillance purposes and that all reporting requirements meet the established steady state Error Rates set forth in Section A.3(b). Once this is verified, FINRA's goal is to minimize the dual-reporting requirement.

Finally, the Participants note that, pursuant to Section 19 of the Exchange Act, the amendment or elimination of the OATS Rules can only be done with Commission approval. Approval of any such filings is dependent upon a number of factors, including public notice and comment and required findings by the Commission before it can approve any amendments; therefore, FINRA cannot speculate how long this process may ultimately take.

## 10. Objective Milestones to Assess Progress (SEC Rule 613(a)(1)(x))

As required by SEC Rule 613(a)(1)(x), this section sets forth a series of detailed objective milestones, with required completion dates, toward implementation of the consolidated audit trail.

### (a) Publication and Implementation of the Methods for Providing Information to the Customer-ID Database

| Milestone | Completion Date |
|---|---|
| **Selection of Plan Processor** | |

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| Participants jointly select the Initial Plan Processor pursuant to the process set forth in Article V of the CAT NMS Plan | No later than 2 months after Effective Date |
| **Industry Members (other than Small Industry Members[240])** | |
| Plan Processor begins developing the procedures, connectivity requirements and Technical Specifications for Industry Members to report Customer Account Information and Customer Identifying Information to the Central Repository | No later than 15 months before Industry Members (other than Small Industry Members) are required to begin reporting data to the Central Repository |
| Plan Processor publishes iterative drafts of the procedures, connectivity requirements and Technical Specifications for Industry Members to Report Customer Account Information and Customer Identifying Information to the Central Repository | As needed before publishing the final documents |
| Plan Processor publishes the procedures, connectivity requirements and Technical Specifications for Industry Members to report Customer Account Information and Customer Identifying Information to the Central Repository | No later than 6 months before Industry Members (other than Small Industry Members) are required to begin reporting data to the Central Repository |
| Industry Members (other than Small Industry Members) begin connectivity and acceptance testing with the Central Repository | No later than 3 months before Industry Members (other than Small Industry Members) are required to begin reporting data to the Central Repository |
| Industry Members (other than Small Industry Members) begin reporting customer / institutional / firm account information to the Central Repository for processing | No later than 1 month before Industry Members (other than Small Industry Members) are required to begin reporting data to the Central Repository |
| **Small Industry Members** | |

[240] Small broker-dealers are defined SEC Rule 0-10(c).

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| Small Industry Members begin connectivity and acceptance testing with the Central Repository | No later than 3 months before Small Industry Members are required to begin reporting data to the Central Repository |
| Small Industry Members begin reporting customer / institutional / firm account information to the Central Repository for processing | No later than 1 month before Small Industry Members are required to begin reporting data to the Central Repository |

**(b) Submission of Order and MM Quote Data to Central Repository**

| Milestone | Completion Date |
|---|---|
| **Participants** | |
| Plan Processor begins developing Technical Specification(s) for Participant submission of order and MM Quote data | No later than 10 months before Participants are required to begin reporting data to the Central Repository |
| Plan Processor publishes iterative drafts of Technical Specification(s) | As needed before publishing of the final document |
| Plan Processor publishes Technical Specification(s) for Participant submission of order and MM Quote data | No later than 6 months before Participants are required to begin reporting data to the Central Repository |
| Plan Processor begins connectivity testing and accepting order and MM Quote data from Participants for testing purposes | No later than 3 months before Participants are required to begin reporting data to the Central Repository |
| Plan Processor plans specific testing dates for Participant testing of order and MM Quote submission | No later than 3 months before Participants are required to begin reporting data to the Central Repository |
| **Industry Members (other than Small Industry Members)** | |
| Plan Processor begins developing Technical Specification(s) for Industry Members submission of order data | No later than 15 months before Industry Members (other than Small Industry Members) are required to |

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|---|---|
| | begin reporting data to the Central Repository |
| Plan Processor publishes iterative drafts of Technical Specification(s) | As needed before publishing of the final document |
| Plan Processor publishes Technical Specification(s) for Industry Member submission of order data | No later than 1 year before Industry Members (other than Small Industry Members) are required to begin reporting data to the Central Repository |
| Participant exchanges that support options MM quoting publish specifications for adding Quote Sent time to Quoting APIs | No later than 6 months before Industry Members (other than Small Industry Members) are required to begin reporting data to the Central Repository |
| Plan Processor makes the testing environment available on a voluntary basis and begins connectivity testing and accepting order data from Industry Members (other than Small Industry Members) for testing purposes | No later than 6 months before Industry Members (other than Small Industry Members) are required to begin reporting data to the Central Repository |
| Plan Processor and Industry Members begin coordinated and structured testing of order submission | No later than 3 months before Industry Members (other than Small Industry Members) are required to begin reporting data to the Central Repository |
| Participant exchanges that support options MM quoting begin accepting Quote Sent time on Quotes | No later than 1 month before Industry Members (other than Small Industry Members) are required to begin reporting data to the Central Repository |
| **Small Industry Members** | |
| Plan Processor makes the testing environment available on a voluntary basis and begins connectivity testing and accepting order data from Small Industry Members for testing purposes | No later than 6 months before Small Industry Members are required to begin reporting data to the Central Repository |

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| Plan Processor and Small Industry Members begin coordinated and structured testing of order submissions | No later than 3 months before Small Industry Members are required to begin reporting data to the Central Repository |

**(c) Linkage of Lifecycle of Order Events**

| Milestone | Completion Date |
|---|---|
| **Participants** | |
| Using order and MM Quote data submitted during planned testing, Plan Processor creates linkages of the lifecycle of order events based on the received data | No later than 3 months before Participants are required to begin reporting data to the Central Repository |
| Participants must synchronize Business Clocks in accordance with Section 6.8 of the CAT NMS Plan | No later than 4 months after effectiveness of the CAT NMS Plan |
| **Industry Members (other than Small Industry Members)** | |
| Using order and MM Quote data submitted during planned testing, Plan Processor creates linkages of the lifecycle of order events based on the received data | No later than 6 months before Industry Members (other than Small Industry Members) are required to begin reporting data to the Central Repository |
| Industry Members must synchronize Business Clocks in accordance with Section 6.8 of the CAT NMS Plan | No later than 4 months after effectiveness of the CAT NMS Plan |
| **Small Industry Members** | |
| Using order and MM Quote data submitted during planned testing, Plan Processor creates linkages of the lifecycle of order events based on the received data | No later than 6 months before Small Industry Members are required to begin reporting data to the Central Repository |
| Industry Members must synchronize Business Clocks in accordance with Section 6.8 of the CAT NMS Plan | No later than 4 months after effectiveness of the CAT NMS Plan |

### (d) Access to the Central Repository for Regulators

| Milestone | Completion Date |
|---|---|
| Plan Processor publishes a draft document detailing methods of access to the Central Repository for regulators | No later than 6 months before Participants are required to begin reporting data to the Central Repository |
| Plan Processor publishes a finalized document detailing methods of access to the Central Repository for regulators, including any relevant APIs, GUI descriptions, etc. that will be supplied for access | No later than 1 month before Participants are required to begin reporting data to the Central Repository |
| Plan Processor provides (1) test information, either from Participant testing or from other test data, for regulators to test use of the Central Repository and (2) regulators connectivity to the Central Repository test environment and production environments | No later than 1 month before Participants are required to begin reporting data to the Central Repository |
| Plan Processor provides regulators access to test data for Industry Members (other than Small Industry Members) | No later than 6 months before Industry Members (other than Small Industry Members) are required to begin reporting data to the Central Repository |
| Plan Processor provides regulators access to test data for Small Industry Members | No later than 6 months before Small Industry Members are required to begin reporting data to the Central Repository |

**(e) Integration of Other Data ("Other Data" includes, but is not limited to, SIP quote and trade data, OCC data, trade and quote information from Participants and reference data)**

| Milestone | Completion Date |
|---|---|
| Operating Committee finalizes Other Data requirements | No later than 10 months before Participants are required to begin reporting data to the Central Repository |
| Plan Processor determines methods and requirements for each additional data source and publish applicable Technical Specifications, if required | No later than 3 months before Participants are required to begin reporting data to the Central Repository |
| Plan Processor begins testing with Other Data sources | No later than 1 month before Participants are required to begin reporting data to the Central Repository |
| Plan Processor begins accepting Other Data sources | No later than concurrently when Participants report to the Central Repository |

**D. PROCESS FOLLOWED TO DEVELOP THE NMS PLAN.** These considerations require the CAT NMS Plan to discuss: (i) the views of the Participants' Industry Members and other appropriate parties regarding the creation, implementation, and maintenance of the CAT; and (ii) the alternative approaches to creating, implementing, and maintaining the CAT considered and rejected by the Participants.

**11. Process by Which Participants Solicited Views of Members and Other Appropriate Parties Regarding Creation, Implementation, and Maintenance of CAT; Summary of Views; and How Sponsors Took Views Into Account in Preparing NMS Plan (SEC Rule 613(a)(1)(xi))**

**(a) Process Used to Solicit Views:**

When the Participants first began creating a CAT pursuant to SEC Rule 613, the Participants developed the following guiding principles (the "Guiding Principles"):

i. The CAT must meet the specific requirements of SEC Rule 613 and achieve the primary goal of creating a single, comprehensive audit trail to enhance regulators' ability to surveil the U.S. markets in an effective and efficient way.

ii. The reporting requirements and technology infrastructure developed must be adaptable to changing market structures and reflective of trading practices, as well as scalable to increasing market volumes.

iii. The costs of developing, implementing, and operating the CAT should be minimized to the extent possible. To this end, existing reporting structures and technology interfaces will be utilized where practicable.

iv. Industry input is a critical component in the creation of the CAT. The Participants will consider industry feedback before decisions are made with respect to reporting requirements and cost allocation models.

The Participants explicitly recognized in the Guiding Principles that meaningful input by the industry was integral to the successful creation and implementation of the CAT, and as outlined below, the Participants have taken numerous steps throughout this process to ensure the industry and the public have a voice in the process.

(i) General Industry Solicitation

SEC Rule 613 was published in the Federal Register on August 1, 2012, and the following month, the Participants launched the CAT NMS Plan Website, which includes a dedicated email address for firms or the public to submit views on any aspect of the CAT. The CAT NMS Plan Website has been used as a means to communicate information to the industry and the public at large since that time. Also beginning in September 2012, the Participants hosted several events intended to solicit industry input regarding the CAT NMS Plan. A summary of the events is provided below:[241]

- *CAT Industry Call (September 19, 2012)*. The Participants provided an overview of SEC Rule 613, the steps the Participants were taking to develop a CAT NMS Plan as required by SEC Rule 613, and how the Participants planned to solicit industry comments and feedback on key implementation issues.

- *CAT Industry Events (October 2012)*. The Participants provided an overview of SEC Rule 613 and the steps the Participants were taking to develop an NMS Plan as required by SEC Rule 613. The events included an open Q & A and feedback session so that Industry Members could ask questions of the Participants and share feedback on key implementation issues. Two identical sessions were held on October 15, 2012 from 2:00 p.m. to 4:00 p.m. and on October 16, 2012 from 10:00 a.m. to 12:00 p.m. A total of 89 Industry Members attended the October 15 event in person, and a total of 162 Industry Members attended it by phone. A total of 130 Industry Members attended the October 16 event in person, and a total of 48 Industry Members attended it by phone.

[241] These events are also described on the CAT NMS Plan Website at www.catnmsplan.com. *See* SEC Rule 613: Consolidated Audit Trail (CAT), Past Events and Announcements (last updated Dec. 10, 2014), *available at* http://catnmsplan.com/PastEvents/.

- *CAT Industry Call and WebEx (November 29, 2012)*. The Participants provided an update on CAT NMS Plan development efforts including the process and timeline for issuing the RFP to solicit Bids to build and operate the CAT.

- *CAT Industry Events (February 27, 2014 and April 9, 2014)*. During these two events, the Participants provided an overview of the latest progress on the RFP process and the overall development of the NMS Plan. A total of 120 Industry Members attended the February event in person, and a total of 123 Industry Members attended it by phone. A total of 46 Industry Members attended the April event in person, and a total of 76 Industry Members attended it by phone.

- *CAT Cost Study Webinars (June 25, 2014 and July 9, 2014)*. The Participants hosted two Webinars to review and answer questions related to the Reporter Cost Study. There were approximately 100 to 120 Industry Members on each call.

- *CAT Industry Call and WebEx (December 10, 2014)*. The Participants provided an update on CAT NMS Plan development efforts, including filing of the CAT NMS Plan on September 30, 2014, the development of a funding model, and the PPR, which documents additional requirements for the CAT.

For the above events, documentation was developed and presented to attendees, as well as posted publicly on the CAT NMS Plan Website.

In addition to the above events, some Participants individually attended or participated in additional industry events, such as SIFMA conferences and FIF working groups, where they provided updates on the status of CAT NMS Plan development and discussed areas of expected CAT functionality.

The Participants received general industry feedback from broker-dealers and software vendors.[242] The Participants reviewed such feedback in detail, and addressed as appropriate while developing the RFP.

The Participants also received industry feedback in response to solicitations by the Participants for industry viewpoints as follows:

- *Proposed RFP Concepts Document (published December 5, 2012, updated January 16, 2013)*. The Participants published via the CAT NMS Plan Website this document to solicit feedback on the feasibility and cost of implementing the CAT reporting requirements being considered by the Participants. Feedback was received from seven organizations, including software vendors, industry associations and broker-dealers, and the Participants discussed and addressed the feedback as appropriate in the final RFP document.

[242] *See generally* Industry Feedback on the Consolidated Audit Trail (last updated Feb. 17, 2015), *available at* http://catnmsplan.com/industryFeedback/.

- *Representative Order Scenarios Solicitation for Feedback (February 1, 2013)*. The Participants solicited feedback via the CAT NMS Plan Website on potential CAT reporting requirements to facilitate the reporting of representative orders. Approximately 30 responses were received.

- *CAT Industry Solicitation for Feedback Concerning Selected Topics Related to NMS Plan (April 22, 2013)*. The Participants solicited feedback via the CAT NMS Plan Website on four components of the CAT NMS Plan: (1) Primary Market Transactions; (2) Advisory Committee; (3) Time Stamp Requirement; and (4) Clock Synchronization. Approximately 80 Industry Members provided responses. FIF, SIFMA, and Thomson Reuters submitted detailed responses to the request for comments.

- *CAT Industry Solicitation for Feedback Concerning Selected Topics Related to NMS Plan (June 2013)*. The Participants solicited feedback via the CAT NMS Plan Website concerning Customer identifiers, Customer information, CAT-Reporter-IDs, CAT-Order-IDs, CAT intra-firm order linkages, CAT inter-firm order linkages, broker-dealer CAT order-to-exchange order linkages, data transmission, and error correction.

- *CAT Industry Feedback on Clock Drift and Time Stamp Issues (September 2013)*. The Participants solicited feedback via the DAG concerning the implementation impact associated with a 50 millisecond clock drift requirement for electronic orders and executions.

- *Cost Survey on CAT Reporting of Options Market Maker Quotes (November 2013).* The Participants solicited feedback via the DAG concerning the implementation impact and costs associated with reporting of quotes by options market makers to the Central Repository.

- *Cost Estimates for CAT Exemptive Relief (December 2014).* The Participants solicited feedback via the DAG regarding minimum additional costs to be expected by Industry Members in the absence of the requested Exemptive Relief.

- *Cost Estimate for Adding Primary Market Transactions in CAT (February 2015).* The Participants solicited feedback via the DAG concerning the feasibility and costs of broker-dealers to report to the Central Repository information regarding primary market transactions in NMS securities.

- *Clock Offset Survey (February 2015).* The Participants solicited further feedback via the DAG concerning current broker-dealer clock synchronization practices and expected costs associated with complying with a 50ms, 5ms, 1ms, and 100 microsecond clock drift requirement for electronic orders and executions.

Feedback on these topics was received primarily through discussion during meetings of the DAG.

(ii) The Development Advisory Group (DAG)

In furtherance of Guiding Principle (iv) above, the Participants solicited members for the DAG in February 2013 to further facilitate input from the industry regarding various topics that are critical to the success of the CAT NMS Plan. Initially, the DAG consisted of 10 firms that represented large, medium, and small broker-dealers, the Options Clearing Corporation (OCC), a service bureau and three industry associations: the Security Traders Association (STA), SIFMA, and FIF.

In March 2014, the Participants invited additional firms to join the DAG in an effort to ensure that it reflected a diversity of perspectives. At this time, the Participants increased the membership of the DAG to include 12 additional firms. As of January 2015, the DAG consisted of the Participants and Representatives from 24 firms and industry associations.

The DAG has had 49 meetings since April 2013. Topics discussed with the DAG have included:

- *CAT Plan Feedback.* The Participants shared draft versions of the CAT NMS Plan, including the PPR, as it was being developed with the DAG, who provided feedback to the Participants. The Participants reviewed and discussed this feedback with the DAG, and incorporated portions of it into the CAT NMS Plan.

- *Options Market Maker Quotes.* The DAG discussed the impact of options market maker quotes on the industry. A cost analysis was conducted by the industry trade associations to analyze the impact of market maker quote reporting, as well as adding a "quote sent" time stamp to messages sent to exchanges by all options market makers The Participants included in the Exemptive Request Letters a request for exemptive relief related to option market maker quotes given that exchanges will be reporting this data to the CAT.

- *Customer-ID.* The DAG discussed the requirements for capturing Customer-ID. The Participants proposed a Customer Information Approach in which broker-dealers assign a unique Firm Designated ID to each Customer and the Plan Processor creates and stores the Customer-ID. This concept was supported by the DAG and the Participants included in the Exemptive Request Letters a request for exemptive relief related to the Customer-ID to reduce the reporting on CAT Reporters.

- *Time Stamp, Clock Synchronization and Clock Drift.* The DAG discussed time stamps in regards to potential exemptive relief on the time stamp requirements for allocations and Manual Order Events. In addition, industry clock synchronization processes were discussed as well as the feasibility of specific clock drift requirements (e.g., 50ms), with the DAG and the FIF conducting an industry survey to identify the costs and challenges associated with various levels of clock synchronization

requirements.[243] The Participants included in the Exemptive Request Letters a request for exemptive relief related to manual time stamps.

- *Exemptive Request Letters*. In addition to the specific areas detailed above (Options Market Maker Quotes, Customer-ID, and Time Stamp, Clock Synchronization, and Clock Drift), the DAG provided input and feedback on draft versions of the Exemptive Request Letters prior to their filing with the SEC, including cost estimates to firms and the Industry as a whole should the exemptive requests not be granted. This feedback was discussed by the Participants and the DAG and incorporated into the Exemptive Request Letters. The DAG also provided input and feedback on the Exemptive Request Letters covering Linking Allocations to Executions and Account Effective Date submitted on April 3, 2015 and September 2, 2015 respectively.

- *Primary Markets*. At the request of the Participants, the DAG discussed with the Participants the feasibility, costs, and benefits associated with reporting allocations of NMS Securities in Primary Market Transactions. The DAG further provided estimated costs associated with reporting allocations of NMS Securities in Primary Market Transactions at the top-account and sub-account levels, which was incorporated into the CAT NMS Plan.[244]

- *Order Handling Scenarios.* The DAG discussed potential CAT reporting requirements for certain order handling scenarios and additional corresponding sub-scenarios (e.g., riskless principal order and sub-scenarios involving post-execution print-for-print matching, pre-execution one-to-one matching, pre-execution many-to-one matching, complex options and auctions) An Industry Member and Participant working group was established to discuss order handling scenarios in more detail.

- *Error Handling and Correction Process.* The DAG discussed error handling and correction process. Industry Members of the DAG provided recommendations for making the CAT error correction processes more efficient. The Participants have reviewed and analyzed these recommended solutions for error correction processes and incorporated them in the requirements for the Plan Processor.

- *Elimination of Systems.* The DAG discussed the gaps between CAT and both OATS and EBS. An OATS-EBS-CAT gap analysis was developed and published on the CAT NMS Plan Website to identify commonalities and redundancies between the systems and the functionality of the CAT. Additionally, gaps between LTID and the CAT were also developed. Additional examples of systems and rules being analyzed include, but are not limited to: CBOE Rule 8.9, PHLX Rule 1022, COATS, Equity Cleared Reports, LOPR, and FINRA Rule 4560.

[243] *See* FIF, Clock Offset Survey Preliminary Report (last updated Feb. 17, 2015), *available at* http://catnmsplan.com/web/groups/catnms/@catnms/documents/appsupportdocs/p602479.pdf (the "FIF Clock Offset Survey Preliminary Report").
[244] *See* DAG, Cost Estimate for Adding Primary Market Transactions into CAT (Feb. 17, 2015), *available at* http://catnmsplan.com/industryFeedback/P602480.

- *Cost and Funding of the CAT.* The DAG helped to develop the cost study that was distributed to Industry Members. Additionally, the Participants have discussed with the DAG the funding principles for the CAT and potential funding models.

In addition, a subgroup of the DAG has met six times to discuss equity and option order handling scenarios, order types, how and whether the orders are currently reported and how linkages could be created for the orders within the CAT.

**(b) Summary of Views Expressed by Members and Other Parties and How Participants Took Those Views Into Account in Preparing the CAT NMS Plan**

The various perspectives of Industry Members and other appropriate parties informed the Participants' consideration of operational and technical issues during the development of the CAT NMS Plan. In addition to the regular DAG meetings and special industry calls and events noted above, the Participants conducted multiple group working sessions to discuss the industry's unique perspectives on CAT-related operational and technical issues. These sessions included discussions of options and equity order scenarios and the RFP specifications and requirements.

Industry feedback was provided to Participants through gap analyses, cost studies, comment letters and active discussion in DAG meetings and industry outreach events. Specific topics on which the industry provided input include:

*Overall Timeline*. Industry Members expressed a concern that the original timeline for implementation of the CAT is significantly shorter than the timeline for other large scale requirements such as Large Trader Reporting. The industry requested that, in developing the overall timeline for development and implementation of the CAT NMS Plan, the Participants account for additional industry comment/input on specifications in the official timeline and discussed risk mitigation strategies for implementation of the Central Repository.

*Request for proposal.* The Participants provided relevant excerpts of the RFP to DAG members for review and input. These sections were discussed by the Participants, and appropriate feedback was incorporated prior to publishing the RFP.

*Options Market Maker Quotes.* Industry Members expressed the view that requiring market makers to provide quote information to the CAT will be duplicative of information already being submitted to the CAT by the exchanges. Participants worked closely with DAG members to develop an alternative approach that will meet the goals of SEC Rule 613, and which is detailed in the Exemptive Request Letter that the Participants submitted to the Commission related to manual time stamps.

*Customer-ID.* Extensive DAG discussions reviewed the Customer-ID requirements in SEC Rule 613. The industry expressed significant concern that the complexities of adding a unique CAT customer identifier to order reporting would introduce significant costs and effort related to the system modifications and business process changes broker-dealers would face in order to implement this requirement of SEC Rule 613. Working with Industry Members, the

Participants proposed a Customer Information Approach in which broker-dealers would assign a unique Firm Designated ID to each Customer which the Plan Processor would retain. Additional feedback was provided by the DAG for the use of the Legal Entity Identifier ("LEI") as a valid unique customer identifier as an alternative to Tax Identification Numbers to identify non-natural person accounts. This Customer Information Approach is included in the Exemptive Request Letters that the Participants submitted to the Commission.

*Error Correction.* DAG members discussed the criticality of CAT Data quality to market surveillance and reconstruction, as well as the need for a robust process for the timely identification and correction of errors. Industry Members provided feedback on error correction objectives and processes, including the importance of those data errors not causing linkage breaks. This feedback was incorporated into the RFP and relevant portions of the PPR.

Industry Members also suggested that CAT Reporters be provided access to their submitted data. Participants discussed the data security and cost considerations of this request and determined that it was not a cost-effective requirement for the CAT.

*Governance of the CAT*. Industry Members provided detailed recommendation for the integration of Industry Members into the governance of the CAT, including an expansion of the proposed Advisory Committee to include industry associations such as FIF and SIFMA. Industry Members also recommended a three-year term with one-third turnover per year is recommended to provide improved continuity given the complexity of CAT processing.

The Participants have discussed CAT governance considerations with the DAG at several meetings. The Participants incorporated industry feedback into the CAT NMS Plan to the extent possible in light of the regulatory responsibilities placed solely upon the Participants under the provisions of SEC Rule 613. The proposed structure and composition of the Advisory Committee in Article 4.12 was discussed with the DAG in advance of the submission of this Plan.

*Role of Operating Committee.* The Operating Committee, consisting of one voting member representing each Participant, is structured to ensure fair and equal representation of the Participants in furtherance of SEC Rule 613(b)(1). The overarching role of the Operating Committee is to manage the Company and the CAT System similar to the manner in which a board of directors manages the business and affairs of a corporation. The primary and more specific role of the Operating Committee is to make all policy decisions on behalf of the Company in furtherance of the functions and objectives of the Company under the Exchange Act, any rules thereunder, including SEC Rule 613, and the CAT NMS Plan. In connection with its role, the Operating Committee has the right, power and authority to exercise all of the powers of the Company, to make all decisions, and to authorize or otherwise approve all actions by the Company, except as otherwise provided by applicable law or as otherwise provided in the CAT NMS Plan (Section 4.1 of the CAT NMS Plan). The Operating Committee also monitors, supervises and oversees the actions of the Plan Processor, the Chief Compliance Officer and the Chief Information Security Officer, all of whom are involved with the CAT System on a more detailed and day-to-day basis.

The decisions made by the Operating Committee include matters that are typically considered ordinary course for a governing body like a board of directors (e.g., approval of compensation of the Chief Compliance Officer (Section 6.2(a)(iv) the CAT NMS Plan) and approval to hold an executive session of the Operating Committee (Section 4.3(a)(v) of the CAT NMS Plan)), in addition to matters that are specific to the functioning, management and financing of the CAT System (e.g., changes to Technical Specifications (Sections 4.3(b)(vi)-(vii) of the CAT NMS Plan) and significant changes to the CAT System (Section 4.3(b)(v) of the CAT NMS Plan)).

The CAT NMS Plan sets forth a structure for decisions that the Operating Committee may make after approval of the CAT NMS Plan by the SEC. These decisions relate to events that may occur in the future as a result of the normal operation of any business (e.g., additional capital contributions (Section 3.8 of the CAT NMS Plan), approval of a loan to the Company (Section 3.9 of the CAT NMS Plan)) or that may occur due to the operation of the CAT System (e.g., the amount of the Participation Fee to be paid by a prospective Participant (Section 3.3(a) of the CAT NMS Plan)). These decisions cannot be made at the time of approval of the CAT NMS Plan because the Operating Committee will need to make its determination based on the facts and circumstances as they exist in the future. For example, in determining the appropriate Participation Fee, the Operating Committee will apply the factors identified in Section 3.3 of the CAT NMS Plan (e.g., costs of the Company and previous fees paid by other new Participants) to the facts existing at the time the prospective Participant is under consideration. Another example is the establishment of funding for the Company and fees for Participants and Industry Members. Section 11.2 of the CAT NMS Plan sets forth factors and principles that the Operating Committee will use in determining the funding of the Company. The Operating Committee then has the ability to review the annual budget and operations and costs of the CAT System to determine the appropriate funding and fees at the relevant future time. This approach, which sets forth standards at the time the CAT NMS Plan is approved that will be applied to future facts and circumstances, provides the Operating Committee with guiding principles to aid its decision-making in the future.

The Participants also recognize that certain decisions that are fundamental and significant to the operation of the Company and the CAT System must require the prior approval of the SEC, such as the use of new factors in determining a Participation Fee (Section 3.3(b)(v) of the CAT NMS Plan). In addition, any decision that requires an amendment to the CAT NMS Plan, such as termination of a Participant (Section 3.7(b) of the CAT NMS Plan), requires prior approval of the SEC (Section 12.3 of the CAT NMS Plan).

The Operating Committee has the authority to delegate administrative functions related to the management of the business and affairs of the Company to one or more Subcommittees and other Persons; however, the CAT NMS Plan expressly states that the Operating Committee may not delegate its policy-making functions (except to the extent policy-making determinations are already delegated as set forth in the CAT NMS Plan, which determinations will have been approved by the SEC) (Section 4.1 of the CAT NMS Plan). For example, the CAT NMS Plan provides for the formation of a Compliance Subcommittee to aid the Chief Compliance Officer in performing compliance functions, including (1) the maintenance of confidentiality of information submitted to the CAT; (2) the timeliness, accuracy and completeness of information;

and (3) the manner and extent to which each Participant is meeting its compliance obligations under SEC Rule 613 and the CAT NMS Plan (Section 4.12(b) of the CAT NMS Plan). The Operating Committee also has delegated authority to the Plan Processor with respect to the normal day-to-day operating function of the Central Repository (Section 6.1 of the CAT NMS Plan). Nevertheless, decisions made by the Plan Processor that are more significant in nature remain subject to approval by the Operating Committee, such as decisions related to the implementation of policies and procedures (Section 6.1(c) of the CAT NMS Plan), appointment of the Chief Compliance Officer, Chief Information Officer, and Independent Auditor (Section 6.1(b) of the CAT NMS Plan), Material System Changes or any system changes for regulatory compliance (Sections 6.1(i) and 6.1(j) of the CAT NMS Plan). In addition, the Operating Committee will conduct a formal review of the Plan Processor's performance under the CAT NMS Plan on an annual basis (Section 6.1(n) of the CAT NMS Plan). As to Subcommittees that the Operating Committee may form in the future, the Participants have determined that the Operating Committee will establish a Selection Subcommittee to select a successor Plan Processor when the time arises (Section 6.1(t) of the CAT NMS Plan). In the future, the Operating Committee will take a similar approach when delegating authority by providing Subcommittees or other Persons with discretion with respect to administrative functions and retaining authority to approve decisions related to policy and other significant matters of the Company and the CAT System.

The role of the Operating Committee, including the delegation of its authority to Subcommittees and other limited Persons, as provided in the CAT NMS Plan is similar to that of other national market system plans, including the Limited Liability Company Agreement of the Options Price Reporting Authority, LLC. It also is based on rules and regulations under the Exchange Act, and general principles with respect to the governance of a limited liability company. All decisions made by the Operating Committee will be governed by the guiding principles of the CAT NMS Plan and SEC Rule 613.

*Voting Criteria of the Operating Committee*: This section describes the voting criteria for decisions made by the Operating Committee, which consists of a representative for each Participant, and by any Subcommittee of the Operating Committee in the management and supervision of the business of the Company and the CAT System.

A Majority Vote (an affirmative vote of at least a majority of all members of the Operating Committee or any Subcommittee authorized to vote on a particular matter) is the default standard for decisions that are typically considered ordinary course matters for a governing body like a board of directors or board of managers or that address the general governance and function of the Operating Committee and its Subcommittees. All actions of the Company requiring a vote by the Operating Committee or any Subcommittee requires authorization by a Majority Vote except for matters specified in certain sections of the CAT NMS Plan described below, which matters require either a Supermajority Vote or a unanimous vote. As a general matter, the approach adopted by the Operating Committee is consistent with the voting criteria of the NASDAQ Unlisted Trading Privileges Plan (the "NASDAQ UTP Plan"), the Limited Liability Company Agreement of the Options Price Reporting Authority, LLC, the Consolidated Quotation Plan and the Consolidated Tape Association Plan.

A Supermajority Vote (an affirmative vote of at least two-thirds of all of the members of the Operating Committee or any Subcommittee authorized to vote on a particular matter) is required to authorize decisions on matters that are outside ordinary course of business and are considered by the Participants to have a direct and significant impact on the functioning, management and financing of the CAT System. This approach was informed by similar plans (e.g., the NASDAQ UTP Plan, which requires a unanimous vote in many similar circumstances); however, the CAT NMS Plan has the lower requirement of a Supermajority Vote because overuse of the unanimity requirement makes management and oversight difficult. This approach takes into account concerns expressed by the Participants regarding management of the CAT NMS Plan, and is consistent with suggestions in the Adopting Release for the Participants to take into account the need for efficient and fair operation of the CAT NMS Plan and to consider the appropriateness of a unanimity requirement and the possibility of a governance requirement other than unanimity, or even supermajority approval, for all but the most important decisions.

The Participants believe that certain decisions that may directly impact the functioning and performance of the CAT System should be subject to the heightened standard of a Supermajority Vote, such as: selection and removal of the Plan Processor and key officers; approval of the initial Technical Specifications; approval of Material Amendments to the Technical Specifications proposed by the Plan Processor; and direct amendments to the Technical Specifications by the Operating Committee. In addition, the Participants believe the instances in which the Company enters into or modifies a Material Contract, incurs debt, makes distributions or tax elections or changes fee schedules should be limited, given that the Company is intended to operate on a break-even basis. Accordingly, those matters should also require the heightened standard of a Supermajority Vote.

A unanimous vote of all Participants is required in only three circumstances. First, a decision to obligate Participants to make a loan or capital contribution to the Company requires a unanimous vote (Section 3.8(a) of the CAT NMS Plan). Requiring Participants to provide additional financing to the Company is an event that imposes an additional and direct financial burden on each Participant, thus it is important that each Participant's approval is obtained. Second, a decision by the Participants to dissolve the Company requires unanimity (Section 10.1 of the CAT NMS Plan). The dissolution of the Company is an extraordinary event that would have a direct impact on each Participant's ability to meet its compliance requirements so it is critical that each Participant consents to this decision. Third, a unanimous vote is required if Participants decide to take an action by written consent in lieu of a meeting (Section 4.10 of the CAT NMS Plan). In that case, because Participants will not have the opportunity to discuss and exchange ideas on the matter under consideration, all Participants must sign the written consent. This approach is similar to the unanimity requirement under the Delaware General Corporation Law for decisions made by written consent of the directors of a corporation in lieu of a meeting.

*Voting on Behalf of Affiliated Participants*: Each Participant has one vote on the Operating Committee to permit equal representation among all the Participants. Initially, the Operating Committee will have 19 Participants. Of the 19 Participants, there are five Participants that are part of the Affiliated Participants Group and five Participants without any Affiliated Participants. Because of the relationship between the respective Affiliated Participants and given the large number of Participants on the Operating Committee, the Participants believe

an efficient and effective way of structuring the Operating Committee in order to have an orderly and well-functioning committee is to permit but not require one individual to serve as a voting member for multiple Affiliated Participants. This approach does not change the standard rule that each Participant has one vote. This approach provides Affiliated Participants with the flexibility to choose whether to have one individual represent one or more of the Affiliated Participants or to have each of them represented by a separate individual. Affiliated Participants may likely vote on a matter similarly, and allowing them to choose the same individual as a voting member would be a convenient and practical way of having the Affiliated Participants' votes cast. Because there is no requirement that the representative of multiple Affiliated Participants cast the same vote for all represented Participants, there is no practical difference between this approach and an approach that mandates a separate representative for each Participant. In addition, the Participants considered whether this approach would result in less participation because of a reduced number of individuals on the Operating Committee. If each group of Affiliated Participants were to choose one individual to serve as a voting member, there would be still be 10 individuals on the Operating Committee, which the Participants do not believe would cause less active representation or participation or would otherwise lead to unwanted concentration on the Operating Committee.

*Affiliated Participant Groups and Participants without Affiliations:*

1. New York Stock Exchange LLC; NYSE Arca, Inc.; NYSE MKT LLC
2. The NASDAQ Stock Market LLC; NASDAQ OMX BX, Inc.; NASDAQ OMX PHLX LLC
3. BATS Exchange, Inc.; BATS Y-Exchange, Inc.; EDGX Exchange, Inc.; EDGA Exchange, Inc.
4. Chicago Board Options Exchange, Incorporated; C2 Options Exchange, Incorporated
5. International Securities Exchange, LLC; ISE Gemini, LLC
6. National Stock Exchange, Inc.
7. Chicago Stock Exchange, Inc.
8. BOX Options Exchange LLC
9. Miami International Securities Exchange LLC
10. Financial Industry Regulatory Authority, Inc.

*Conflicts of Interest Definition*: The Participants arrived at the definition of Conflicts of Interest set forth in Article I of the CAT NMS Plan based on a review of existing rules and standards of securities exchanges, other plans, including the Selection Plan as to qualifications of a Voting Senior Officer of a Bidding Participant, and general corporate and governance principles.

*Transparency in the Bidding and Selection Process*: DAG members requested input into the bidding and selection process for the Plan Processor, citing the extensive impact of CAT requirements on the industry as well as proposed cost for compliance. Specifically, Industry Members requested that non-proprietary aspects of the responses to the RFP should be available

to the public to inform the discussion regarding the costs and benefits of various CAT features and the technological feasibility of different solutions. Participants, working with counsel, determined that such information could be appropriately shared with DAG members pursuant to the provisions of a non-disclosure agreement ("NDA") that was consistent with the terms of the NDA executed between the Participants and the Bidders. After extensive discussion, DAG members declined to sign such an NDA. The Participants continued to share non-bid specific information and to solicit the views and perspective of DAG members as it developed a Plan approach and related solutions.

*Time Stamp Granularity and Clock Synchronization Requirement*: Industry Members recommended a millisecond time stamp for electronic order and execution events and a time stamp in seconds for manual order handling. Industry Members suggested a grace period of two years after the CAT requirements are finalized to allow broker-dealers sufficient time to meet the millisecond time stamp granularity. In addition, Industry Members recommended maintaining the current OATS rule of a one second clock drift tolerance for electronic order and execution events, citing a significant burden to Industry Members to comply with a change to the current one-second clock drift.[245] Participants conducted active discussions with Industry Members on this topic, and included in the Exemptive Request Letter a request for exemptive relief related to time stamp granularity for Manual Order Events.

*Equitable Cost and Funding:* Industry Members expressed the view that any funding mechanism developed by the Participants should provide for equitable funding among all market participants, including the Participants. The Participants recognized the importance of this viewpoint and have incorporated it within the guiding principles that were discussed with the Industry.

*Order ID/Linkages*: The DAG formed an order scenarios working group to discuss approaches to satisfy the order linkage requirements of SEC Rule 613. On the topic of allocations, Industry Members provided feedback that the order and execution processes are handled via front office systems, while allocation processes are conducted in the back office. Industry Members expressed the view that creating linkages between these systems, which currently operate independently, would require extensive reengineering of middle and back office processes not just within a broker-dealer but across broker-dealers, imposing significant additional costs on the industry as a whole. Given the widespread use of average price processing accounts, clearing firms, prime brokers and self-clearing firm cannot always determine which specific order results in a given allocation or allocations. Industry Members worked closely with Participants on a proposed alternative approach which the Participants submitted to the Commission in the Exemptive Request Letters.

*Elimination of Systems and Rules:* The elimination of duplicative and redundant systems and rules is a critical aspect of the CAT development process. Industry DAG members including SIFMA and FIF provided broad based and comprehensive insight on the list of existing regulatory systems and Participant rules that they deem to be duplicative, including, among

[245] *See* FIF Clock Offset Survey Preliminary Report.

others, OATS, the EBS reporting system, and Large Trader reporting. In addition, FIF provided a gap analysis of CAT requirements against Large Trader transactional reporting obligations.

The Participants discussed feedback from the industry in a variety of forums: (i) during DAG meetings; (ii) in relevant Subcommittee meetings, depending on the topic; and (iii) at two multi-day offsite meetings where Representatives of each Participant gathered in a series of in-person workshops to discuss the requirements of the Plan Processor, both technical and operational. This was in addition to numerous video-conference meetings when Participants discussed and developed the RFP document incorporating, where appropriate, feedback from the industry.

### 12. Discuss Reasonable Alternative Approaches that the Participants Considered to Create, Implement, and Maintain the CAT (SEC Rule 613(a)(1)(xii))

The Participants, working as a consortium, selected the approach reflected in the Plan through a detailed analysis of alternatives, relying on both internal and external knowledge and expertise to collect and evaluate information related to the CAT. For some of the requirements of SEC Rule 613, the Participants' analysis indicated that the required approach would be unduly burdensome or complex. In these cases, the Participants have requested exemption from these requirements in the Exemptive Request Letter, which details the analysis performed and alternatives considered for these specific requirements.

The Participants leveraged their own extensive experience with regulatory, technical and securities issues in formulating, drafting and filing the CAT NMS Plan. Specifically, the nineteen Participants formed various Subcommittees to focus on specific critical issues during the development of the CAT NMS Plan. The Subcommittees included:

- a Governance Committee, which developed recommendations for decision-making protocols and voting criteria critical to the development of the CAT NMS Plan, in addition to developing formal governance and operating structures for the CAT NMS Plan;

- a Technical Committee, which developed the technical scope requirements of the CAT, the CAT RFP documents, and the PPR;

- an Industry Outreach Committee, which provided recommendations on effective methods for soliciting industry input, in addition to facilitating industry involvement in CAT-related public events[246] and development of the CAT NMS Plan and the Exemptive Request Letters;

- a Press Committee as a Subcommittee of the Industry Outreach Committee, which coordinated interactions with the press;

[246] A summary of industry outreach events is included in Appendix C, General Industry Solicitation.

- a Cost and Funding Committee, which drafted a framework for determining the costs of the CAT, and provided recommendations on revenue/funding of the CAT for both initial development costs and ongoing costs; and

- an Other Products Committee, which is designed to assist the SEC, as necessary, when the SEC is determining whether and how other products should be added to the CAT.[247]

Representatives from all Subcommittees met to discuss the overall progress of the CAT initiative in the Operating Committee.

To support the Participants' internal expertise, the Participants also engaged outside experts to assist in formulating the CAT NMS Plan. Specifically, the Participants engaged the consulting firm Deloitte & Touche LLP as a project manager, and engaged the law firm Wilmer Cutler Pickering Hale and Dorr LLP to serve as legal counsel in drafting the CAT NMS Plan, both of which have extensive experience with issues raised by the CAT. Additionally, the Participants engaged the services of the public relations firm Peppercomm to assist with public relations and press engagement in formulating the CAT NMS Plan.

Furthermore, as discussed in more detail above in Appendix C, Process by Which Participants Solicited Views of Members and Other Appropriate Parties Regarding Creation, Implementation, and Maintenance of CAT; Summary of Views; and How Sponsors Took Views Into Account in Preparing NMS Plan, the Participants engaged in meaningful dialogue with Industry Members with respect to the development of the CAT through the DAG and other industry outreach events.

Using this internal and external expertise, the Participants developed a process to identify, evaluate and resolve issues so as to finalize the CAT NMS Plan. As discussed above in Appendix C, the Participants have, among other things, developed the Selection Plan to describe the process for selecting the Plan Processor, created and published an RFP, evaluated Bids, and chosen a shortlist of Bids. Contemporaneously, the Participants have drafted the Plan set forth herein to reflect the recommendations that have resulted from the approach and analysis described above.

For certain technical considerations for the development and maintenance of the CAT that do not materially impact cost, required functionality or data security, the Participants did not mandate specific approaches, but rather chose to consider solutions proposed by the Bidders.

**(a) Request for Proposal**

The Participants considered multiple alternatives for the best approach to gathering the information necessary to determine how to create, implement and maintain the CAT, including issuance of a Request for Information ("RFI") and Request for Proposal ("RFP"). After due consideration, with a view to meeting the demanding deadline set forth in SEC Rule 613, the

[247] When adopting the CAT, the Commission directed the Commission staff "to work with the SROs, the CFTC staff, and other regulators and market participants to determine how other asset classes, such as futures, might be added to the consolidated audit trail." Adopting Release at 45744-5 n.241.

Participants decided to use their expertise to craft an RFP seeking proposals to implement the main requirements to successfully build and operate the CAT. This approach was designed to solicit imaginative and competitive proposals from the private sector as well as to provide an adequate amount of insight into the costs associated with creating, implementing, and maintaining the CAT.

To design the RFP process, the Participants consulted with their technology subject matter resources to determine technical implications and requirements of the CAT and to develop the RFP. Based on these requirements, the Participants developed the Proposed RFP Concepts Document,[248] which identified the high level requirements for which potential Bidders would be expected to design a solution, ahead of publishing the full RFP on February 26, 2013. The Participants received 31 intents to bid, and then hosted a Bidder conference on March 8, 2013 to discuss the requirements and provide additional context to the industry and potential Bidders. Two additional conference calls to discuss additional questions on the RFP were held on April 25, 2013 and May 2, 2013. The Participants also established an e-mail box through which questions on the RFP were received.

Ten competitive proposals were submitted on March 21, 2014. Each of the ten proposals was carefully reviewed by the Participants, including in-person meetings with each of the ten Bidders. Following this review, the Bids were reduced to six proposals in accordance with the Selection Plan approved by the Commission in February 2014. In accordance with the Selection Plan Amendment approved by the Commission on June 23, 2015, the Participants asked the Bidders on July 14, 2015 to revise their bids to account for the updated requirements included in the CAT NMS Plan as filed on February 27, 2015, as well as to address specific additional questions and considerations. As described more fully throughout this Appendix C, the proposals offer a variety of solutions for creating, implementing and maintaining the CAT.

As stated above, the Participants received proposals from ten Bidders that were deemed qualified, including many from large and well-respected information technology firms. The open ended nature of the questions contained in the RFP allowed Bidders to provide thoughtful and creative responses with regards to all aspects of the implementation and the operation of the CAT. The RFP process also resulted in the submission of multiple competitively-priced Bids. The six Shortlisted Bids remaining under consideration by the Participants, inclusive of the initial system build and the first five years of maintenance costs, have ranges between $165 million and $556 million, and encompass a number of innovative approaches to meeting the requirements of SEC Rule 613, such as use of non-traditional database architectures and cloud-based infrastructure solutions.

The Participants conducted the RFP process and the review of Bids pursuant to the Selection Plan approved by the Commission, which was designed to mitigate the conflicts of interest associated with Participants that are participating in developing the CAT while also seeking to become the Plan Processor and to ensure a level playing field for all potential Bidders to be considered on a fair and equal basis.

[248] *See supra* note 11.

### (b) Organizational Structure

The Participants considered various organizational structures of the Bidders to assess whether a particular structure would be a material factor in the ability of a Bidder to effectively operate as the Plan Processor. Of the Bids submitted, three general organizational structures for the Plan Processor emerged: (1) consortiums or partnerships (i.e., the Plan Processor would consist of more than one unaffiliated entity that would operate the CAT); (2) single firms (i.e., one entity would be the Plan Processor and that entity would operate the CAT as part of its other ongoing business operations); and (3) dedicated legal entities (i.e., CAT operations would be conducted in a separate legal entity that would perform no other business activities). Each type of organizational structure has strengths and limitations, but the Participants did not find that a particular organizational structure should be a material factor in selecting a Bidder. Accordingly the Participants have not mandated a specific organizational structure for the Plan Processor.

### (c) Primary Storage

The Bidders proposed two methods of primary data storage: traditionally-hosted storage architecture, and infrastructure-as-a-service. Traditionally-hosted storage architecture is a model in which an organization would purchase and maintain proprietary servers and other hardware to store CAT Data. Infrastructure-as-a-service is a provisioning model in which an organization outsources the equipment used to support operations, including storage, hardware, servers and networking components to a third party who charges for the service on a usage basis.

Each data storage method has a number of considerations that the Participants will take into account when evaluating each Bidder's proposed solution. Such considerations include the maturity, cost, complexity, and reliability of the data storage method as used in each Bidder's proposal. The Participants are not mandating a specific method for primary data storage provided that the data storage solution can meet the security, reliability, and accessibility requirements for the CAT, including storage of PII data, separately.

### (d) Customer and Account Data

All Bidders proposed solutions consistent with the Customer Information Approach in which broker-dealers would report a unique Firm Designated ID for each Customer to the Plan Processor and the Plan Processor would create and store the CAT Customer-ID without passing this information back to the broker-dealer. The use of existing unique identifiers (such as internal firm customer identifiers) could minimize potentially large overhead in the CAT System that otherwise would be required to create and transmit back to CAT Reporters a CAT System-generated unique identifiers. Allowing multiple identifiers also will be more beneficial to CAT Reporters. This approach would still require mapping of identifiers to connect all trading associated with a single Customer across multiple accounts, but it would also ease the burden on CAT Reporters because each CAT Reporter would report information using existing identifiers it currently uses in its internal systems. Moreover, because the CAT System would not be sending a CAT System-generated Customer-ID back to the CAT Reporters, CAT Reporters would not need to process CAT Customer-IDs assigned by the Plan Processor. This approach would reduce the burden on the CAT Reporters because they would not need to build an additional process to receive a Customer-ID and append that identifier to each order origination, receipt or

cancellation. This approach may also help alleviate storage and processing costs and potentially reduce the security risk of transmission of the Customer-ID to the CAT Reporter.

The Participants support the use of the Customer Information Approach and included the approach in the Exemptive Request Letter so that the Central Repository could utilize this approach to link Customer and Customer Account Information. The Participants believe this approach would be the most efficient approach for both the Plan Processor and CAT Reporters.

**(e) Personally Identifying Information (PII)**

All Bidders proposed encrypting all PII, both at rest and in motion. This approach allows for secure storage of PII, even if servers should be compromised or data should be leaked. However, encryption can be highly complex to implement effectively (e.g., the poor choice of password salting or an insecure storage of private keys can compromise security, even without knowledge of the system administrator).

All Bidders also proposed imposing a Role Based Access Control[249] to PII. These controls would allow for varying levels of access depending on user needs, and would allow compartmentalizing access based on "need to know." However, multiple layers of access can add further complexity to the implementation and use of a system.

Some Bidders also proposed implementing multi-factor authentication[250]. This greatly enhances security and can prevent a leak of passwords or keys from completely compromising security. However, it increases system overhead, and increases the difficulty of accessing data.

The Participants are requiring multi-factor authentication and Role Based Access Control for access to PII, separation of PII from other CAT Data, restricted access to PII (only those with a "need to know" will have access), and an auditable record of all access to PII data contained in the Central Repository. The Participants believe potential increased costs to the Plan Processor and delays that this could cause to accessing PII are balanced by the need to protect PII.

**(f) Data Ingestion Format**

Bidders proposed several approaches for the ingestion format for CAT Data: uniform defined format, use of existing messaging protocols or a hybrid approach whereby data can be submitted in a uniform defined format or using existing message protocols. There are benefits to the industry under any of the three formats. A large portion of the industry currently reports to OATS in a uniform defined format. These firms have invested time and resources to develop a process for reporting to OATS. The uniform formats recommended by the Bidders would leverage the OATS format and enhance it to meet the requirements of SEC Rule 613. This uniform format, therefore, may reduce the burden on certain CAT Reporters and simplify the process for those CAT Reporters to implement the CAT. However, some firms use message

[249] Role Based Access Control (RBAC) is a mechanism for authentication in which users are assigned to one or many roles, and each role is assigned a defined set of permissions. Additional details are provided in Appendix D, Data Security.

[250] Multifactor authentication is a mechanism that requires the user to provide more than one factor (e.g., biometrics/ personal information in addition to a password) in order to be validated by the system.

protocols, like FIX, as a standard point of reference with Industry Members that is typically used across the order lifecycle and within a firm's order management processes. Leveraging existing messaging protocols could result in quicker implementation times and simplify data aggregation for Participants, CAT Reporters, and the Plan Processor, though it is worth noting that message formats may need to be updated to support CAT Data requirements.

The Participants are not mandating the data ingestion format for the CAT. The Participants believe that the nature of the data ingestion is key to the architecture of the CAT. A cost study of members of the Participants did not reveal a strong cost preference for using an existing file format for reporting vs. creating a new format.[251] However, FIF did indicate there was an industry preference among its members for using the FIX protocol.[252]

**(g) Process to Develop the CAT**

Bidders proposed several processes for development of the CAT: the agile or iterative development model, the waterfall model, and hybrid models that incorporate aspects of both the waterfall and agile methodologies. An agile methodology is an iterative model in which development is staggered and provides for continuous evolution of requirements and solutions. A waterfall model is a sequential process of software development with dedicated phases for Conception, Initiation, Analysis, Design, Construction, Testing, Production/ Implementation and Maintenance. The agile or iterative model is flexible to changes and facilitates early delivery of usable software that can be used for testing and feedback, helping to facilitate software that meets users' needs. However, at the beginning of an agile or iterative development process, it can be difficult to accurately estimate the effort and time required for completion. The waterfall model would provide an up-front estimate of time and effort and would facilitate longer-term planning and coordination among multiple vendors or project streams. However, the waterfall model could be less flexible to changes, particularly changes that occur between design and delivery (and thereby potentially producing software that meets specifications but not user needs).

The Participants are not mandating a development process. The Participants believe that either agile or iterative development or waterfall method or even a combination of both methods could be utilized to manage the development of CAT.

**(h) Industry Testing**

Bidders also proposed a range of approaches to industry testing, including dedicated environments, re-use of existing environments, scheduled testing events, and ongoing testing.

Dedicated industry test environments could provide the possibility of continuous testing by participants, rather than allow for testing only on scheduled dates. Use of dedicated industry test environments also would not impact other ongoing operations (such as disaster recovery sites). However, developing and maintaining dedicated test environments would entail

[251] *See* Appendix C, Analysis of the CAT NMS Plan, for additional details on cost studies.
[252] *See* FIF Response.

additional complexity and expense. Such expenses may be highest in hosted architecture systems where dedicated hardware would be needed, but potentially rarely used.

The re-use of existing environments, such as disaster recovery environment, would provide simplicity and lower administrative costs. However, it could impact other ongoing operations, such as disaster recovery.

Scheduled testing events (which might be held, for example, on weekends only, or on specific dates throughout the year) could provide for more realistic testing by involving multiple market participants. This approach also would not require the test environment to be available at all times. However, scheduled events would not allow users to test on the CAT System until a dedicated time window is open.

Ongoing testing would allow users to test the CAT System as often as needed. However, this approach would require the test environment to be available at all times. It also may lead to lower levels of test participation at any given time, which may lead to less realistic testing.

The Participants are requiring that the CAT provide a dedicated test environment that is functionally equivalent to the production environment and available on a 24x6 basis. The Participants believe that an ongoing testing model will be more helpful to the industry because it will provide an environment in which to test any internal system changes or updates that may occur in the course of their business that may affect reporting to the CAT. Additionally, this environment will provide a resource through which the CAT Reporters can continually test any CAT System mandated or rule associated changes to identify and reduce data errors prior to the changes being implemented in the production environment.

**(i) Quality Assurance (QA)**

The Participants considered a number of QA approaches and methodologies, informed by the Bidder's proposals as well as discussions with the Participants' own subject matter resources. Some of the approaches considered included "continuous integration," where developer working copies are merged into the master and tested several times a day, test automation, and various industry standards such as ISO 20000/ITIL. The Participants are not mandating a single approach to QA beyond the requirements detailed in the RFP, for which each Bidder provided a detailed approach.

One key component of the QA approaches proposed by the Bidders was the staffing levels associated with QA. Initial QA proposals from Bidders included staffing ranges from between 2 and 90 FTEs, although some Bidders indicated that their QA function was directly incorporated into their development function. Some Bidders proposed allocating QA resources after the third month. A larger number of QA resources may facilitate structured, in-depth testing and validation of the CAT System. However, a larger set of QA resources could lead to higher fixed costs and administrative overhead.

The Participants are not mandating the size for QA staffing; however, the Participants will consider each Bidder's QA staffing proposals in the context of the overall Bid, and the selected Bidder must ensure that its QA staffing is sufficient to perform the activities required by

the CAT NMS Plan. The Participants believe the QA staffing numbers varied in the Bids because they are largely dependent on both the staffing philosophy of the Bidder as well as the organizational structure for the proposed Central Repository.

**(j) User Support and Help Desk**

The RFP required that the CAT Help Desk be available on a 24x7 basis, and that it be able to manage 2,500 calls per month. To comply with these requirements, Bidders proposed user support staffing ranges from five to 36 FTEs. They also proposed dedicated support teams and support teams shared with other groups.

A larger number of FTE user support staff could provide a higher level and quality of support. However, a higher number of staff would impose additional overhead and administrative costs. Additionally, as the support organization grows, it may become less closely integrated with the development team, which could decrease support effectiveness.

A dedicated CAT support team would facilitate deep knowledge of the CAT System and industry practices. However, it would create additional overhead and costs. Additionally, management of support teams may not be the managing firm's primary business, which could lead to inefficiencies. A support staff shared with non-CAT teams could provide for increased efficiency, if the team has greater experience in support more broadly. However, support resources may not have the depth of knowledge that dedicated support teams could be expected to develop.

The Participants are not requiring specific FTEs for user support staffing; however, the Participants will consider each Bidder's user support staffing proposals in the context of the overall Bid, and the selected Bidder must ensure that its staffing is sufficient to perform the activities required by the CAT NMS Plan. The Participants believe that the number of FTEs varied in the Bids because they are largely dependent on both the staffing philosophy of the Bidder as well as the organizational structure for the proposed Central Repository.

Some Bidders proposed a US-based help desk, while others proposed basing it offshore. A U.S.-based help desk could facilitate a higher level of service, and could provide a greater level of security (given the sensitive nature of the CAT). However, a U.S.-based help desk may have greater labor costs. An offshore help desk would potentially have lower labor costs, but could provide (actual or perceived) lower level of service, and could raise security concerns (particularly where the help desk resources are employed by a third-party).

The Participants are not requiring a specific location for the help desk. The Participants believe that as long as the Bidder's solution meets the service and security requirements of the CAT, it is not necessary to prescribe the location.

**(k) CAT User Management**

Bidders proposed several approaches to user management[253]: help desk creation of user accounts, user (e.g., broker-dealer) creation of accounts, and multi-role. Help desk creation of

[253] User management is a business function that grants, controls, and maintains user access to a system.

accounts would allow for greater oversight and validation of user creation. However, it would increase administrative costs, particularly in the early stages of the CAT (as an FTE must setup each user). User creation of accounts would require lower staffing levels but would provide less oversight and validation of user creation.

A multi-role approach would allow for a blended approach in which the Plan Processor could, for example, set up an administrator at each broker-dealer, and then allow the broker-dealer to set up additional accounts as needed. This approach could allow users with different levels of access to be provisioned differently, with those requiring greater oversight being provisioned manually. However, it would add complexity to the user creation system, and would provide less oversight and validation than would a fully manual system.

For CAT Reporters entering information into the CAT, the Participants are requiring that each user be validated by the Plan Processor to set-up access to the system. However, for staff at regulators that will be accessing the information for regulatory purposes only, the Plan Processor can establish a set-up administrator who has the ability to provide access to other users within its organization. However, such administrators cannot set up access for PII information. Staff at regulators who need access to PII information must go through an authentication process directly with the Plan Processor. The Participants believe that this approach balances the demand on the staff at the Plan Processor with the need to ensure proper oversight and validation for users of the CAT.

**(l) Required Reportable Order Events**

The Participants considered multiple order event types for inclusion in the Plan. Of the order event types considered, the results order event type and the CAT feedback order event were not required. The Participants determined that a results order event type would not provide additional value over a "daisy chain" linkage method. A CAT feedback order event can be generated by the Plan Processor, thereby removing the reporting burden from reporting firms. Therefore the Participants are not requiring CAT Reporters to provide data for these two event types to the CAT. The required reportable order events are listed in Section 6.3(d).

**(m) Data Retention Requirements**

SEC Rule 613(e)(8) requires data to be available and searchable for a period of not less than five years. Broker-dealers are currently required to retain data for six years under the Exchange Act Rule 17a-4(a).

The Participants support the use of a six year retention timeframe as it complies with Exchange Act Rule 17a-4(a). The Participants are requiring data for six years to be kept online in an easily accessible format to enable regulators to have access to six years of audit trail materials for purposes of its regulation.

The Participants understand that requiring this sixth year of data storage may increase the cost to run the CAT; however, they believe the incremental cost would be outweighed by the needs of regulators to have access to the information. An analysis of the six Shortlisted Bidder proposals indicated that the average expected year-on-year annual cost increase during years four

and five (i.e., once all reporters were reporting to the Central Repository) was approximately 4%. Extending this increase to another year would result in incremental annual costs to the Plan Processor ranging from approximately $1.15 million to $4.44 million depending upon the Bidder. Based on the assumption that the cumulative annual cost increase from year five to year six will also be 4% (including all the components provided by the Bidders in their respective cost schedules[254]), the maximum cost increase for data retention for an additional year would be 4%.

**(n) Data Feed Connectivity**

Bidders proposed either real-time SIP connectivity or end-of-day batch SIP connectivity. Real-time SIP connectivity would provide for more rapid access to SIP Data, but may require additional processing support to deal with out-of-sequence or missing records. End-of-day batch SIP connectivity provides the possibility of simpler implementation, but data from SIPs would not be available in the CAT until after overnight processing. Because CAT Reporters are only required to report order information on a next-day basis, the Participants are not requiring that the Plan Processor have real-time SIP connectivity.

**(o) Disaster Recovery**

Participants discussed two commonly accepted structures for disaster recovery: hot-hot[255] and hot-warm[256]. While hot-hot allows for immediate cutover, the Participants agreed that real-time synchronization was not required, but rather that data must be kept synchronized to satisfy disaster recovery timing requirements (e.g., 48 hour cutover). A hot-warm structure meets the requirements of SEC Rule 613, and costs for hot-hot were considered to be higher than hot-warm. Therefore, the Participants are requiring a hot-warm disaster recovery structure, provided it meets the requirements set forth in Appendix D, BCP / DR Process.

**(p) Synchronization of Business Clocks**

The Participants considered multiple levels of precision for the clock synchronization standard set forth in the plan, ranging from 1 second (s) to 100 microseconds (μs). The Participants determined based on their expertise and feedback from industry that an initial clock synchronization of 50 milliseconds (ms) would be the most practical and effective choice and represents the current industry standard. Pursuant to SEC Rule 613(d), the initial standard of 50ms will be subject to annual analysis as to whether or not a more stringent clock synchronization tolerance could be implemented consistent with changes in industry standards.

In order to identify the industry standard the Participants and Industry Members reviewed their own internal technology around Network Time Protocol ("NTP") and Precision Time Protocol ("PTP"),[257] potentially used in conjunction with Global Positioning System ("GPS").[258] In reviewing internal infrastructure, the Participants and Industry Members noted that the

[254] RFP at 57.
[255] In a hot-hot disaster recovery design, both the production site as well as the backup site are live, and the backup can be brought online immediately.
[256] In a hot-warm disaster recovery design, the backup site is fully equipped with the necessary hardware. In the event of a disaster, the software and data would need to be loaded into the backup site for it to become operational.
[257] NTP and PTP are protocols used to synchronize clocks across a computer network.
[258] GPS is a radio navigation system that can be used to capture a precise determination of time.

majority of firms had indicated that they leveraged at least NTP clock synchronization technology. In addition, the FIF conducted a clock synchronization survey[259] ("FIF Clock Offset Survey") of 28 firms to identify costs and challenges associated with clock synchronization tolerances of 50ms, 5ms, 1ms, and 100µs. The FIF Clock Offset Survey indicated that 93% of responding firms leverage NTP technology, while fewer than half of responding firms use SNTP, PTP, or GPS. In reviewing the standards for NTP technology, the Participants determined that this technology can accommodate a 50ms tolerance. In addition, the FIF Clock Offset Survey demonstrated that 60% of responding firms currently synchronize their clocks with an offset of 50ms or greater, with approximately 20% of responding firms currently using an offset of 50ms. Only 18% of responding firms used a clock offset of 30ms or less. In light of these reviews and the survey data, the Participants concluded that a clock offset of 50ms represents an aggressive, but achievable, industry standard.

In addition to determining current industry clock offset standards used in the industry, the FIF Clock Offset Survey indicated that the costs to survey respondents were as follows:[260]

| Proposed Clock Offset | Estimated Implementation Cost (per firm) | Estimated Annual Maintenance Cost (per firm) |
|---|---|---|
| 50ms | $554,348 | $313,043 |
| 5ms | $887,500 | $482,609 |
| 1ms | $1,141,667 | $534,783 |
| 100µs | $1,550,000 | $783,333 |

As indicated in the above table, annual maintenance costs of survey respondents for a 50ms standard would be on average 31% higher than current costs, and would escalate to 102%, 123%, and 242% increases over current maintenance costs as clock synchronization standards move to 5ms, 1ms, and 100µs respectively, indicating that maintenance costs rapidly escalate as clock synchronization standards increase beyond 50ms. Survey respondents also indicated that increasing clock synchronization requirements would require escalating technology changes, including significant hardware changes (such as installation of dedicated GPS or other hardware clocks and network architecture redesign), migration to new time synchronization standards, and widespread upgrades of operating systems and databases currently in use. For example, to achieve a 5ms clock offset would require firms to install GPS clocks in all locations and migrate from NTP to PTP. The Participants believe, based on the FIF Clock Offset Survey, that fewer than half of firms currently leverage GPS technology or PTP for clock synchronization.

[259] FIF Clock Offset Survey Preliminary Report.
[260] The Participants consider the estimates provided to be conservative as a majority of the study respondents fell into the category of large broker-dealers.

As noted in Article VI, Section 6.8, the Participants, working with the Processor's Chief Compliance Officer, shall annually evaluate and make recommendations as to whether industry standards have evolved such that changes to the clock synchronization standards should be changed. It is the belief of the Participants that, while setting an initial clock synchronization of 5ms lower than 50ms may be achievable, it does not represent current industry standard and there may be challenges with small broker-dealers' potentially substantial costs. However, once both large and small broker-dealers begin reporting data to the Central Repository, and as increased time synchronization standards become more mature, the Participants will assess the ability to tighten the clock synchronization standards to reflect changes in industry standards in accordance with SEC Rule 613.

**(q) Reportable Securities**

SEC Rule 613(c)(6) requires NMS Securities to be reported the Central Repository and SEC Rule 613(i) requires the Participants to detail a plan outlining how non-NMS Securities, debt securities, and Primary Market Transactions in equity securities that are not NMS Securities can be reported to the Central Repository in the future. The Participants considered whether to require including OTC Equity Securities, non NMS Securities, in a future phase of the CAT NMS Plan, as contemplated by the Commission in SEC Rule 613, or accelerating their inclusion into the first phase of the Plan. As part of this consideration, Participants weighed heavily the feedback from the DAG and other market participants of the considerations associated with the two alternatives, and made the determination to include OTC Equities in the requirements under the CAT NMS Plan.

# APPENDIX D

## CAT NMS Plan Processor Requirements

Appendix D, CAT NMS Plan Processor Requirements, outlines minimum functional and technical requirements established by the Participants of the CAT NMS Plan for the Plan Processor. Given the technical nature of many of these requirements, it is anticipated, as technology evolves, that some may change over time. The Participants recognize that effective oversight of, and a collaborative working relationship with, the Plan Processor will be critical to ensure the CAT achieves its intended purpose, namely enhanced investor protection, in an efficient and cost-effective manner. The Participants also recognize that maintaining the efficiency and cost-effectiveness of the CAT requires flexibility to respond to technological innovations and market changes. For example, these minimum functional and technical requirements allow the Plan Processor flexibility to make certain changes to the Technical Specifications, while limiting others to the Operating Committee, and anticipate agreement between the Operating Committee and the Plan Processor on SLAs relating to, among other things, development, change management, and implementation processes and timelines. Maintaining such flexibility to adapt in these and other areas relating to the development and operation of the CAT is a foundational principle of this Appendix D.

### 1. Central Repository Requirements

#### 1.1 Technical Architecture Requirements

The Central Repository must be designed and sized to ingest, process, and store large volumes of data. The technical infrastructure needs to be scalable, adaptable to new requirements and operable within a rigorous processing and control environment. As a result, the technical infrastructure will require an environment with significant throughput capabilities, advanced data management services and robust processing architecture.

The technical architecture must be scalable and able to readily expand its capacity to process significant increases in data volumes beyond the baseline capacity. The baseline capacity requirements are defined in this document. Once the CAT NMS Plan is approved, the Operating Committee will define the baseline metrics on an ongoing basis. CAT capacity planning must include SIP, OPRA and exchange capacity and growth forecasts. The initial baseline capacity requirements will be based on twice (2X) the historical peaks for the most recent six years, and the Plan Processor must be prepared to handle peaks in volume that could exceed this baseline for short periods. The SLA(s) will outline details of the technical performance and scalability requirements, and will be specifically targeted to the selected Bidder's solution.

The Central Repository must have the capacity and capability to:

- Ingest and process throughput to meet baseline capacity requirements as well as scalability to meet peak capacity requirements, including staging, loading, speed of processing, and linking of data;

- Accommodate data storage and query compute, such as:

    - Scalable for growth data storage and expansion capability, including but not limited to, resizing of database(s), data redistribution across nodes, and resizing of network bandwidth;
    - Robust processes to seamlessly add capacity without affecting the online operation and performance of the CAT System; and
    - Quantitative methods for measuring, monitoring, and reporting of excess capacity of the solution;

- Satisfy minimum processing standards as described in the CAT RFP and that will be further defined in the SLA(s);

- Adapt to support future technology developments and new requirements (including considerations for anticipated/potential changes to applicable rules and market behavior);

- Handle an extensible architecture that is capable of supporting asset classes beyond the initial scope of NMS Securities and OTC Equity Securities;

- Comply with the clock synchronization standards as set forth in Article VI, Section 6.8; and

- Handle an extensible data model and messaging protocols that are able to support future requirements such as, but not limited to:

    - Expansion of trading hours, including capability and support for 24-hour markets;
    - Sessions for securities;[261] and
    - New asset classes, such as debt securities or derivative instruments.

## 1.2 Technical Environments

The architecture must include environments for production, development, quality assurance testing, disaster recovery, industry-wide coordinated testing, and individual on-going CAT Reporter testing. The building and introduction of environments available to CAT Reporters may be phased in to align with the following agreed upon implementation milestones:

- Development environment – the development environment must be created to build, develop, and maintain enhancements and new requirements. This environment must be separate from those listed below.

[261] Equity markets currently have morning, primary, and evening sessions. It is possible that over time sessions may cross into the next calendar day.

- Quality assurance environment – a quality assurance (QA) environment must be created to allow simulation and testing of all applications, interfaces, and data integration points contained in the CAT System.

    - The QA environment shall be able to simulate end-to-end production functionality and perform with the same operational characteristics, including processing speed, as the production environment.
    - The QA environment shall support varied types of changes, such as, but not limited to, the following:

        - Application patches;
        - Bug fixes;
        - Operating system upgrades;
        - Introduction of new hardware or software components;
        - New functionality;
        - Network changes;
        - Regression testing of existing functionality;
        - Stress or load testing (simulation of production-level usage); and
        - Recovery and failover.

    - A comprehensive test plan for each build and subsequent releases must be documented.

- Production environment – fully operational environment that supports receipt, ingestion, processing and storage of CAT Data. Backup/disaster recovery components must be included as part of the production environment.

- Industry test environment –

    - The Plan Processor must provide an environment supporting industry testing (test environment) that is functionally equivalent to the production environment, including:

        - End-to-end functionality (e.g., data validation, processing, linkage, error identification, correction and reporting mechanism) from ingestion to output, sized to meet the standards of the production SLA;
        - Performance metrics that mirror the production environment; and
        - Management with the same information security policies applicable to the production environment.

    - The industry test environment must also contain functionality to support industry testing, including:

        - Minimum availability of 24x6;
        - Replica of production data when needed for testing;
        - Data storage sized to meet varying needs, dependent upon scope and test scenarios; and

        - Support of two versions of code (current and pending).

    - The industry test environment must support the following types of industry testing:

        - Technical upgrades made by the Plan Processor;
        - CAT code releases that impact CAT Reporters;
        - Changes to industry data feeds (e.g., SIP, OPRA, etc.);
        - Industry-wide disaster recovery testing;
        - Individual CAT Reporter and Data Submitter testing of their upgrades against CAT interfaces and functionality; and
        - Multiple, simultaneous CAT Reporter testing.

    - The industry test environment must be a discrete environment separate from the production environment.
    - The Plan Processor must provide the linkage processing of data submitted during coordinated, scheduled, industry-wide testing. Results of the linkage processes must be communicated back to Participants as well as to the Operating Committee.
    - Data from industry testing must be saved for three months. Notwithstanding any other provision of the CAT NMS Plan, this Appendix D, or Exchange Act Rule 17a-1, such test data (whether related to the CAT order and transaction system or the customer account and information system) may be deleted by the Plan Processor after three months. Operational metrics associated with industry testing (including but not limited to testing results, firms who participated, and amount of data reported and linked) must be stored for the same duration as the CAT production data.
    - The Plan Processor must provide support for industry testing, including testing procedures, coordination of industry testing, publish notifications, and provide help desk support during industry testing.
    - The Participants and the SEC must have access to industry test data.

### 1.3 Capacity Requirements

System capacity must have the following characteristics.[262]

The Central Repository must be:

- Designed such that additional capacity can be quickly and seamlessly integrated while maintaining system access and availability requirements;

[262] References to data sizing refer to raw, uncompressed data and do not account for benefits of compression, overhead of data storage or indices. Data sizing estimates do not include meta-data and are based on delimited, fixed length data sets. The Plan Processor is responsible for calculating its platform capacity capabilities based on its proposed solution. Three years after the finalization of the CAT NMS Plan, when all CAT Reporters submit their data to the Central Repository, the Central Repository must be sized to receive process and load more than 58 billion records per day.

- Able to efficiently and effectively handle data ingestion on days with peak and above-peak data submission volumes; and

- Required to maintain and store data for a 6-year sliding window of data. System access and availability requirements must be maintained during the maintenance of the sliding window. It is expected that the Central Repository will grow to more than 29 petabytes of raw, uncompressed data.

The Plan Processor must:

- Define a capacity planning process to be approved by the Operating Committee, with such process incorporating industry utility capacity metrics; and

- Develop a robust process to add capacity, including both the ability to scale the environment to meet the expected annual increases as well as to rapidly expand the environment should unexpected peaks in data volumes breach the defined capacity baseline. Capacity forecasts from systems, including OPRA, UTP, and CTA, must also be included for capacity planning purposes. This capacity planning process must be approved by the Operating Committee.

#### 1.3.1 Monitoring Capacity Utilization and Performance Optimization

In order to manage the data volume, operational capacity planning must be conducted on a periodic basis. The Plan Processor must submit capacity-planning metrics to the Operating Committee for review to ensure that all parties are aware of the system processing capabilities and changes to assumptions. Changes to assumptions could lead to positive or negative adjustments in the costs charged to CAT Reporters. Reports that capture daily disk space, processing time, amount of data received and linkage completion times must be provided by the Plan Processor to the Operating Committee.

### 1.4 Data Retention Requirements

The Plan Processor must develop a formal record retention policy and program for the CAT, to be approved by the Operating Committee, which will, at a minimum:

- Contain requirements associated with data retention, maintenance, destruction, and holds;

- Comply with applicable SEC record-keeping requirements;

- Have a record hold program where specific CAT Data can be archived offline for as long as necessary;

- Store and retain both raw data submitted by CAT Reporters and processed data; and

- Make data directly available and searchable electronically without manual intervention for at least six years, subject to the exceptions in Section 6.3 of Appendix D.

## 2. Data Management

The Plan Processor must develop data management policies and procedures to govern and manage CAT Data, reference data, and metadata contained in and used by the Central Repository.

The CAT must capture, store, and maintain current and historical reference data information. This master / reference database will include data elements such as, but not limited to, SRO-assigned market participant identifiers, product type, trading unit size, trade / quote minimum price variation, corporate actions, symbology changes, and changes in listings market center. The Plan Processor must support bi-temporal milestones (e.g., Effective Date and as-of-date) of the reference data.

CAT Reporters will submit data to the Central Repository with the listing exchange symbology format. The Central Repository must use the listing exchange symbology format for output of the linked data. Instrument validation must be included in the processing of data submitted by CAT Reporters.

The Central Repository must be able to link instrument data across any time period so that data can be properly displayed and linked regardless of changes to issue symbols or market class. The Plan Processor is required to create and maintain a symbol history and mapping table, as well as to provide a tool that will display a complete issue symbol history that will be accessible to CAT Reporters, Participants and the SEC. In addition, the Plan Processor will be required to create a start-of-day ("SOD") and end-of-day ("EOD") CAT reportable list of securities for use by CAT Reporters. This list must be available online and in a machine readable (e.g., .csv) format by 6 a.m. on each Trading Day.

Queries, reports, and searches for data that span dates where there are changes to reference data must automatically include data within the requested date range. For example, if a query is run for a symbol that had three issue symbol changes during the time window of the query parameters, the result set must automatically include data for all three symbols that were in use during the time window of the query.

The Plan Processor must also develop an end-to-end process and framework for technical, business and operational metadata.

### 2.1 Data Types and Sources

The Plan Processor will be responsible for developing detailed data and interface specifications for data to be submitted by CAT Reporters. These specifications will be contained in the Technical Specifications, the initial version of which will be presented to the Operating Committee for approval. The Technical Specifications must be designed to capture all of the data elements required by SEC Rule 613, as well as other information the Participants determine necessary to facilitate elimination of reporting systems that the CAT may cause to be redundant, such as EBS and OATS. In the future, new data sources such as public news may be added to the specifications.

CAT Reporters and Data Submitters will transmit data in an electronic data format(s) that will be defined by the Plan Processor. The Technical Specifications must include details for connectivity and electronic submission, transmission, retransmission and processing. It is possible that more than one format will be defined to support the various senders throughout the industry.

The Participants anticipate that some broker-dealers will not directly report to the CAT but will rely on other organizations to report on their behalf. However, the CAT will need to have the flexibility to adapt on a timely basis to changes in the number of entities that report CAT Data.

## 2.2 Data Feed Management

The Plan Processor must monitor and manage incoming and outgoing data feeds for, at a minimum, the following:

- Data files from each CAT Reporter and Data Submitter;
- Files that cover multiple trade dates (e.g., to account for clearing and changes);
- Full and partial file submissions that contain corrections from previously rejected files;
- Full and partial file submissions based on CAT Reporter; and
- Receipt and processing of market data feeds (SIP, OPRA, OCC).

The Plan Processor must also develop a process for detecting, managing, and mitigating duplicate file submissions. It must create and store operational logs of transmissions, success, and failure reasons in order to create reports for CAT Reporters, Participants, and the SEC. Outgoing data feeds must be logged and corresponding metadata elements must be monitored and captured.

### 2.2.1 Managing connectivity for data feeds (e.g., SIPs, broker-dealers and regulators)

The Plan Processor will be required to ensure that it provides all CAT Reporters with the ability to transmit CAT Data to the Central Repository as required to meet the reporting requirements. The Plan Processer is required to have a robust managed file transfer ("MFT") tool, including full monitoring, permissioning, auditing, security, high availability,[263] file integrity checks, identification of data transmission failures / errors, transmission performance metrics, multiple transmission protocols, Latency / network bottlenecks or delays, key management, etc. CAT Reporters must also have the ability to conduct manual data entry via a

[263] To be defined in the SLAs to be agreed to between the Participants and the Plan Processor, as detailed in Appendix D, Functionality of the CAT System.

GUI interface or the uploading of a file, subject to a maximum record capacity, which will be defined by the Plan Processor in consultation with the Operating Committee.

**3. Reporting and Linkage Requirements**

All CAT Data reported to the Central Repository must be processed and assembled to create the complete lifecycle of each Reportable Event. Reportable Events must contain data elements sufficient to ensure the same regulatory coverage currently provided by existing regulatory reporting systems that have been identified as candidates for retirement.

Additionally, the Central Repository must be able to:

- Assign a unique CAT-Reporter-ID to all reports submitted to the system based on sub-identifiers, (e.g., MPIDs, ETPID, trading mnemonic) currently used by CAT Reporters in their order handling and trading processes.

- Handle duplicate sub-identifiers used by members of different Participants to be properly associated with each Participant.

- Generate and associate one or more Customer-IDs with all Reportable Events representing new orders received from a Customer(s) of a CAT Reporter. The Customer-ID(s) will be generated from a Firm Designated ID provided by the CAT Reporter for each such event, which will be included on all new order events.

- Accept time stamps on order events handled electronically to the finest level of granularity captured by CAT Reporters. Additionally, the CAT must be able to expand the time stamp field to accept time stamps to an even finer granularity as trading systems expand to capture time stamps in ever finer granularity. The Plan Processor must normalize all processed date/time CAT Data into a standard time zone/format.

In addition, the data required from CAT Reporters will include all events and data elements required by the Plan Processor in the Technical Specifications to build the:

- Life cycle of an order for defined events within a CAT Reporter;

- Life cycle of an order for defined events intra-CAT Reporter; and

- State of all orders across all CAT Reporters at any point in time.

The Plan Processor must use the "daisy chain approach" to link and create the order lifecycle. In the daisy chain approach, a series of unique order identifiers, assigned to all order events handled by CAT Reporters are linked together by the Central Repository and assigned a single CAT-generated CAT-Order-ID that is associated with each individual order event and used to create the complete lifecycle of an order.

By using the daisy chain approach the Plan Processor must be able to link all related order events from all CAT Reporters involved in the lifecycle of an order. At a minimum, the Central Repository must be able to create the lifecycle between:

- All order events handled within an individual CAT Reporter, including orders routed to internal desks or departments with different functions (e.g., an internal ATS);
- Customer orders to "representative" orders created in firm accounts for the purpose of facilitating a customer order (e.g., linking a customer order handled on a riskless principal basis to the street-side proprietary order);
- Orders routed between broker-dealers;
- Orders routed from broker-dealers to exchanges;
- Orders sent from an exchange to its routing broker-dealer;
- Executed orders and trade reports;
- Various legs of option/equity complex orders; and
- Order events for all equity and option order handling scenarios that are currently or may potentially be used by CAT Reporters, including:
    - Agency route to another broker-dealer or exchange;
    - Riskless principal route to another broker-dealer or exchange capturing within the lifecycle both the customer leg and street side principal leg;
    - Orders routed from one exchange through a routing broker-dealer to a second exchange;
    - Orders worked through an average price account capturing both the individual street side execution(s) and the average price fill to the Customer;
    - Orders aggregated with other orders for further routing and execution capturing both the street side executions for the aggregated order and the fills to each customer order;
    - Complex orders involving one or more options legs and an equity leg, with a linkage between the option and equity legs;
    - Complex orders containing more legs than an exchange's order management system can accept, causing the original order to be broken into multiple orders;
    - Orders negotiated over the telephone or via a negotiation system;
    - Orders routed on an agency basis to a foreign exchange;
    - Execution of customer order via allocation of shares from a pre-existing principal order;
    - Market maker quotes; and
    - Complex orders involving two or more options legs.

Additionally, the Central Repository must be able to:

- Link each order lifecycle back to the originating Customer;

- Integrate and appropriately link reports representing repairs of original submissions that are rejected by the CAT due to a failure to meet a particular data validation;

- Integrate into the CAT and appropriately link reports representing records that are corrected by a CAT Reporter for the purposes of correcting data errors not identified in the data validation process;

- Assign a single CAT-Order-ID to all events contained within the lifecycle of an order so that regulators can readily identify all events contained therein; and

- Process and link Manual Order Events with the remainder of the associated order lifecycle.

As described in Section 3.4 of Appendix D, Options Market Maker quotes in Listed Options will be subject to ingestion only and will not be subject to any linkage requirements.

### 3.1 Timelines for Reporting

CAT Data for the previous Trading Day must be reported to the Central Repository by 8:00 a.m. Eastern Time on the Trading Day following the day the Industry Member receives such data; however, the Plan Processor must accept data prior to that deadline, including intra-day submissions.

### 3.2 Other Items

The Plan Processor must anticipate and manage order data processing over holidays, early market closures and both anticipated and unanticipated market closures. The Plan Processor must allow and enable entities that are not CAT Reporters (e.g., service bureaus) to report on behalf of CAT Reporters only upon being permissioned by the CAT Reporter, and must develop appropriate tools to facilitate this process.

### 3.3 Required Data Attributes for Order Records Submitted by CAT Reporters

At a minimum, the Plan Processor must be able to receive the data elements as detailed in the CAT NMS Plan.

### 3.4 Requirements for Options Market Maker Quotes in Listed Options

The provisions of this section shall govern the processing and storage of Options Market Maker quotes in Listed Options and shall override any conflicting provisions in the CAT NMS Plan, this Appendix D, or Exchange Act Rule 17a-1.

Options Market Maker quotes in Listed Options must be reported to the Central Repository as provided under Section 6.4(d)(iii) of the CAT NMS Plan. This data will undergo ingestion validation only and such unlinked data will be made available to regulators by T+1 at 12:00 p.m. Eastern Time. Options Market Maker quotes in Listed Options will not be subject to

any requirement to link and create an order lifecycle, and will not undergo any linkage validation, linkage feedback, or lifecycle enrichment processing, but will undergo ingestion validation. Options Market Maker quotes in Listed Options will be accessible through BDSQL and Direct Read interfaces only and will not be accessible through the online targeted query tool.

Upon request of the SEC or any Participant, the Plan Processor will provide the business and technical requirements needed to re-create the eliminated enrichments, as well as the code (which is unique to the Plan Processor's linkage implementation) existing as of the effective date of this provision used to derive the eliminated enrichments. The Plan Processor will not maintain the business and technical requirements and the code following the effective date of this provision, but it will retain a copy so that they may be provided to any regulators that might request them in the future.

## 4. Data Security

### 4.1 Overview

SEC Rule 613 requires that the Plan Processor ensure the security and confidentiality of all information reported to and maintained by the CAT in accordance with the policies, procedures and standards in the CAT NMS Plan.

The Plan Processor must have appropriate solutions and controls in place to ensure data confidentiality and security during all communication between CAT Reporters and Data Submitters and the Plan Processor, data extraction, manipulation and transformation, loading to and from the Central Repository and data maintenance by the CAT System. The Plan Processor must address security controls for data retrieval and query reports by Participant and the SEC. The solution must provide appropriate tools, logging, auditing and access controls for all components of the CAT System, such as but not limited to access to the Central Repository, access for CAT Reporters, access to rejected data, processing status and CAT Reporter performance and comparison statistics.

The Plan Processor must provide to the Operating Committee a comprehensive security plan that covers all components of the CAT System, including physical assets and personnel, and the training of all persons who have access to the Central Repository consistent with Article VI, Section 6.1(m). The security plan must be updated annually. The security plan must include an overview of the Plan Processor's network security controls, processes and procedures pertaining to the CAT Systems. Details of the security plan must document how the Plan Processor will protect, monitor and patch the environment; assess it for vulnerabilities as part of a managed process, as well as the process for response to security incidents and reporting of such incidents. The security plan must address physical security controls for corporate, data center, and leased facilities where Central Repository data is transmitted or stored. The Plan Processor must have documented "hardening baselines" for systems that will store, process, or transmit CAT Data or PII data.

#### 4.1.1 Connectivity and Data Transfer

The CAT System(s) must have encrypted internet connectivity. CAT Reporters must connect to the CAT infrastructure using secure methods such as private lines or (for smaller

broker-dealers) Virtual Private Network connections over public lines. Remote access to the Central Repository must be limited to authorized Plan Processor staff and must use secure multi-factor authentication that meets or exceeds the Federal Financial Institutions Examination Council ("FFIEC") security guidelines surrounding authentication best practices.[264]

The CAT databases must be deployed within the network infrastructure so that they are not directly accessible from external end-user networks. If public cloud infrastructures are used, virtual private networking and firewalls/access control lists or equivalent controls such as private network segments or private tenant segmentation must be used to isolate CAT Data from unauthenticated public access.

#### 4.1.2 Data Encryption

All CAT Data must be encrypted at rest and in flight using industry standard best practices (e.g., SSL/TLS) including archival data storage methods such as tape backup. Symmetric key encryption must use a minimum key size of 128 bits or greater (e.g., AES-128), larger keys are preferable. Asymmetric key encryption (e.g., PGP) for exchanging data between Data Submitters and the Central Repository is desirable.

Storage of unencrypted PII data is not permissible. PII encryption methodology must include a secure documented key management strategy such as the use of HSM(s). The Plan Processor must describe how PII encryption is performed and the key management strategy (e.g., AES-256, 3DES).

If public cloud managed services are used that would inherently have access to the data (e.g., BigQuery, S3, Redshift), then the key management surrounding the encryption of that data must be documented (particularly whether the cloud provider manages the keys, or if the Plan Processor maintains that control). Auditing and real-time monitoring of the service for when cloud provider personnel are able to access/decrypt CAT Data must be documented, as well as a response plan to address instances where unauthorized access to CAT Data is detected. Key management/rotation/revocation strategies and key chain of custody must also be documented in detail.

#### 4.1.3 Data Storage and Environment

Data centers housing CAT Systems (whether public or private) must, at a minimum, be AICPA SOC 2 certified by a qualified third-party auditor that is not an affiliate of any of the Participants or the CAT Processor. The frequency of the audit must be at least once per year.

CAT compute infrastructure may not be commingled with other non-regulatory systems (or tenets, in the case of public cloud infrastructure). Systems hosting the CAT processing for any applications must be segmented from other systems as far as is feasible on a network level (firewalls, security groups, ACL's, VLAN's, authentication proxies/bastion hosts and similar). In the case of systems using inherently shared infrastructure/storage (e.g., public cloud storage

[264] Federal Financial Institutions Examination Council, Supplement to Authentication in an Internet Banking Environment (June 22, 2011), *available at* http://www.ffiec.gov/pdf/Auth-ITS-Final%206-22-11%20(FFIEC%20Formated).pdf.

services), an encryption/key management/access control strategy that effectively renders the data private must be documented.

The Plan Processor must include penetration testing and an application security code audit by a reputable (and named) third party prior to launch as well as periodically as defined in the SLA(s). Reports of the audit will be provided to the Operating Committee as well as remediation plan for identified issues. The penetration test reviews of the Central Repository's network, firewalls, and development, testing and production systems should help the CAT evaluate the system's security and resiliency in the face of attempted and successful systems intrusions.

#### 4.1.4 Data Access

The Plan Processor must provide an overview of how access to PII and other CAT Data by Plan Processor employees and administrators is restricted. This overview must include items such as, but not limited to, how the Plan Processor will manage access to the systems, internal segmentation, multi-factor authentication, separation of duties, entitlement management, background checks, etc.

The Plan Processor must develop and maintain policies and procedures reasonably designed to prevent, detect, and mitigate the impact of unauthorized access or usage of data in the Central Repository. Such policies and procedures must be approved by the Operating Committee, and should include, at a minimum:

- Information barriers governing access to and usage of data in the Central Repository;
- Monitoring processes to detect unauthorized access to or usage of data in the Central Repository; and
- Escalation procedures in the event that unauthorized access to or usage of data is detected.

A Role Based Access Control ("RBAC") model must be used to permission user with access to different areas of the CAT System. The CAT System must support an arbitrary number of roles with access to different types of CAT Data, down to the attribute level. The administration and management of roles must be documented. Periodic reports detailing the current list of authorized users and the date of their most recent access must be provided to Participants, the SEC and the Operating Committee. The reports of the Participants and the SEC will include only their respective list of users. The Participants must provide a response to the report confirming that the list of users is accurate. The required frequency of this report will be defined by the Operating Committee. The Plan Processor must log every instance of access to Central Repository data by users.

Passwords stored in the CAT System must be stored according to industry best practices. Reasonable password complexity rules should be documented and enforced, such as, but not limited to, mandatory periodic password changes and prohibitions on the reuse of the recently used passwords.

Password recovery mechanisms must provide a secure channel for password reset, such as emailing a one-time, time-limited login token to a pre-determined email address associated with that user. Password recovery mechanisms that allow in-place changes or email the actual forgotten password are not permitted.

Any login to the system that is able to access PII data must follow non-PII password rules and must be further secured via multi-factor authentication ("MFA"). The implementation of MFA must be documented by the Plan Processor. MFA authentication capability for all logins is required to be implemented by the Plan Processor.

#### 4.1.5 Breach Management

The Plan Processor must develop policies and procedures governing its responses to systems or data breaches. Such policies and procedures will include a formal cyber incident response plan, and documentation of all information relevant to breaches.

The cyber incident response plan will provide guidance and direction during security incidents. The plan will be subject to approval by the Operating Committee. The plan may include items such as:

- Guidance on crisis communications;
- Security and forensic procedures;
- Customer notifications;
- "Playbook" or quick reference guides that allow responders quick access to key information;
- Insurance against security breaches;
- Retention of legal counsel with data privacy and protection expertise; and
- Retention of a Public Relations firm to manage media coverage.

Documentation of information relevant to breaches should include:

- A chronological timeline of events from the breach throughout the duration of the investigation;
- Relevant information related to the breach (e.g., date discovered, who made the discovery, and details of the breach);
- Response efforts, involvement of third parties, summary of meetings/conference calls, and communication; and

- The impact of the breach, including an assessment of data accessed during the breach and impact on CAT Reporters.

#### 4.1.6 PII Data Requirements

PII data must not be included in the result set(s) from online or direct query tools, reports or bulk data extraction. Instead, results will display existing non-PII unique identifiers (e.g., Customer-ID or Firm Designated ID). The PII corresponding to these identifiers can be gathered using the PII workflow described in Appendix D, Data Security, PII Data Requirements. By default, users entitled to query CAT Data are not authorized for PII access. The process by which someone becomes entitled for PII access, and how they then go about accessing PII data, must be documented by the Plan Processor. The chief regulatory officer, or other such designated officer or employee at each Participant must, at least annually, review and certify that people with PII access have the appropriate level of access for their role.

Using the RBAC model described above, access to PII data shall be configured at the PII attribute level, following the "least privileged" practice of limiting access as much as possible.

PII data must be stored separately from other CAT Data. It cannot be stored with the transactional CAT Data, and it must not be accessible from public internet connectivity. A full audit trail of PII access (who accessed what data, and when) must be maintained. The Chief Compliance Officer and the Chief Information Security Officer shall have access to daily PII reports that list all users who are entitled for PII access, as well as the audit trail of all PII access that has occurred for the day being reported on.

### 4.2 Industry Standards

The following industry standards—which is not intended to be an exclusive list—must be followed as such standards and requirements may be replaced by successor publications, or modified, amended, or supplemented and as approved by the Operating Committee (in the event of a conflict between standards, the more stringent standard shall apply, subject to the approval of the Operating Committee):

- National Institute of Standards and Technology:
    - 800-23 – Guidelines to Federal Organizations on Security Assurance and Acquisition / Use of Test/Evaluated Products
    - 800-53 – Security and Privacy Controls for Federal Information Systems and Organizations
    - 800-115 – Technical Guide to Information Security Testing and Assessment
    - 800-118 – Guide to Enterprise Password Management
    - 800-133 – Recommendation for Cryptographic Key Generation
    - 800-137 – Information Security Continuous Monitoring for Federal Information Systems and Organizations
    - To the extent not specified above, all other provisions of the NIST Cyber Security Framework

- Federal Financial Institutions Examination Council:
    - Authentication Best Practices
- International Organization for Standardization:
    - ISO/IEC 27001 – Information Security Management

The Company shall endeavor to join the FS-ISAC and comparable bodies as the Operating Committee may determine. The FS-ISAC provides real time security updates, industry best practices, threat conference calls, xml data feeds and a member contact directory. The FS-ISAC provides the Company with the ability to work with the entire financial industry to collaborate for the purposes of staying up to date with the latest information security activities.

## 5. BCP / DR Process

### 5.1 Overview

The Plan Processor must develop and implement disaster recovery ("DR") and business continuity plans ("BCP") that are tailored to the specific requirements of the CAT environment, and which must be approved and regularly reviewed by the Operating Committee. The BCP must address the protection of data, service for the data submissions, processing, data access, support functions and operations. In the context of this document, BCP generally refers to how the business activities will continue in the event of a widespread disruption and the DR requirements refer to how the CAT infrastructure will be designed to support a full data center outage. In addition, the Plan Processor must have SLAs in place to govern redundancy (i.e., no single point of failure) of critical aspects of the CAT System (e.g., electrical feeds, network connectivity, redundant processors, storage units, etc.) and must have an architecture to support and meet the SLA requirements. Any SLAs between the Plan Processor and third parties must be approved by the Operating Committee.

### 5.2 Industry Standards

The following National Institute of Standards and Technology standards, at a minimum, must be followed in association with Disaster Recovery, in each case as such standards and requirements may be replaced by successor publications, or modified, amended, or supplemented and as approved by the Operating Committee:

- 800-34 – Contingency Planning for Federal Information Systems; and
- Specifically, the following sections as minimum requirements for designing and implementing BCP and DR plans:
    - Chapter 3: Information System Contingency Planning Process, which identifies seven steps to use when developing contingency plans;
    - Chapter 4: Information System Contingency Plan Development, which outlines the key elements of a contingency plan;

- Chapter 5: Technical Contingency Planning Considerations (using the specific sections applicable to the Plan Processor's systems) which provides considerations specific to different types of technology; and
- Other sections and the appendices should be taken into consideration as warranted.

In addition, the Plan Processor will need to develop a process to manage and report all breaches.

### 5.3 Business Continuity Planning

The Plan Processor will design a BCP that supports a continuation of the business activities required of the CAT in the event of a widespread disruption.

With respect to the team supporting CAT business operations, a secondary site must be selected that is capable of housing the critical staff necessary for CAT business operations. The site must be fully equipped to allow for immediate use. The selection of the site must take into account diversity in utility and telecommunications infrastructure as well as the ability for CAT staff to access the site in the event of transit shutdowns, closure of major roadways and other significant disruptions that may affect staff. Planning should consider operational disruption involving significant unavailability of staff.

A bi-annual test of CAT operations where CAT staff operates the facility from the secondary site is required. This will ensure that phone systems, operational tools and other help desk functions all work as expected and the Plan Processor still functions as usual even in the event of a disruption.

CAT operations staff must maintain, and annually test, remote access capabilities to ensure smooth operations during a site un-availability event. Certain critical staff may be required to report directly to the secondary office site. However, an effective telecommuting solution must be in place for all critical CAT operations staff. Furthermore, any telecommuting strategy must require a remote desktop style solution where CAT operations and data consoles remain at the primary data center and must further ensure that CAT Data may not be downloaded to equipment that is not CAT-owned and compliant with CAT security requirements.

The BCP must identify critical third party dependencies. The Plan Processor will coordinate with critical suppliers regarding their arrangements and involve these parties in tests on an annual basis. Critical third party firms may be required to provide evidence of their BCP capabilities and testing.

The Plan Processor must conduct third party risk assessments at regular intervals to verify that security controls implemented are in accordance with NIST SP 800-53. These risk assessments must include assessment scheduling, questionnaire completion and reporting. The Plan Processor should provide assessment reports to the Operating Committee.

The Plan Processor will develop and annually test a detailed crisis management plan to be invoked following certain agreed disruptive circumstances.

The processing sites for business continuity must adhere to the "Interagency Paper on Sound Practices to Strengthen the Resilience of the U.S. Financial System."[265]

The Plan Processor will conduct an annual Business Continuity Audit using an Independent Auditor approved by the Operating Committee. The Independent Auditor will document all findings in a detailed report provided to the Operating Committee.

### 5.4 Disaster Recovery Requirements

The Plan Processor will implement a DR capability that will ensure no loss of data and will support the data availability requirements and anticipated volumes of the CAT.

A secondary processing site must be capable of recovery and restoration of services at the secondary site within a minimum of 48 hours, but with the goal of achieving next day recovery after a disaster event. The selection of the secondary site must consider sites with geographic diversity that do not rely on the same utility, telecom and other critical infrastructure services. The processing sites for disaster recovery and business continuity must adhere to the "Interagency Paper on Sound Practices to Strengthen the Resilience of the U.S. Financial System."

The secondary site must have the same level of availability / capacity / throughput and security (physical and logical) as the primary site. The requirement implies and expects that fully redundant connectivity between the primary and secondary processing sites be established and fully available. Further, given this recovery window, this connectivity must be used to replicate repositories between the primary and secondary sites. Finally, CAT Reporter and Data Submitter submissions must be replicated to the secondary site for possible replay if recent replications are incomplete. Replication must occur as deliveries complete to ensure that a widespread communications failure will have minimal impact to the state of the secondary site.

On an annual basis, the Plan Processor must execute an industry DR test, which must include Plan Participants and a critical mass of non-Plan Participant CAT Reporters and Data Submitters. The tests must be structured such that all CAT Reporters and other Data Submitters can upload to the DR site and the data be ingested by the CAT Data loaders. All DR tests are required to realistically reflect the worst-case scenario.

Failover processes must be transparent to CAT Reporters, as well as failback. In the event of a site failover, CAT Reporters must be able to deliver their daily files without changing configuration. This avoids requiring all CAT Reporters to update configurations, which is an error-prone effort.

After a DR event, the primary processing site must be made available as quickly as possible. For short duration DR events, the primary site must be returned to primary within 48 hours after the DR event. Longer duration outages will have differing SLAs. The DR plan must

[265] *See* Interagency Paper on Sound Practices to Strengthen the Resilience of the U.S. Financial System (Apr. 8, 2003), *available at* http://www.sec.gov/news/studies/34-47638.htm.

include designs that allow the re-introduction of the primary site or the introduction of a new primary site as the event dictates and an indication of the time required for this re-introduction.

## 6. Data Availability

### 6.1 Data Processing

CAT order events must be processed within established timeframes to ensure data can be made available to Participants' regulatory staff and the SEC in a timely manner. The processing timelines start on the day the order event is received by the Central Repository for processing. Most events must be reported to the CAT by 8:00 a.m. Eastern Time the Trading Day after the order event occurred (referred to as transaction date). The processing timeframes below are presented in this context. All events submitted after T+1 (either reported late or submitted later because not all of the information was available) must be processed within these timeframes based on the date they were received.

The Participants require the following timeframes (Figure A) for the identification, communication and correction of errors from the time an order event is received by the processor:

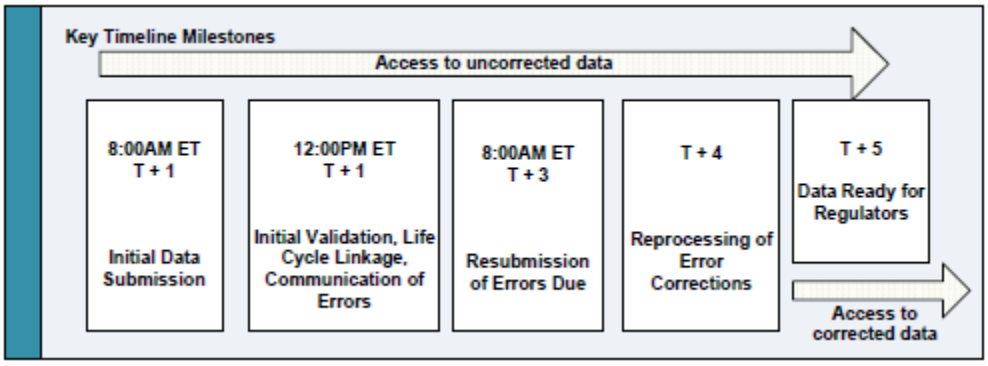
- Noon Eastern Time T+1 (transaction date + one day) – Initial data validation, lifecycle linkages and communication of errors to CAT Reporters;

- 8:00 a.m. Eastern Time T+3 (transaction date + three days) – Resubmission of corrected data; and

- 8:00 a.m. Eastern Time T+5 (transaction date + five days) – Corrected data available to Participant regulatory staff and the SEC.

Late submissions or re-submissions (after 8:00 a.m.) may be considered to be processed that day if it falls within a given time period after the cutoff. This threshold will be determined by the Plan Processor and approved by the Operating Committee. In the event that a significant portion of the data has not been received as monitored by the Plan Processor, the Plan Processor may decide to halt processing pending submission of that data.

**Figure A: CAT Central Repository Data Processing Timelines**



For the avoidance of doubt, processing and storage of Options Market Maker quotes in Listed Options shall be governed by Section 3.4 of Appendix D.

### 6.2 Data Availability Requirements

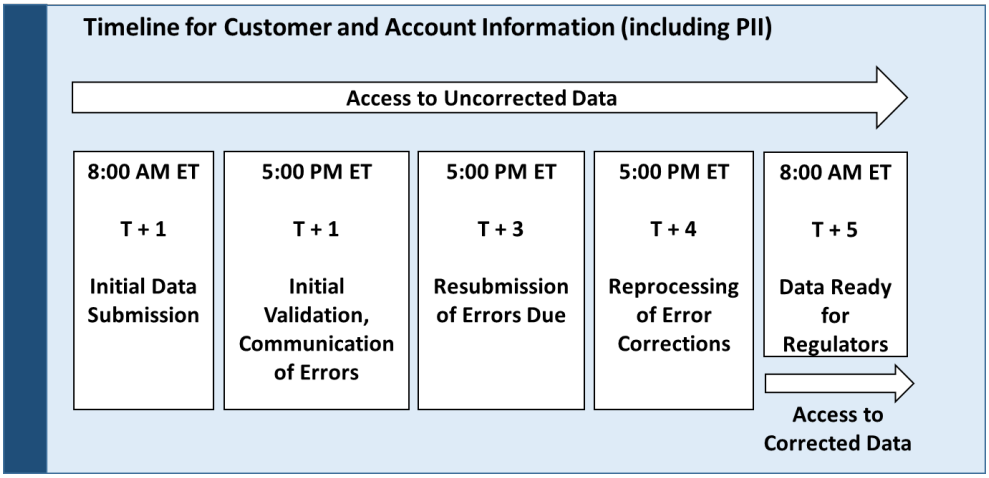
Prior to 12:00 p.m. Eastern Time on T+1, raw unprocessed data that has been ingested by the Plan Processor must be available to Participants' regulatory staff and the SEC.

Between 12:00 p.m. Eastern Time on T+1 and T+5, access to all iterations of processed data must be available to Participants' regulatory staff and the SEC.

The Plan Processor must provide reports and notifications to Participant regulatory staff and the SEC regularly during the five-day process, indicating the completeness of the data and errors. Notice of major errors or missing data must be reported as early in the process as possible. If any data remains un-linked after T+5, it must be available and included with all linked data with an indication that the data was not linked.

If corrections are received after T+5, Participants' regulatory staff and the SEC must be notified and informed as to how re-processing will be completed. The Operating Committee will be involved with decisions on how to re-process the data; however, this does not relieve the Plan Processor of notifying the Participants' regulatory staff and the SEC.

**Figure B: Customer and Account Information (Including PII)**




CAT PII data must be processed within established timeframes to ensure data can be made available to Participants' regulatory staff and the SEC in a timely manner. Industry Members submitting new or modified Customer information must provide it to the Central Repository no later than 8:00 a.m. Eastern Time on T+1. The Central Repository must validate the data and generate error reports no later than 5:00 p.m. Eastern Time on T+1. The Central Repository must process the resubmitted data no later than 5:00 p.m. Eastern Time on T+4. Corrected data must be resubmitted no later than 5:00 p.m. Eastern Time on T+3. The Central Repository must process the resubmitted data no later than 5:00 p.m. Eastern Time on T+4. Corrected data must be available to regulators no later than 8:00 a.m. Eastern Time on T+5.

Customer information that includes PII data must be available to regulators immediately upon receipt of initial data and corrected data, pursuant to security policies for retrieving PII.

### 6.3 Exceptions to Data Availability Requirements

Notwithstanding any other provision of the CAT NMS Plan, this Appendix D, or Exchange Act Rule 17a-1, the following types of data may be retained in an archive storage tier. Archived data is not directly available and searchable electronically without manual intervention and will not be subject to any query tool performance requirements until it is restored to an accessible storage tier. The Plan Processor will restore archived data to an accessible storage tier upon request to the CAT Help Desk by an authorized regulatory user from the Participants or a senior officer from the SEC.

- Raw Unprocessed Data older than 15 days. "Raw Unprocessed Data" means data that has been ingested by the Plan Processor and made available to regulators prior to 12:00 p.m. Eastern Time on T+1.

- Interim Operational Data older than 15 days. "Interim Operational Data" means all processed, validated and unlinked data made available to regulators by T+1 at 12:00 p.m. ET and all iterations of processed data made available to regulators between T+1 and T+5, but excludes the final version of corrected data that is made available at T+5 at 8:00 a.m. ET. For the avoidance of doubt, "Interim Operational Data" does not include processed data relating to Options Market Maker quotes in Listed Options made available to regulators by T+1 at 12:00 p.m. ET.

- All submission and feedback files older than 15 days.

## 7. Receipt of Data from Reporters

### 7.1 Receipt of Data Transmission

Following receipt of data files submitted by the CAT Reporter or Data Submitter, the Plan Processor must send an acknowledgement of data received to the CAT Reporter and Data Submitter, if applicable. Such acknowledgment will enable CAT Reporters to create an audit trail of their submissions and allow for tracing of data breakdowns when data is not received. At a minimum, the receipt acknowledgement will include:

- SRO-Assigned Market Participant Identifier;

- Date of Receipt;

- Time of Receipt;

- File Identifier; and

- Value signifying the acknowledgement of receipt, but not processing, of the file.

### 7.2 Data Validation

The Plan Processor will implement data validations at the file and individual record level for data received by the Plan Processor including customer data. If a record does not pass basic validations, such as syntax rejections, then it must be rejected and sent back to the CAT Reporter as soon as possible, so it can repair and resubmit.[266] The required data validations may be amended based on input from the Operating Committee and the Advisory Committee. All identified exceptions will be reported back to the CAT Reporter submitting the data and/or the CAT Reporter on whose behalf the data was submitted.

The data validations must include the following categories and must be explained in the Technical Specifications document:

- File Validations – Confirmation of file transmission and receipt are in the correct formats. This includes validation of header and trailers on the submitted report, confirmation of a valid SRO-Assigned Market Participant Identifier, and verification of the number of records in the file.

- Validation of CAT Data – Syntax and context checks, including:

    - Format checks:
        - Check that the data is entered in the specified format
    - Data Type checks:
        - Check that the data type of each attribute is as per specification
    - Consistency checks:
        - Check that all attributes for a record of a specified type are consistent
    - Range/logic checks:
        - Range check – Validate that each attribute for every record has a value within specified limits
        - Logic check – Validate that the values provided against each attribute are associated with the event type they represent
    - Data validity checks:
        - Validate that each attribute for every record has an acceptable value
    - Completeness checks:
        - Verify that each mandatory attribute for every record is not null
    - Timeliness checks:
        - Verify that records were submitted within the submission timelines

- Linkage Validation[267] – Process by which related CAT Reportable Events are in a linked daisy chain method

CAT Reporters must have the ability to correct, replace or delete records that have passed initial validations within the CAT.

[266] If needed – data validation may be a process with an initial validation phase for data errors and a subsequent validation phase later in processing where more time is needed to assess the context of the record in relation to data that may be submitted to the CAT later in the submission window. The Plan Processor must have an additional "matching" process for the purposes of linking together order data passed between CAT Reporters.
[267] A linkage validation error should only populate for the CAT Reporter that the Plan Processor determines to have broken the link.

After the Central Repository has processed the data, the Plan Processor must provide daily statistics, including at a minimum, the following information:

- SRO-Assigned Market Participant Identifier;
- Date of Submission;
- Number of files received;
- Number of files accepted;
- Number of files rejected;
- Number of total order events received;
- Number of order events accepted;
- Number of order events rejected;
- Number of each type of report received;
- Number of each type of report accepted;
- Number of each type of report rejected;
- Number of customer records received;
- Number of total customer records accepted;
- Number of total customer records rejected;
- Number of unknown accounts;
- Number of late submissions;
- Order-IDs rejected;
- Reason(s) for rejection;
- Number of records attempted to be matched;
- Number of records matched; and
- Percentage of records matched.

Individual records contained in files that do not pass the file validation process must not be included for further processing. Once a file passes the initial validation, individual records contained therein may then be processed for further validation. Individual records that do not

pass the data validation processes will not be included in the final audit trail but must be retained. Additionally, records not passing the validations will not be included for matching processes.

### 7.3 Exception Management

The Plan Processor must capture rejected records for each CAT Reporter and make them available to the CAT Reporter. The "rejects" file must be accessible via an electronic file format and the rejections and daily statistics must be available via a web interface. The Plan Processor must provide functionality for CAT Reporters to amend any exceptions.

The Plan Processor must support bulk error correction. Rejected records can be resubmitted as a new file with appropriate indicators to identify the rejection record, which is being repaired. The Plan Processor will then reprocess repaired records.

A GUI must be available for CAT Reporters to make updates to individual records or attributes and must include, at a minimum, the:

- Count of each type of rejection;
- Reason for each rejection;
- Ability to download the rejections;
- Firm assigned order ID of each rejection;
- Details of each rejection;
- Type of report rejected; and
- Repair status.

The Plan Processor must support bulk replacement of records, and reprocess such replaced records. The Plan Processor must provide CAT Reporters with documentation that detail the process how to amend and upload records that fail the validations that are outlined as part of Section 7.4. The Plan Processor must maintain a detailed audit trail capturing corrections to and replacements of records.

The Plan Processor will provide CAT Reporters with their error reports as they become available, and daily statistics will be provided after data has been uploaded and validated by the Plan Processor. The Plan Processor must support a continuous validation and feedback model so that CAT Reporters can identify and correct rejections on an ongoing basis. The rejected reports will include descriptive details, or codes related to descriptive details, as to why each data record was rejected by the Plan Processor.

On a monthly basis, the Plan Processor must produce and publish reports detailing performance and comparison statistics for CAT Reporters,[268] similar to the Report Cards

[268] *See* Appendix C, Error Communication, Correction, and Processing.

published for OATS presently. This will enable CAT Reporters to assess their performance in relation to their industry peers and help them assess the risk related to their reporting of transmitted data.

Breaks in intermittent lifecycle linkages must not cause the entire lifecycle to break nor cause a reject to the CAT Reporter that correctly reported.

### 7.4 Error Corrections

Error corrections must be able to be submitted and processed at any time, including timeframes after the standard repair window. Additionally, in order to make corrections, CAT Reporters must have access to the Central Repository over weekends.

CAT Reporters must be able to submit error corrections for data errors identified by CAT Reporters that passed format validations.

Additionally, the Plan Processor must:

- Provide feedback as to the reason(s) for errors;
- Prevent a linkage break between reports from resulting in additional events being rejected;
- Allow broken linkages to be repaired without having to submit or resubmit additional reports;
- Allow error corrections to be submitted both via online and bulk uploads or via file submission;
- Support auto-correction of identified errors and notify reporters of any auto-corrections;
- Support group repairs (i.e., the wrong issue symbol affecting multiple reports).

### 7.5 Data Ingestion

Data submitted to the Central Repository, including rejections and corrections, must be stored in repositories designed to hold information based on the classification of the CAT Reporter (i.e., whether the CAT Reporter is a Participant, a broker-dealer, or a third party Data Submitter). After ingestion by the Central Repository, the Raw Data must be transformed into a format appropriate for data querying and regulatory output.

## 8. Functionality of the CAT System

### 8.1 Regulator Access

The Plan Processor must provide Participants' regulatory staff and the SEC with access to all CAT Data for regulatory purposes only. Participants' regulatory staff and the SEC will

access CAT Data to perform functions, including economic analyses, market structure analyses, market surveillance, investigations, and examinations.

The CAT must be able to support, at a minimum, 3,000 regulatory users within the system. It is estimated that approximately 20% of all users will use the system on a daily or weekly basis while approximately 10% of all users will require advanced regulator-user access, as described below. Furthermore, it is estimated that there may be approximately 600 concurrent users accessing the CAT at any given point in time. These users must be able to access and use the system without an unacceptable decline in system performance.[269]

As stated in Appendix D, Data Security, the Plan Processor must be able to support an arbitrary number of user roles. Defined roles must include, at a minimum:

- Basic regulator users – Individuals with approved access who plan to use the Central Repository to run basic queries (e.g., pulling all trades in a single stock by a specific party).

- Advanced regulator users – Individuals with approved access who plan to use the Central Repository to construct and run their own complex queries.

Regulators will have access to processed CAT Data through two different methods, an online-targeted query tool and user-defined direct queries and bulk extracts.

As described in Section 3.4 of Appendix D, Options Market Maker quotes in Listed Options will be accessible through BDSQL and Direct Read interfaces only and will not be accessible through the online targeted query tool.

### 8.1.1 Online Targeted Query Tool

The online targeted query tool will provide authorized users with the ability to retrieve processed and/or validated (unlinked) data via an online query screen that includes the ability to choose from a variety of pre-defined selection criteria. Targeted queries must include date(s) and/or time range(s), as well as one or more of a variety of fields, including the following:

- Instrument(s);

- Related instruments (e.g., single stock and all options with for the stock);

- Data type (executions, orders, cancelations, quotes, etc.);

- Product type (equity, option, etc.);

- Processed data, unlinked data or both;

- Listing market;

[269] Specific performance requirements will be included in the SLA.

- Exchange;
- CAT-Reporter-ID(s) – CAT assigned and Participant assigned;
- Customer-ID(s) – CAT assigned and CAT Reporter assigned;
- CAT-Order-ID(s) – CAT assigned and CAT Reporter assigned;
- ISO flag;
- Put/call;
- Strike price (include ability to select range);
- Size;
- Price;
- Side;
- Short-sale identifier;
- Time-in-force (IOC, GTC, etc.);
- Orders, quotes, BBOs or trades above or below a certain size;
- Orders, quotes, BBOs or trades within a range of prices;
- Canceled orders and/or trades;
- CAT Reporters exceeding specified volume or percentage of volume thresholds in a single instrument or market-wide during a specified period of time;
- CAT Reporter correction rate over time;
- Audit trail of order linkages;
- Corporate action events;
- Instrument history; and
- Others to be defined.

The tool must provide a record count of the result set, the date and time the query request is submitted, and the date and time the result set is provided to the users. In addition, the tool must indicate in the search results whether the retrieved data was linked or unlinked (e.g., using a flag). In addition, the online targeted query tool must not display any PII data. Instead, it will display existing non-PII unique identifiers (e.g., Customer-ID or Firm Designated ID). The PII

corresponding to these identifiers can be gathered using the PII workflow described in Appendix D, Data Security, PII Data Requirements. The Plan Processor must define the maximum number of records that can be viewed in the online tool as well as the maximum number of records that can be downloaded. Users must have the ability to download the results to .csv, .txt, and other formats, as applicable. These files will also need to be available in a compressed format (e.g., .zip, .gz). Result sets that exceed the maximum viewable or download limits must return to users a message informing them of the size of the result set and the option to choose to have the result set returned via an alternate method.

The Plan Processor must define a maximum number of records that the online targeted query tool is able to process. The minimum number of records that the online targeted query tool is able to process is 5,000 (if viewed within the online query tool) or 10,000 (if viewed via a downloadable file).

Once query results are available for download, users are to be given the total file size of the result set and an option to download the results in a single or multiple file(s). Users that select the multiple file option will be required to define the maximum file size of the downloadable files. The application will then provide users with the ability to download the files. This functionality is provided to address limitations of end-user network environment that may occur when downloading large files.

The tool must log submitted queries and parameters used in the query, the user ID of the submitter, the date and time of the submission, as well as the delivery of results. The Plan Processor will use this logged information to provide monthly reports to each Participant and the SEC of its respective metrics on query performance and data usage of the online query tool. The Operating Committee must receive all monthly reports in order to review items, including user usage and system processing performance.

### 8.1.2 Online Targeted Query Tool Performance Requirements

For targeted search criteria, the minimum acceptable response times will be increments of less than one minute. For the complex queries that either scan large volumes of data (e.g., multiple trade dates) or return large result sets (>1M records), the response time must generally be available within 24 hours of the submission of the request. Regardless of the complexity of the criteria used within the online query tool, any query request for data within one business date of a 12-month period must return results within 3 hours.

Performance requirements listed below apply to data:

- Online targeted query tool searches that include equities and options trade data only in the search criteria must meet minimum requirements, including:
    - Returning results within 1 minute for all trades and related lifecycle events for a specific Customer or CAT Reporter with the ability to filter by security and time range for a specified time window up to and including an entire day;

- Returning results within 30 minutes for all trades and related lifecycle events for a specific Customer or CAT Reporter in a specified date range (maximum 1 month);
- Returning results within 6 hours for all trades and related lifecycle events for a specific Customer or CAT Reporter in a specified date range (maximum 12-month duration from the most recent 24 months); and
- Returning results for the full 6 years of data for all trades and lifecycle events across daily, weekly, and multi-year periods.

- Online targeted query tool searches that include equities and options order and National Best Bid and National Best Offer data in search criteria must meet minimum requirements, including:

    - Returning results within 5 minutes for all orders and their complete lifecycles for a single security from a specific Participant across all markets (note: a Participant could have multiple participant identifiers) in a specified time window not to exceed 10 minutes for a single date;
    - Returning results within 5 minutes for all orders, cancelations, and the National Best Bid and National Best Offer (or the protected best bid and offer) at the time the order is created for a single security in a specified time window not to exceed 10 minutes for a single date;
    - Returning results within 5 minutes for all equity and options orders, cancelations, and executions from a specific market participant in a single underlying instrument in a specified time window not to exceed 10 minutes for a single date;
    - Returning results within 5 minutes for all orders, quotes, routes, cancelations and trades (complete life-cycle) for related instruments (e.g., single stock and all options series for the same stock) in a specified time window not to exceed 10 minutes for a single date;
    - Returning results within 5 minutes for all orders and quotes entered during a specific time period by a list of specific CAT Reporters, with the ability to drill down to show the complete life-cycle must return results in a specified time window not to exceed 10 minutes for a single date; and
    - Returning results within 5 minutes for all orders and quotes entered during a specific time period for a specified list of instruments must return results in a specified time window not to exceed 10 minutes for a single date.

The online targeted query tool architecture must include an automated application-level resource management component. This feature must manage query requests to balance the workload to ensure the response times for targeted and complex queries meet the defined response times. The resource management function will categorize and prioritize query requests based on the input parameters, complexity of the query, and the volume of data to be parsed in the query. Additionally, the source of the query may also be used to prioritize the processing. The Plan Processor must provide details on the prioritization plan of the defined solution for online query requests.

The online targeted query tool must support parallel processing of queries. At a minimum, the online targeted query tool must be able to process up to 300 simultaneous query requests with no performance degradation.

### 8.1.3 Online Targeted Query Tool Access and Administration

Access to CAT Data is limited to authorized regulatory users from the Participants and the SEC. Authorized regulators from the Participants and the SEC may access all CAT Data, with the exception of PII data. A subset of the authorized regulators from the Participants and the SEC will have permission to access and view PII data. The Plan Processor must work with the Participants and SEC to implement an administrative and authorization process to provide regulator access. The Plan Processor must have procedures and a process in place to verify the list of active users on a regular basis.

A two-factor authentication is required for access to CAT Data. PII data must not be available via the online targeted query tool or the user-defined direct query interface.

## 8.2 User-Defined Direct Queries and Bulk Extraction of Data

The Central Repository must provide for direct queries, bulk extraction, and download of data for all regulatory users. Both the user-defined direct queries and bulk extracts will be used by regulators to deliver large sets of data that can then be used in internal surveillance or market analysis applications. The data extracts must use common industry formats.

Direct queries must not return or display PII data. Instead, they will return existing non-PII unique identifiers (e.g., Customer-ID or Firm Designated ID). The PII corresponding to these identifiers can be gathered using the PII workflow described in Appendix D, Data Security, PII Data Requirements.

Participants and regulators must have the ability to create, save, and schedule dynamic queries that will run directly against processed and/or unlinked CAT Data. The examples below demonstrate robust usage of the CAT Data to perform a variety of complex query, surveillance, and market analysis use cases. User-defined direct queries will be used to perform tasks such as market reconstruction, behavioral analysis, and cross-market surveillance.

The method(s) for providing this capability is dependent upon the architecture of the CAT and will be defined by the final solution. The CAT cannot be web-based due to the volumes of data that could be extracted.

The Participants are agnostic as to how user-defined direct queries or bulk extracts are implemented as long as the solution provides an open API that allows regulators to use analytic tools (e.g., R, SAS, Python, Tableau) and can use ODBC/JDBC drivers to access the CAT Data. Queries invoked through the open API must be auditable. The CAT System must contain the same level of control, monitoring, logging and reporting as the online targeted query tool. The Plan Processor may define a limited set of basic required fields (e.g., date and at least one other field such as symbol, CAT-Reporter ID, or CAT-Customer-ID) that regulators must use in direct dynamic queries.

The Plan Processor must provide procedures and training to regulators that will use the direct query feature. The Plan Processor may choose to require that user-defined direct query users participate in mandatory training sessions.

The bulk extract feature will replace the current Intermarket Surveillance Group (ISG) ECAT and COATS compliance data files that are currently processed and provided to Participants for use in surveillance applications. These files are used extensively across all Participants in a variety of surveillance applications and are a critical data input to many surveillance algorithms. With the initial implementation of the CAT, opportunities exist to improve the content and depth of information available in these data files. The Plan Processor will need to work with ISG to define new layouts that will include additional data elements that will be available in the CAT Data.

The Plan Processor is responsible for providing data models and data dictionaries for all processed and unlinked CAT Data.

### 8.2.1 User-Defined Direct Query Performance Requirements

The user-defined direct query tool is a controlled component of the production environment made available to allow the Participants' regulatory staff and the SEC to conduct queries. The user-defined direct query tool must:

- Provide industry standard programmatic interface(s) that allows Participants' regulatory staff and the SEC with the ability to create, save, and run a query;

- Provide query results that are extractable / downloadable and can be used to refine subsequent queries;

- Support complex, multistage queries;

- Run at a minimum 3,000 queries on a daily basis. Of these, it is anticipated that roughly 60% would be simple queries (e.g., pulling of all trades in a given symbol traded during a certain time period) and 40% would be complex (e.g., looking for quotes or orders more than 5% away from the National Best Bid and National Best Offer);

- Process and run approximately 1,800 queries concurrently;

- Support SQL 92 as well as recursive queries with common table expressions (recursive CTEs), bulk load utility, interface for dimension management, windowing functions, JBDC and ODBC, or provide another API with equal or greater query capabilities, so long as ODBC and JDBC are supported. Support for stored procedures and user-defined functions are optional;

- Include data presentation tools / query tools that support query results that produce data sets ranging from less than 1 gigabyte to at least 10 terabytes or more of uncompressed data;

- Provide query owners with the ability to schedule queries;

- Provide query owners with the ability to cancel a query during execution or prior to the scheduled running of a query;

- Provide Participants with a means to view all saved queries owned by the Participants as well as the scheduling of query executions (for queries that have been scheduled);

- Provide an automated delivery method of scheduled query results to the appropriate Participant. Delivery methods must comply with all information security guidelines (encryption, etc.);

- Provide technical expertise to assist regulators with questions and/or functionality about the content and structure of the CAT query capability;

- Include workload balancer to allow prioritization and processing of queries and delivery of results; and

- Support parallel processing of queries. At a minimum, the user-defined direct query tool must be able to process up to 300 simultaneous query requests with no performance degradation.

#### 8.2.2 Bulk Extract Performance Requirements

For bulk extracts of an entire day of data, the minimum acceptable transfer time of equity and options data is four hours. This requirement assumes that there are no limitations within the regulator's own network environment that will prevent the Plan Processor from meeting this requirement.

A consideration was made to require an online Report Center that would include pre-canned reports that could be delivered to regulators or pulled upon request. The reports would be predefined based on requirements developed by Participants and the SEC. Due to the added complexity and the lack of quantifiable use cases, the Participants determined that this was something that may be useful in the future but not at the initial implementation and launch of the CAT. This will be reassessed when broker-dealers begin submitting data to the CAT.

It is envisioned that non-Participant CAT Reporters will be unable to access their data submissions through bulk data exports with the initial implementation of CAT. Only Participants and the SEC will have access to full lifecycle corrected bulk data exports.

Extraction of data must be consistently in line with all permissioning rights granted by the Plan Processor. Data returned must be encrypted, password protected and sent via secure methods of transmission. In addition, PII data must be masked unless users have permission to view the data that has been requested.

The Plan Processor must have an automated mechanism in place to monitor user-defined direct query usage. This monitoring must include automated alerts to notify the Plan Processor of potential issues with bottlenecks or excessively long queues for queries or data extractions. The Plan Processor must provide details as to how the monitoring will be accomplished and the metrics that will be used to trigger alerts.

The user-defined direct query and bulk extraction tool must log submitted queries and parameters used in the query, the user ID of the submitter, the date and time of the submission and the date and time of the delivery of results. The Plan Processor will use this logged information to provide monthly reports to the Operating Committee, Participants and the SEC of their respective usage of the online query tool.

The bulk extract tool must support parallel processing of queries. At a minimum, the bulk extract tool must be able to process up to 300 simultaneous query requests with no performance degradation.

### 8.3 Identifying Latency and Communicating Latency Warnings to CAT Reporters

The Plan Processor will measure and monitor Latency within the CAT network. Thresholds for acceptable levels of Latency will be identified and presented to the Operating Committee for approval. The Plan Processor will also define policies and procedures for handling and the communication of data feed delays to CAT Reporters, the SEC, and Participants' regulatory staff that occur in the CAT. Any delays will be posted for public consumption, so that CAT Reporters may choose to adjust the submission of their data appropriately, and the Plan Processor will provide approximate timelines for when system processing will be restored to normal operations.

### 8.4 Technical Operations

The Plan Processor will develop policies, procedures, and tools to monitor and manage the performance of the Central Repository, to be approved by the Operating Committee. Such policies, procedures, and tools will include, at a minimum:

- Monitoring and management of system availability and performance, to include both Online Targeted Query Tool and User-Defined Direct Queries;
- Monitoring and management of query tool usage (e.g., to identify long-running or "stuck" queries); and
- Segregation of query queues by regulator or Participant (i.e., one regulator or Participant's queries should not prevent another regulator or Participant's queries from running).

### 8.5 System SLAs

Service Level Agreements for system and operational performance will be established for areas, including the following:

- Linkage and order event processing performance;
- Query performance and response times;
- System availability;
- User support/help desk performance;
- Application, network, and data security performance; and
- Development, change management, and implementation processes and timelines.

The actual terms of the SLAs will be negotiated between the Plan Participants and the eventual Plan Processor.

## 9. CAT Customer and Customer Account Information

### 9.1 Customer and Customer Account Information Storage

The CAT must capture and store Customer and Customer Account Information in a secure database physically separated from the transactional database. The Plan Processor will maintain information of sufficient detail to uniquely and consistently identify each Customer across all CAT Reporters, and associated accounts from each CAT Reporter. The following attributes, at a minimum, must be captured:

- Social security number (SSN) or Individual Taxpayer Identification Number (ITIN);
- Date of birth;
- Current name;
- Current address;
- Previous name; and
- Previous address.

For legal entities, the CAT must capture the following attributes:

- Legal Entity Identifier (LEI) (if available);
- Tax identifier;
- Full legal name; and
- Address.

The Plan Processor must maintain valid Customer and Customer Account Information for each trading day and provide a method for Participants' regulatory staff and the SEC to easily obtain historical changes to that information (e.g., name changes, address changes, etc.).

The Plan Processor will design and implement a robust data validation process for submitted Firm Designated ID, Customer Account Information and Customer Identifying Information, and must continue to process orders while investigating Customer information mismatches. Validations should:

- Confirm the number of digits on a SSN,
- Confirm date of birth, and
- Accommodate the situation where a single SSN is used by more than one individual.

The Plan Processor will use the Customer information submitted by all broker-dealer CAT Reporters to assign a unique Customer-ID for each Customer. The Customer-ID must be consistent across all broker-dealers that have an account associated with that Customer. This unique CAT-Customer-ID will not be returned to CAT Reporters and will only be used internally by the CAT.

Broker-Dealers will initially submit full account lists for all active accounts to the Plan Processor and subsequently submit updates and changes on a daily basis. In addition, the Plan Processor must have a process to periodically receive full account lists to ensure the completeness and accuracy of the account database. The Central Repository must support account structures that have multiple account owners and associated Customer information (joint accounts, managed accounts, etc.), and must be able to link accounts that move from one CAT Reporter to another (e.g., due to mergers and acquisitions, divestitures, etc.).

### 9.2 Required Data Attributes for Customer Information Data Submitted by Industry Members

At a minimum, the following Customer information data attributes must be accepted by the Central Repository:

- Account Owner Name;
- Account Owner Mailing Address;
- Account Tax Identifier (SSN, TIN, ITIN);
- Market Identifiers (Larger Trader ID, LEI);
- Type of Account;
- Firm Identifier Number;

- The number that the CAT Reporter will supply on all orders generated for the Account;

- Prime Broker ID;

- Bank Depository ID; and

- Clearing Broker.

### 9.3 Customer-ID Tracking

The Plan Processor will assign a CAT-Customer-ID for each unique Customer. The Plan Processor will determine a unique Customer using information such as SSN and DOB for natural persons or entity identifiers for Customers that are not natural persons and will resolve discrepancies. Once a CAT-Customer-ID is assigned, it will be added to each linked (or unlinked) order record for that Customer.

Participants and the SEC must be able to use the unique CAT-Customer-ID to track orders from any Customer or group of Customers, regardless of what brokerage account was used to enter the order.

### 9.4 Error Resolution for Customer Data

The Plan Processor must design and implement procedures and mechanisms to handle both minor and material inconsistencies in Customer information. The Central Repository needs to be able to accommodate minor data discrepancies such as variations in road name abbreviations in searches. Material inconsistencies such as two different people with the same SSN must be communicated to the submitting CAT Reporters and resolved within the established error correction timeframe as detailed in Section 8.

The Central Repository must have an audit trail showing the resolution of all errors. The audit trail must, at a minimum, include the:

- CAT Reporter submitting the data;

- Initial submission date and time;

- Data in question or the ID of the record in question;

- Reason identified as the source of the issue, such as:

    - duplicate SSN, significantly different Name;
    - duplicate SSN, different DOB;
    - discrepancies in LTID; or
    - others as determined by the Plan Processor;

- Date and time the issue was transmitted to the CAT Reporter, included each time the issue was re-transmitted, if more than once;

- Corrected submission date and time, including each corrected submission if more than one, or the record ID(s) of the corrected data or a flag indicating that the issue was resolved and corrected data was not required; and

- Corrected data, the record ID, or a link to the corrected data.

## 10. User Support

### 10.1 CAT Reporter Support

The Plan Processor will provide technical, operational and business support to CAT Reporters for all aspects of reporting. Such support will include, at a minimum:

- Self-help through a web portal;

- Direct support through email and phone;

- Support contact information available through the internet; and

- Direct interface with Industry Members and Data Submitters via industry events and calls, industry group meetings and informational and training sessions.

The Plan Processor must develop tools to allow each CAT Reporter to:

- Monitor its submissions;

- View submitted transactions in a non-bulk format (i.e., non-downloadable) to facilitate error corrections;

- Identify and correct errors;

- Manage Customer and Customer Account Information;

- Monitor its compliance with CAT reporting requirements; and

- Monitor system status.

The Plan Processor will develop and maintain communication protocols (including email messaging) and a secure website to keep CAT Reporters informed as to their current reporting status, as well as issues with the CAT that may impact CAT Reporters' ability to submit or correct data. The website will use user authentication to prevent users for seeing information about firms other than their own, and will contain:

- Daily reporting statistics for each CAT Reporter,[270] including items such as:

    - SRO-Assigned Market Participant Identifier;
    - Date of submission;
    - Number of files received;
    - Number of files accepted;
    - Number of files rejected;
    - Number of total order events received;
    - Number of order events accepted;
    - Number of order events rejected;
    - Number of each type of report received;
    - Number of each type of report accepted;
    - Number of each type of report rejected;
    - Number of total customer records accepted;
    - Number of total customer records rejected;
    - Order-IDs rejected;
    - Reason for rejection;
    - Number of records attempted to be matched;
    - Number of records matched;
    - Percentage of records matched;
    - Number of customer records received;
    - Number of unknown accounts;
    - Latest view of statistics inclusive of re-submissions to get a trade-date view of exceptions and correction statistics available for CAT Reporters to know when everything for a given trade date has been completed; and
    - Most recent CAT Reporter Compliance Report Card, as defined in section 12.4;

- CAT System status, system notifications, system maintenance, and system outages; and

- A mechanism for submitting event data and correcting and resubmitting rejections or inaccurate data.

The Plan Processor will develop and maintain a public website containing comprehensive CAT reporting information, including:

- Technical Specifications;

- Reporting guidance (e.g., FAQs);

- Pending rule changes affecting CAT reporting;

[270] Each CAT Reporter or Data Submitter must only be able to view its own data and data it submits on behalf of others.

- CAT contact information;
- Availability of test systems;
- Testing plans;
- Proposed changes to the CAT; and
- Fee schedule.

The Plan Processor will develop and maintain a mechanism for assigning CAT Reporter-IDs. A mechanism will also be developed and maintained to change CAT Reporter-IDs should this be necessary (e.g., due to a merger), with the expectations that such changes should be infrequent. Changes to CAT-Reporter-IDs must be reviewed and approved by the Plan Processor.

Initially, non-Participant CAT Reporters will not have access to their data submissions through bulk data exports with the initial implementation of the Central Repository. Only Participants and the SEC will have access to full lifecycle corrected bulk data exports. Non-Participant CAT Reporters will be able to view their submissions online in a read-only, non-exportable format to facilitate error identification and correction. Data Submitters will be able to export bulk file rejections for repair and error correction purposes.

The Plan Processor will define methods by which it will consult with and inform CAT Reporters and industry groups on updates and changes to user support.

The Plan Processor will define pre- and post-production support programs to minimize the Error Rate and help CAT Reporters to meet their compliance thresholds. Such pre-production support program shall include, but are not limited to, the following activities:

- Educational programs – Includes the following:
    - Publication and industry-wide communication (including FAQs) of the Technical Specifications, including:
        - Appropriate definitions / expected usages for each value in field format
        - All available attribute values for each field
    - Establishment of a dedicated help desk for Reporters to contact;
    - Industry participation in order linkage methodologies;
        - Include information on new order / trade types;
    - Hosting of industry educational calls; and
    - Hosting of industry-wide training.

- Registration – Requires all firms to:

    - Register and be certified as CAT Reporters;
    - Attend industry-wide training;
    - Establish internal controls to capture potential misreporting scenarios; and
    - Work with the Plan Processor to understand scenario-based reporting and expected outputs.

- Communications Plan – A strong communications plan of the timeline to reporting go-live shall:

    - Include communication on how Error Rates and Compliance Thresholds are calculated; and
    - Describe how errors will be communicated back to CAT Reporters.

- Industry-wide testing – Industry-wide test results must be available for all CAT Reporters.

    - As mentioned in Appendix C, Objective Milestones to Assess Progress, appropriate time must be provided between Technical Specification publication and production go-live.
    - Ample testing time must be provided.
    - Appropriate scenario-based testing, including all three validation processes, shall be established.
    - A separate test environment for CAT Reporters that mirrors the production environment shall be provided.

Post-production support program activities shall include, but are not limited to the following:

- Issuing a monthly Report Card on reporting statistics, with information on how reporters stand against similar entities;

- Publishing daily reporting statistics;

- Maintaining Technical Specifications with defined intervals for new releases/updates;

- Posting FAQs and other informational notices to be updated as necessary;

- Hosting of industry educational calls;

- Hosting of industry-wide training;

- Emailing outliers, meaning firms significantly reporting outside of industry standards;

- Conducting annual assessments of dedicated help desk to determine appropriate staffing levels;

- Using the test environment prior to releasing new code to production; and

- Imposing CAT Reporter requirements:

    - Attendance/participation of industry testing sessions;
    - Attendance in industry educational calls; and
    - Attendance in industry-wide training.

### 10.2 CAT User Support

The Plan Processor will develop a program to provide technical, operational and business support to CAT users, including Participants' regulatory staff and the SEC. The CAT help desk will provide technical expertise to assist regulators with questions and/or functionality about the content and structure of the CAT query capability.

The Plan Processor will develop tools, including an interface, to allow users to monitor the status of their queries and/or reports. Such website will show all in-progress queries/reports, as well as the current status and estimated completion time of each query/report.

The Plan Processor will develop communication protocols to notify regulators of CAT System status, outages and other issues that would affect Participants' regulatory staff and the SEC's ability to access, extract, and use CAT Data. At a minimum, Participants' regulatory staff and the SEC must each have access to a secure website where they can monitor CAT System status, receive and track system notifications, and submit and monitor data requests.

The Plan Processor will develop and maintain documentation and other materials as necessary to train regulators in the use of the Central Repository, including documentation on how to build and run reporting queries.

### 10.3 CAT Help Desk

The Plan Processor will implement and maintain a help desk to support broker-dealers, third party CAT Reporters, and Participant CAT Reporters (the "CAT Help Desk"). The CAT Help Desk will address business questions and issues, as well as technical and operational questions and issues. The CAT Help Desk will also assist Participants' regulatory staff and the SEC with questions and issues regarding obtaining and using CAT Data for regulatory purposes.

The CAT Help Desk must go live within a mutually agreed upon reasonable timeframe after the Plan Processor is selected, and must be available on a 24x7 basis, support both email and phone communication, and be staffed to handle at minimum 2,500 calls per month. Additionally, the CAT Help Desk must be prepared to support an increased call volume at least for the first few years. The Plan Processor must create and maintain a robust electronic tracking system for the CAT Help Desk that must include call logs, incident tracking, issue resolution escalation.

CAT Help Desk support functions must include:

- Setting up new CAT Reporters, including the assignment of CAT-Reporter-IDs and support prior to submitting data to CAT;

- Managing CAT Reporter authentication and entitlements;

- Managing CAT Reporter and third party Data Submitters testing and certification;

- Managing Participants and SEC authentication and entitlements;

- Supporting CAT Reporters with data submissions and data corrections, including submission of Customer and Customer Account Information;

- Coordinating and supporting system testing for CAT Reporters;

- Responding to questions from CAT Reporters about all aspects of CAT reporting, including reporting requirements, technical data transmission questions, potential changes to SEC Rule 613 that may affect the CAT, software/hardware updates and upgrades, entitlements, reporting relationships, and questions about the secure and public websites;

- Responding to questions from Participants' regulatory staff and the SEC about obtaining and using CAT Data for regulatory purposes, including the building and running of queries; and

- Responding to administrative issues from CAT Reporters, such as billing.

### 10.4 CAT Reporter Compliance

The Plan Processor must include a comprehensive compliance program to monitor CAT Reporters' adherence to SEC Rule 613. The Chief Compliance Officer will oversee this compliance program, and will have responsibility for reporting on compliance by CAT Reporters to the Participants. The compliance program covers all CAT Reporters, including broker-dealers and Participants.

As a fundamental component of this program, the Plan Processor will identify on a daily basis all CAT Reporters exceeding the maximum allowable Error Rate established by the Participants. The Error Rate will initially be set by the CAT NMS Plan, and will be reviewed and adjusted on an ongoing basis by the Operating Committee. Error Rates will be based on timeliness, correctness, and linkages.

The Plan Processor will, on an ongoing basis, analyze reporting statistics and Error Rates and recommend to Participants proposed changes to the maximum allowable Error Rates established by the Participants. All CAT Reporters exceeding this threshold will be notified that they have exceeded the maximum allowable Error Rate and will be informed of the specific reporting requirements that they did not fully meet (e.g., timeliness or rejections).

The Plan Processor will develop and publish CAT Reporter compliance report cards on a periodic basis to assist CAT Reporters in monitoring overall compliance with CAT reporting

requirements. The Plan Processor will also recommend criteria and processes by which CAT Reporters will be fined for inaccurate, incomplete, or late submissions. The compliance report cards will include the following information:

- Number of inaccurate transactions submitted;
- Number of incomplete transactions submitted; and
- Number of transactions submitted later than reporting deadlines.

The CAT Reporter compliance program will include reviews to identify CAT Reporters that may have failed to submit order events to the CAT, as well as to ensure CAT Reporters correct all identified errors even if such errors do not exceed the maximum allowable Compliance Threshold.

The Plan Processor will, on a monthly basis, produce and provide reports containing performance and comparison statistics as needed to each Participant on its members' CAT reporting compliance thresholds so that Participants can monitor their members' compliance with CAT reporting requirements and initiate disciplinary action when appropriate. The Plan Processor will also produce and provide, upon request from the Participants and the SEC, reports containing performance and comparison statistics as needed on each CAT Reporter's compliance thresholds so that the Participants or the SEC may take appropriate action if a Participant fails to comply with its CAT reporting obligations.

The Plan Processor will produce and make available on a monthly basis reports for all CAT Reporters, benchmarking their performance and comparison statistics against similar peers. The reports will be anonymized such that it will not be possible to determine the members of the peer group to which the CAT Reporter was compared.

The Plan Processor will produce and make available to regulators on a monthly basis a report detailing Error Rates, transaction volumes, and other metrics as needed to allow regulators to oversee the quality and integrity of CAT Reporter reporting to the Central Repository.

## 11. Upgrade Process and Development of New Functionality

### 11.1 CAT Functional Changes

The Plan Processor must propose a process governing the determination to develop new functionality, which process must be reviewed and approved by the Operating Committee. The process must, at a minimum:

- Contain a mechanism by which changes can be suggested to the Operating Committee by Advisory Committee members, the Participants, or the SEC;
- Contain a defined process for developing impact assessments, including implementation timelines, for proposed changes; and

- Contain a mechanism by which functional changes which the Plan Processor wishes to undertake can be reviewed and approved by the Operating Committee.

The Plan Processor shall not unreasonably withhold, condition, or delay implementation of any changes or modifications reasonably requested by the Operating Committee.

### 11.2 CAT Infrastructure Changes

The Plan Processor must implement a process to govern changes to CAT. This process must contain provisions for:

- Business-as-usual changes (e.g., replacing failed hardware, adding capacity to deal with expected increases in transaction volumes) that would require the Plan Processor to provide the Operating Committee with a summary report (e.g., infrastructure changes, acquired costs, etc.); and

- Isolated infrastructure changes (e.g., moving components of the system from a self-hosted to an Infrastructure-as-a-Service provider) that would require the Plan Processor to provide a request to the Operating Committee for review and approval before commencing any actions.

### 11.3 Testing of New Changes

The Plan Processor must implement a process governing user testing of changes to CAT functionality and infrastructure, which process must be reviewed and approved by the Operating Committee. The process must:

- Define the process by which changes are to be tested by CAT Reporters;

- Define the criteria by which changes will be approved prior to their deployment into the production environment(s); and

- Define the environment(s) to be used for user testing.