provided to CAT Reporters for correction (e.g., specific transmission methods and/or Web-based downloads);[94]

- how account and customer information submitted by broker-dealers will be validated and how rejections or errors will be communicated to CAT Reporters;[95]

- the mechanisms that will be provided to CAT Reporters for the correction of both market data (e.g, order, quotes, and trades) errors, and account and customer data errors, including batch resubmissions and manual web-based submissions;[96]

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(f) 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).[97] It also mandates that each Participant and its Industry Members that are CAT Reporters must ensure that the data it reports 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 the Established Timeframes. In furtherance thereof, all data related to a particular Order will be reported accurately and sequenced from order 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 systems thoroughly before beginning to report data to the Central Repository and the Plan Processor Functional Requirements sets forth that the Plan Processor must make testing facilities available for such testing.

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94 RFP, Question 16.
95 RFP, Question 17.
96 RFP, Question 18.
97 17 CFR 613(e)(4)(ii) and (iii).

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/or the CAT Reporters.[98] 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 send 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 or Data Submitter who submitted the data and the CAT Reporters on whose behalf the data was submitted, 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.[99] The industry believes that this will better align with the reporting of complex transactions and allocations and is more efficient for CAT Reporters.[100] 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).

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[98] 17 CFR 252.613(e)(4)(iii).

[99] FIF Consolidated Audit Trail Working Group Processor Proposed Optimal Solution Recommendations, September 15, 2014, at 6 (hereinafter "FIF Optimal Solution Recommendations").

[100] FIF Consolidated Audit Trail (CAT) Working Group Response to Proposed RFP Concepts Document, January 18, 2013, at 36 (hereinafter "FIF RFP Concepts Recommendations").

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).[101] 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.[102] However, the utility of the CAT is dependent on it providing a timely, accurate and complete audit trail for the Participants and other regulators.[103] 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. In determining the maximum Error Rate, the Participants 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 before. 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. Annually, the Plan Processor will analyze reporting statistics and error rates and make recommendations to the Participants for proposed changes to the maximum Error Rates. Changes to the maximum Error Rate will be recommended by the Chief Compliance Office and 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 all 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 error rates by CAT Reporters, similar to the Report Cards published for OATS today, 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 this threshold 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

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[101] 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." 17 CFR 613(e)(6)(i).

[102] 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, dated August 9, 2010.

[103] Adopting Release at 45790-91

Reporter's compliance rates so that the Participants as Participants or the Securities and Exchange Commission may take appropriate action for failing to comply with the reporting obligations under the CAT NMS Plan and SEC Rule 613.

(c) Clock Synchronization

SEC Rule 613(c)(1) requires the Central Repository to provide "an accurate, time-sequenced record of orders." As an initial matter, because of the drift between clocks, an accurately-sequenced record of orders cannot be based solely on the timestamps 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 timestamps 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 order events without relying entirely on timestamps.[104]

There were several different approaches suggested by the Bidders to accomplish the accurate sequencing of Orders. Some Bidders suggested using timestamp-based sequencing; however, most Bidders recognized that, while all CAT Reporters should have their timestamp 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 timestamp 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 timestamps would enable proper sequencing of an Order. This decision is supported by the industry since timestamps across disparate systems cannot be guaranteed and are likely to be error-prone.[105] The 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.[106]

As required by Section 6.6(a) of the CAT NMS Plan, each Participant will, and will adopt a rule requiring its Industry Members to, synchronize its business clocks that are 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, consistent with industry standards. Furthermore, in order to ensure the accuracy of

[104] Of course, timestamps regarding events occurring within a single system that uses the same clock can be accurately sequenced based on the timestamp.

[105] FIF Letter regarding Participant Request for Comment on Selected Draft CAT NMS Plan Topics, dated June 12, 2013 at 10-11 (hereinafter "FIF Comments on Selected Topics").

[106] FIF Comments on Selected Topics at 11.

timestamps 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 required by Section 6.6(b) of the CAT NMS Plan, each Participant will, and will adopt a rule requiring its Industry Members that are CAT Reporters to, specify the time of occurrence of any event required by SEC Rule 613 and the CAT NMS Plan to be reported to the Central Repository as a time that is within 50 milliseconds of the time such event actually occurred as measured by the time maintained by the NIST.[107]

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.[108] 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.[109] To comply with a millisecond timestamp requirement, firms will face significant costs in both time and resources to implement a consistent time stamp across multiple systems.[110] This may include a need to upgrade databases, internal messaging applications/protocols, data warehouses, and reporting applications to enable the reporting of such timestamps to the Central Repository.[111] Because of this, FIF recommended to the Participants a two year grace period for timestamp compliance.[112] FIF and SIFMA also supported an exception for millisecond reporting for order events that are manually processed, which is discussed below.[113]

To the extent that any CAT Reporter uses timestamps 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 timestamps "reflect current industry standards and be at least to the millisecond,"[114] the Participants believe that timestamp granularity to the millisecond reflects current industry standards. However, after careful consideration, including numerous discussions with the DAG, the Participants have determined that timestamp granularity at the level of a millisecond is not practical for order events that involve non-electronic communication of information

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[107] The Participants note that, although Section 6.8(a) of the CAT NMS Plan initially requires computer clocks to be synchronized to within 50 milliseconds, Section6.8(c) of the CAT NMS Plan requires the Chief Compliance Officer to review this threshold each year. See SEC Rule 613(d)(2). Broker-dealers will not report to the CAT for approximately two years after the CAT NMS Plan is approved; thus, this initial synchronization requirement may change before broker-dealers are submitting data to the CAT as a result of the Participants' annual review.

[108] SIFMA Letter Regarding Participant Request for Comments on Selected Draft CAT NMS Plan Topics dated June 11, 2013 at 11 (hereinafter "SIFMA Comments on Selected Topics"); FIF Comments on Selected Topics at 10.

[109] FIF Comments on Selected Topics at 10.

[110] FIF Comments on Selected Topics at 10; SIFMA Comments on Selected Topics at 11.

[111] FIF Comments on Selected Topics at 10.

[112] FIF Comments on Selected Topics at 10.

[113] FIF Comments on Selected Topics at 10; SIFMA Comments on Selected Topics at 11.

(hereinafter, "Manual Order Events"). In particular, it is the Participants' understanding that recording manual orders 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 timestamps 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 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 Participants plan to request exemptive relief from the Commission to allow the CAT NMS Plan to require Manual Order Events to be reported to the second but also require CAT Reporters to report the timestamp of when a Manual Order Event was captured electronically in the relevant order handling and execution system of the party to the event (hereinafter, "Electronic Capture"). Granularity of the Electronic Capture time stamp will be consistent with the SEC Rule 613(d)(3) requirement that timestamps be at least to the millisecond.

Thus, the Participants have determined that adding the Electronic Capture time stamp 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.

To adopt such an approach, however, would require certain exemptions from the requirements of SEC Rule 613. Therefore, the Participants propose to request an exemption from certain sections of SEC Rule 613 so that this approach could be included in the CAT NMS Plan. However, given the current absence of such relief, the Participants determined to include in the CAT NMS Plan a provision that satisfies the requirements of SEC Rule 613, by requiring millisecond timestamps for Manual Order Events.

In accordance with SEC Rule 613(d), Section 6.6(c) of the CAT NMS Plan states that "[t]he Participants shall annually evaluate whether industry standards have evolved such that (i) the synchronization standard in Section 6.6(a) should be shortened, or (ii) the required time stamp in Section 6.6(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 performance of each clock synchronization performed by it 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 all times such log will include results for a period of not less than five years ending on the then current date.

(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.[115]"

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 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.

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

[115] Adoption Release at 45790.

As detailed above in Section A.2 of this 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.[116] Between Noon Eastern Time on T +1 and T+5, the Participants and other regulators should have access to all iterations of processed data.[117] At T+5, the Participants and other regulators should have access to corrected data.[118] 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 Section A.2 of this Appendix C (Time and Method by which CAT Data will be Available to Regulators).

(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 specifically the standards and requirements set forth in the following documents, in each case as such standards and requirements may be replaced by successor publications or modified, amended, or supplemented:

- ISO 27001 (Information Security Management);

- National Institute of Standards and Technology Special Publications 800-34 (Contingency Planning for Federal Information Systems); and

- National Institute of Standards and Technology Special Publications 800-53 (Security and Privacy Controls for Federal Information Systems and Organizations).

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

[116] *See* Appendix C.A.2 (Time and Method by which CAT Data will be Available to Regulators.
[117] *Id.*
[118] *Id.*

Processor will be required to design a Business Continuity Plan that is inclusive of the technical and business activities of the Central Repository, including:

- bi-annual testing;

- a secondary processing site must be capable of recovery and restoration of services at the secondary site within 48 hours of a disaster event;

- 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";[119] and

- the Plan Processor must conduct an annual Business Continuity Audit using an independent auditor approved by the Operating Committee and the report provided to the Operating Committee.

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.[120]

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);[121]

- the specific security governance/compliance methodologies utilized in the proposed solution;[122]

[119] SEC Release No. 34-47638; File No. S7-32-02; http://www.sec.gov/news/studies/34-47638.htm

[120] 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.

[121] RFP, Question 65.

[122] RFP, Question 66.

- 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;[123]

- what system controls for users are in place to grant different levels of access depending on their role or function;[124]

- the strategy, tools and techniques, and operational and management practices that will be used to maintain security of the system;[125]

- the proposed system controls and operational practices;[126]

- the organization's security auditing practices, including internal audit, external audit, third-party independent penetration testing, and all other forms of audit and testing;[127]

- how security practices may differ across system development lifecycles and environments that support them (e.g., development, testing, and production);[128]

- experiences in developing policies and procedures for a robust security environment, including the protection of PII;[129]

- the use of monitoring and incident handling tools to log and manage the incident handling lifecycle;[130]

- the approach(es) to secure user access, including security features that will prevent unauthorized users from accessing the system;[131]

- the processes/procedures followed if security is breached;[132]

- the infrastructure security architecture, including network, firewalls, authentication, encryption, and protocols; and[133]

- the physical security controls for corporate, data center and leased data center locations.[134]

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123 RFP, Question 67.
124 RFP, Question 68.
125 RFP, Question 69.
126 RFP, Question 70.
127 RFP, Question 71.
128 RFP, Question 72.
129 RFP, Question 75.
130 RFP, Question 76.
131 RFP, Question 77.
132 RFP, Question 78.
133 RFP, Question 79.
134 RFP, Question 80.

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:

- how PII will be stored;[135] and

- how PII access will be controlled and tracked.[136]

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; and[137]

- the process of data classification and how it relates to the DLP architecture and strategy.[138]

(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

[135] RFP, Question 5.
[136] RFP, Question 6.
[137] 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.
[138] RFP, Question 74.

accordance with the policies, procedures, and standards in the CAT NMS Plan.[139] 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. In addition, CAT Data cannot be co-mingled with other non-CAT data (e.g., co-mingled with other non-CAT data in a cloud storage facility).

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 Participant and SEC staff and, as permitted, CAT Reporters or Data Submitters. Specifically:

- the Plan Processor must anticipate protection of data during transmission, processing and at rest;

- access to the data must be controlled and system(s) must have a mechanism to confirm the identity of persons (e.g., username/password) who are permitted to access the data;

- every instance of user access must be logged for auditing purposes;

- the system controls must allow for users to be granted different levels of access and capabilities depending on their role or function; and

- as discussed in more detail below, the Plan Processor must propose an additional level of security for populating, storing, and retrieving sensitive data, such as 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.

To effectuate these requirements, Section 6.5 of the CAT NMS Plan 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 Participant regulatory staff and the

[139] 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. The Participants intend to provide greater detail in the PPFR.

Commission staff; 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 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.[140]

Section 6.12 of the CAT NMS Plan requires that the Plan Processor implement and maintain technology policies and procedures that will safeguard CAT Data reported to the Central Repository and comply with all applicable regulations, including relevant provisions of Regulation Systems Compliance and Integrity under the Exchange Act (if adopted). Additionally, the Plan Processor must meet industry best practices for database security, including specifically the standards and requirements set forth in the following Special Publications of the National Institute of Standards and Technology, in each case as such standards and requirements may be replaced by successor publications or modified, amended, or supplemented:

- 800-23 (Guidelines to Federal Organizations on Security Assurance and Acquisition/Use of Tested/Evaluated Products);

- 800-115 (Technical Guide to Information Security Testing and Assessment);

- 800-133 (Recommendation for Cryptographic Key Generation); and

- 800-137 (Information Security Continuous Monitoring for Federal Information Systems and Organizations).

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 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. The Plan Processor will make a record of each use of a public key infrastructure ("PKI") to track all instances where a person accesses the data.

[140] See SEC Rule 613(e)(5).

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.

(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 SRO and SEC staff, 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 as otherwise permitted by applicable law, rule, or regulation.

As an initial matter, the Participants anticipate that access to PII will be limited to a "need-to-know" basis and only after potentially violative trading has been identified. 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 SRO and SEC regulatory staff who need to know the specific identity of an individual. For this reason, PII such as customer SSN and tax identifier numbers will not be made available in the general query tools, reports, or bulk data extraction.[141] Instead, the Participants will require that the Plan Processor provide for a separate limited access query capability 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:

- PII must be stored separately from Order and transaction data;

[141] As described in Section A.1.b of this Appendix C, 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 in any way.

- PII cannot be accessible via the Internet;
- default access to PII is not permitted;
- two-factor authentication for access to PII must be required;
- a full audit trail must be maintained for any PII access (i.e., tracking who accessed what specific data);
- access to PII must be limited to a defined set of individuals identified by each Regulator that require access to PII;[142]
- each attribute in the PII database must be configurable to determine which roles have access to that data;
- PII data must be masked and encrypted and must not be made available in the query tools, reports, or bulk data extraction, but instead only made available via a separate limited access tool only accessible when required by Participant regulatory staff and the SEC;[143]
- the Plan Processor must produce daily reports that list all individuals that have access to PII;
- vertical and horizontal partitioning of data sets is required for PII data;
- each PII attribute must be protected; and
- the Plan Processor must have the ability to segregate PII elements within the PII database.

As required by SEC Rule 613(e)(4)(i)(C)(1), the Plan Processor will develop and maintain a comprehensive information security program for the Central Repository, with dedicated staff, which program will be subject to regular review by the Chief Compliance Officer. As a key aspect of the information security program, the Plan Processor will provide encryption for data at rest and data in transit in accordance with the Technical Specifications. Furthermore, Customer Account Information, which includes PII, will be provided the additional protections set forth above. Access to Customer Account Information will only be provided pursuant to a controlled and auditable process described in the Technical Specifications. An Industry Member will not be permitted to access Customer Account Information except as needed to correct potential errors in data reported by such Industry Member. It is anticipated that the Technical Specifications will set forth

[142] It is anticipated that the CRO at each Participant will be required to periodically review the individuals with access to PII and attest that each person's access is appropriate and necessary.

[143] It is anticipated that responses to initial requests for data from the Central Repository will not include PII. Instead, such information will be masked and not revealed unless subsequently requested by Commission or Participant regulatory staff.

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 the Plan Processor Functional Requirements.

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 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 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.

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. The technology should also be current with all applicable industry standards as outlined by the Operating Committee.

Participants will identify baseline 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 documented 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 FFP, 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 respondents 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 collections 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 timely facilitate additional capacity functionality. 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.[144] 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.

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:

[144] https://cloud.google.com/developers/articles/auto-scaling-on-the-google-cloud-platform/

- The identity of all market participants (including broker-dealers and customers) that are allocated NMS Securities, directly or indirectly, in a primary market transaction;
- The number of such securities each such market participant is allocated; and
- The identity of the broker-dealer making each such allocation.[145]

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 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,[146] 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.''[147] 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 important to their determination as to the size and pricing of an issue."[148] 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.[149] Using this and other information, the underwriter will then decide how to allocate IPO

[145] SEC Rule 613(a)(1)(vi), 17 C.F.R. § 242.613(a)(1)(vi).
[146] Questions for Public Comment re CAT Plan (April 22, 2013), available at http://catnmsplan.com/web/groups/catnms/@catnms/documents/appsupportdocs/p246652.pdf ("April Request for Comment").
[147] Securities Exchange Act Release No. 67457 , 77 Fed. Reg. 45722, 45792 n. 792 (August 1, 2012)("Adopting Release").
[148] See generally, Securities Act Release No. 8565, 70 Fed. Reg . 19672 (April 13, 2005)(Commission guidance regarding prohibited conduct in connection with IPO allocations)("IPO Allocation Release").
[149] Id.

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.[150]

(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.[151] 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 spread sheets for small firms.[152] The Participants also understand that the investment banking divisions of broker-dealers typically use different compliance systems than those used for secondary market transactions.[153] Thus, the Participants 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 that sub-account allocations are received in a manner and level of detail similar to allocations in secondary market transactions,[154] 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.[155] 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

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[150] See Letter from Manisha Kimmel, Executive Director, Financial Information Forum, to Participant Representatives of the CAT (June 12, 2013)("FIF Letter").

[151] See FIF Letter; Letter from T.R. Lazo, Managing Director, SIFMA, and Thomas Price, Managing Director, SIFMA (June 11, 2013)("SIFMA Letter"), and Thomson Reuters (May 21, 2013)("Thomson Reuters Letter"), available at http://catnmsplan.com/industryFeedback/; see also Thomson Reuters Letter (systems used for primary market allocations differ from those used for secondary market transactions).

[152] FIF Letter at 4; SIFMA Letter at 3

[153] 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.

[154] FIF Letter at 4.

[155] For example, commenters noted that 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.

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.[156] 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 securities and how allocations differ among broker-dealers.[157] Such data also could assist the Commission and Participants in conducting their respective examinations and investigations related to primary market transactions.[158]

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.

While the scope and cost of technological system acquisitions or upgrades that would be required to capture and transmit to the Central Repository information about primary market sub-account allocations likely would be more limited than those associated with top account allocations, they would be significant.[159] Although the clearance and settlement systems, in particular, used for sub-account allocations are similar to secondary market transaction systems, the cost of reporting allocation information for primary market transactions also will depend on the additional technology parameters for the CAT NMS Plan. Specifically, the CAT NMS Plan would need to reflect the unique aspects of reporting of sub-account allocations. For example, primary market transactions currently

[156] Adopting Release at 45792-93.
[157] Id.
[158] Id.
[159] Feedback provided in the "FIF CAT WG Feedback for July 23, 2014 DAG Meeting" document indicates that without specific documented requirements, cost implications are not determinable

are not required to be reported under OATS rules or any transaction reporting rules.[160] Thus, sub-account allocation reports would differ from other reportable Order events because there would be no other order-lifecycle events associated with the sub-account allocation report. Therefore, the CAT NMS Plan would need to define an additional scenario specifically for these allocations, and each CAT Reporter would need to include this additional scenario in its reporting processes. The incremental cost of including these additional stand-alone parameters regarding allocation in the CAT NMS Plan would not be insignificant. However, based on discussions with Industry Members, the Participants believe that such costs likely would be outweighed by the benefits of gathering and reporting sub-account allocations in primary market transactions to the Central Repository.

B. **ANALYSIS OF THE NMS PLAN:** These considerations will help to inform the SEC about the cost for development, implementation and maintenance of the CAT and to help determine if such plan is in the public interest.

7. Detailed Estimated Costs for Creating, Implementing, and Maintaining the Consolidated Audit Trail (SEC Rule 613(a)(1)(vii)):

As required by SEC Rule 613(a)(1)(vii), this section provides detailed estimated costs for creating, implementing, and maintaining the consolidated audit trail, specifying (1) an estimate of the costs to Participants for establishing and maintaining the Central Repository; (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 an on 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 consolidated audit trail, 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 imposed by the adoption of SEC Rule 613. The figures presented herein are best estimates based on research completed and currently available data and are inherently subject to uncertainties.

Given the size and scope of this initiative, estimating the costs of the creation, implementation and maintenance of the consolidated audit trail is a complex task. In light of this complexity, the Participants have used a multi-pronged approach in analyzing the potential costs of the consolidated audit trail. Among other things, the Participants have evaluated the many cost-related comments received in response to the SEC's rule proposal 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 provided by the DAG which includes written feedback from SIFMA and FIF.

Bidders were asked to provide total one-year cost estimates and annual recurring cost estimates. While each bidder identified specific material costs for resource and technology requirements a few key items identified included (1) transactional volumes of

[160] SIFMA Letter at 2.

data ingested into the central repository, (2) the number of technical environments that would be required to build the CAT, (3) data archival requirements and (4) user support/help desk resource requirements.

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.[161] The association group stated the industry is likely to face costs related to upgrade in the regulatory reporting infrastructure. SIFMA highlighted additional costs borne will be distributed across the front office, middle office, customer master data, middle office, 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.[162] 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.

Finally, the Participants developed three cost studies to obtain data about the potential costs related to consolidated audit trail from broker-dealers, the Participants and service providers. These, as well as the economic baseline against which the potential costs and benefits of the consolidated audit trail must be compared, are discussed below.

Cost Studies

In order to estimate the direct costs associated with the CAT NMS Plan, the Participants undertook a series of surveys. The first survey was directed at understanding the potential costs of the consolidated audit trail for broker-dealers. In consultation with the DAG,[163] the Participants developed an independent survey requesting estimates from broker-dealers on costs related to technology, compliance and outsourcing. For each of these categories, the Participants requested estimates for current costs under the existing regulatory reporting framework as well as future costs for reporting to the consolidated audit trail. Questions related to current costs are intended to capture the baseline costs to broker-dealers for regulatory reporting, including costs related to compliance with OATS, the Electronic Blue Sheets 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.

Questions related to future costs are intended to collect information related both to the retirement of existing systems and compliance with requirements of the consolidated audit trail. Survey respondents were asked to evaluate the future costs under two separate scenarios. One scenario asked firms to estimate costs where they were able to rely on their

[161] http://catnmsplan.com/web/groups/catnms/@catnms/documents/appsupportdocs/p242319.pdf
[162] http://www.sec.gov/comments/s7-11-10/s71110-112.pdf

[163] The Participants shared iterations of the draft study with the DAG and discussed the DAG's feedback at length on calls meetings held on May 9 2014 and June 4 2014. Among other things, the DAG provided recommendations on the survey structure and content, including the set of assumptions underlying the survey.

existing reporting systems, while the other contemplated a new uniform reporting system for all broker-dealers.

The survey was distributed to 4,406 broker-dealers[164] on June 23, 2014. The survey link was sent to the compliance contact at each recipient broker-dealer identified by the designated examining authority or designated options examining authority to receive regulatory update and information requests. Responses to the broker-dealer cost survey were due August 20, 2014. Due to the volume and complexity of the information required,[165] the industry requested an extension of the survey window. The Participants extended the due date for the survey until September 3, 2014, two weeks past the original due date. The Participants received 422 responses, of which 167 were used in the analysis.[166] The DAG provided direct cost estimates in the survey to firms.

The second survey undertaken by the Participants was intended to collect information about the potential costs of the consolidated audit trail to the Participants. This survey was similar in structure to the broker-dealer survey described above. Due to the complexity of the data collection effort, the due date for the survey was extended until September 24, 2014. The study evaluated costs for current regulatory reporting by Participants as reporters and regulators. Responses were received from eight of the 10 Participant complexes to which the study was distributed.

The third survey requested information about the potential costs of the consolidated audit trail from various service providers and vendors. On June 22, 2014, the Participants held a meeting with members of the DAG committee to request feedback on the survey to service providers and vendors. In follow up, members of the DAG provided feedback on both the content of the survey, the suggested distribution list and suggested collection period for the survey. On August 11, 2014 individual survey links were distributed to thirteen service bureaus and technology vendors.

The Participants received five completed responses to the Cost to Vendors Study. One of the responses indicated that the firm 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 firms supported more than 100 clients, and one supported between 50 – 99 clients. Two of the firms supported up to 25 million accounts, and two supported up to 50 million accounts. Two of the firms serviced clients with institutional and retail businesses, while the remaining two supported clients with institutional businesses only.

The results of these surveys are discussed below, providing additional context to the Participants' discussions of baseline costs and costs that could be imposed by the Plan.

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[164] A unique study link was distributed to 4406 broker-dealers. For approximately 381 of the broker-dealers, the distribution email either bounced or the broker-dealer responded that the study did not apply to them, leaving approximately 4025 broker-dealers who received the study.

[165] For example, large broker-dealers store data in different systems and in various business segments, and thus accurate responses to the survey questions required complex data assimilation.

[166] A total of 422 broker-dealers responded. Of those responses, 180 were substantially incomplete, and 75 were determined to be erroneous, leaving a population of 167 responses which were used for analysis.

The Participants recognize that to provide estimates of costs to report to the consolidated audit trail, particularly cost estimates as complex as those required to facilitate this initiative, survey respondents were required to make assumptions about what might be contained in a final CAT NMS Plan. The Participants further recognize that this uncertainty or differences in expectations about the Plan may make comparing survey responses more difficult. Accordingly, the estimated costs set forth herein represent the Participants' best estimate of costs based on the information collected, reviewed and analyzed by the Participants as of the date of this Plan, and actual costs incurred may not be consistent with the estimated costs.

Economic Baseline

In publishing SEC Rule 613, the SEC 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."[167] The purpose of this plan is to develop, build and maintain a system that provides an infrastructure appropriate to monitor, surveil and oversee the national market system in its current state and provide sufficient flexibility that the infrastructure can adequately adjust for future financial market innovations.

Such a system may necessarily impact the SEC, 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.

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. For equities, all broker-dealers that are members of FINRA must report their orders in NMS stock and OTC equity securities, including executions or cancellations, to OATS. Thus, 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 if requested. Additionally, each exchange creates its own audit trail for each order received and processed by the exchange.

For options, the options exchanges utilize the Consolidated Options Audit Trail System ("COATS") to obtain and review option transactions. The COATS audit trail includes trades, the NBBO 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 has some shortcomings. For example, it does not include Options Clearing

[167] Adopting Release at 45723.

Corporation adjustment data; these adjustments include changes to either the account type or size of the position. Another significant shortcoming of COATS is that order information is only available upon request from the options exchanges. Currently reports need to be built on order information received from the various options exchanges. Additionally, more fulsome quote information is only available upon request to the option exchanges. As previously noted, only the NBBO at the time of the trade is included in the COATS data; however, this is optional data the exchanges may or may not provide. The Participants 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 create uniquely formatted audit trails.

The existence of multiple non-integrated audit trails has direct consequences on the accuracy and efficiency of regulatory oversight. The SEC 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, rerouted, 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.[168]

There are several efforts to combine information from multiple audit trails into a more complete and consolidated view. For example, as part of its cross-markets surveillance, FINRA integrates data collected through OATS with exchange audit trail data where FINRA has an agreement in place to permit this activity. FINRA expends considerable resources to link and standardize, where possible, these disparate data sources. The resulting audit trail provides a more complete record that may include multiple routes over an order lifecycle. However, this audit trail is limited to equity securities and does not include options.

In addition, the Intermarket Surveillance Group ("ISG") consolidated audit trail combines transaction data from all exchanges and OTC trades and is used by all Participants for surveillance purposes. However, the ISG audit trail is limited because it only contains clearing member and executing broker's CRD number. It does not contain order detail information such as order entry time or routing history of the order. In addition, it does not contain information about the beneficial owner to a trade.

COATS and the ISG equity audit trail are utilized to generate various option cross market/cross product exception reports, such as min-manipulation, front-running, and

[168] Adopting Release at 45722.

anticipatory hedges. Since the current data is unable to drill down to participant or order information, these reports are less effective and produce a large number of false positives.

Impact of Audit Trail Reporting on Regulators and Market Participants

SROs

There are 19 SROs of varying sizes that have established audit trail reporting requirements for NMS securities. Of these, one is an association. The other 18 Participants are associated with exchanges. 14 of these exchanges permit quotation and transactions in NMS equity securities and 12 permit transactions and quotations in NMS options.

SROs expend resources today to maintain and update their audit trail reporting systems. Costs for current surveillance programs as indicated by SROs responding to the Cost to Participants study vary significantly, reflecting the various sizes of SROs: annual costs for hardware and software associated with current surveillance programs are reported to be between $200,000 and $17,000,000.

Broker-Dealers

There are approximately 4,025 broker-dealers that are members of FINRA. Of these, approximately 1,800 quote or execute transactions in NMS securities. The Participants estimate that there are as many as an additional 200 broker-dealers that quote or execute transactions in either NMS equities or options that are members of an exchange but not FINRA members. Thus, the Participants estimate the total number of broker-dealers with current audit trail reporting obligations to be approximately 2000.

Broker-dealers benefit from the current regime of audit trail reporting to the extent that reporting today permits the SEC 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. Their participation increases broker-dealer activities, and hence revenues. 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 necessary data in the required format. These systems also require resources to ensure data quality and consistency, timeliness of reporting, and record keeping obligations. Additionally, firm trading and order routing systems send orders and quotations to each exchange in the format required by each 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 SEC requests for additional data and related information where current surveillance identifies concerning quotes or trades.

Broker-dealers may take varied approaches to fulfilling their regulatory reporting obligations. For instance, larger broker-dealers may develop internal systems for the purpose of compiling order and trading data into a reportable format. In many instances, these firms must centralize varied and disparate systems. Smaller brokers typically use third parties to help them comply with their reporting obligation. These third parties may include service bureaus that provide the firms with order management systems. Smaller 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) total revenue of less than two million dollars; 2) a clean disciplinary history; 3) no clearing or carrying activities; 4) the firm cannot be a market maker in NMS stocks or OTC equity securities; and, 5) the firm does not execute principally. FINRA also excludes some members from the definition of a reporting member. The criteria to receive this exclusion includes: 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.

Additionally, the OATS Rules do not require that proprietary orders generated in the normal course of market-making be reported. As such, there are current gaps in the audit trail.

Upon request, all broker-dealers must submit Electronic Blue Sheet ("EBS") reportable data by the specified due date. EBS data provides detailed information about the underlying account that transacted in a particular security during a particular time period. Broker-dealers must have systems and processes in place to provide FINRA with EBS reportable data in the required format. These systems require resources to ensure data quality, timeliness of reporting, and record keeping obligations. Broker-dealers must commit staff to respond to Participant and SEC requests for EBS data. Broker-dealers may take varied approaches to fulfilling their regulatory reporting obligations. For instance, some broker-dealers may self-clear and develop internal systems for the purpose of compiling EBS reportable data into the required format. Other broker-dealers may contract with a clearing firm to submit EBS data files on their behalf.

Of the 167 respondents to the broker-dealer survey used in the analysis of costs associated with the CAT, 49 are large and 118 are small.[169] 116 respondents stated that

[169] Firms were requested to self-select as "small" if they would qualify under Securities 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

they do not currently report to OATS. However, six of those respondents report a positive number for the current regulatory reporting costs. Of the 116 that do not report to OATS, 11 use the FIX protocol for order entry or order routing to exchanges. Of the 11 FIX users, only two reported a positive current cost.

Of the 51 respondents that report to OATS, 21 are large and 30 are small. However, of the 51 respondents, 17 report $0 for costs associated with current regulatory reporting requirements. Including another six firms (three small and three large) in the sample that are not OATS-reporters, but provided positive estimates for the current cost, the average (median) current regulatory reporting costs for small firms are $449,182 ($3,000). For large respondents, the reported regulatory reporting costs are $634,679 ($14,000). The difference between the averages across large and small firms is not significant due to small sample size and high variance caused by a few very large observations, especially in the small firm subsample. Therefore, the comparison of the median costs associated with the current regulatory reporting environment may provide more accurate information about the typical costs incurred by small and large firms.

Large firms report that they employ an average (median) of 11.60 (4.75) FTEs for OATS reporting, while the reported figure is 4.97 (2.0) for small firms. When we consider the FTEs for EBS and large trader reporting and other reporting, large firms report employing an average (median) of 19.40 (7.0) FTEs, and small firms report employing an average (median) of 8.16 (4.0) FTEs.[170]

Some firms report that they choose to outsource the regulatory reporting services. Of the 167 respondents, 38 reported that they currently incur outsourcing costs for regulatory reporting services. Of these 38 firms, nine reported a $0 cost associated with current regulatory reporting requirements and thus incurred outsourcing costs only. The average (median) outsourcing cost reported by 13 large firms is $586,100 ($10,000) and by 25 small firms is $592,720 ($4,000). The large difference between the average and median numbers is again due to a few very large cost responses in the data.

Based upon the Survey to Vendors, the Participants understand that for equity order reporting, two respondents indicated that they report up to 1 million equity orders per day on behalf of their clients, and two respondents indicated that they report up to 2 million equity orders per day. 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. All four respondents indicated that they report between three and 100 million OATS Reportable Order Events per day. Three of the four responding firms submitted Electronic Blue Sheet reports for

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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.

[170] One anonymous large firm reported an aggregate of 190 FTEs for OATS, EBS and large trader, and other reporting. Such outliers create an upward bias in the estimated averages and might potentially cause an overestimation of the staffing costs. Therefore, reported averages must be interpreted with caution, and median numbers might better represent the typical costs across large and small firms.

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. Dollar costs for hardware and software ranged from $50,000 to $15,000,000, and FTE requirements ranged from 11 to 92. While the firm with the largest number of clients reported the highest costs, costs did not always correlate uniformly with the number of clients for other firms.

In addition, broker-dealers may bear a significant portion of the costs of the Participants' systems through fees and other assessments imposed by the Participants. The extent to which these costs are not passed on to broker-dealers is related to alternative sources of revenue available to the Participants, the materiality of those costs, and the ease with which broker-dealers can substitute away from any given exchange or Participant.

Investors

Approximately 52% of Americans hold individual stocks, stock mutual funds or stocks through their retirement plan,[171] and the retail options industry continues to grow.[172]

Investors benefit from the protections provided through the use of audit trail data, as previously described. They 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 the Commission's Section 31 fees.[173] In other cases, broker-dealers may cover some of their regulatory charges through commissions and other charges. 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.

Issuers

Issuers also benefit from an effective regulatory regime supported by a reliable and complete audit trail. Specifically, issuers may benefit from an economic externality that arises 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.

Need for Regulatory Action

[171] Gallup Poll in 2013. See http://money.cnn.com/2013/05/09/investing/american-stock-ownership/.
[172] See http://tabbforum.com/opinions/the-retail-options-reneissance.
[173] Pursuant to Section 31 of the Exchange Act, Participants are required to pay transaction fees and assessments to the SEC 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.

SEC Rule 613 provides a basis for the need for regulatory action given the current economic baseline. As the Commission stated in the Adopting Release:

> The Commission therefore believes that the regulatory data infrastructure on which the SROs and the Commission currently must rely generally is outdated and inadequate to effectively oversee a complex, dispersed, and highly automated national market system. In performing their oversight responsibilities, regulators today must attempt to cobble together disparate data from a variety of existing information systems lacking in completeness, accuracy, accessibility, and/or timeliness – a model that neither supports the efficient aggregation of data from multiple trading venues nor yields the type of complete and accurate market activity data needed for robust market oversight.[174]

Estimated Costs

Through the request for proposals, the review of those proposals, and interaction with industry, the Participants have identified the sources of costs associated with the CAT NMS Plan. There are direct costs associated with developing, building and maintaining the infrastructure required to meet the requirements of the CAT NMS Plan. There are also direct costs associated with adapting broker-dealer reporting systems to meet the requirements of the CAT NMS Plan. Additionally, Participants and broker-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. We discuss estimates of these direct costs below.

The Participants also considered the potential for indirect costs associated with the CAT NMS Plan. These indirect costs would manifest themselves in at least two possible forms. First, as discussed above, some market participants may shift the costs associated with supporting the consolidated audit trail to their customers. 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 costs, whether incurred directly or indirectly, either through explicit fees associated with consolidated audit trail costs or through their existing fee structure. The second set of indirect costs may be associated with any negative impacts to efficiency, competition or capital formation that the Plan might cause. We discuss these potential impacts separately below.

(a) Estimated Cost to Participants for Creating and Maintaining Consolidated Audit Trail

As part of the RFP process, the bidders were asked to provide a schedule of the anticipated total cost of ownership of building, operating and maintaining the CAT that will be passed through to the CAT. As noted above in Section I of this Appendix C, any

[174] Adopting Release at 45723.

one of the six Shortlisted Bidders could be selected as the Plan Processor and each Shortlisted Bidder has proposed different approaches to various issues. The Shortlisted Bidder selected as the Plan Processor must meet the specific requirements set forth in the PPFR and will be required to revise its Bid if it does not reflect those requirements. Accordingly, the Participants anticipate that the cost estimates to build and maintain the CAT may differ from what is set forth below.

The RFP requested that Bidders provide an estimate of the total one-time cost to build the CAT, including technology, operational, administration and any other material costs. The six Shortlisted Bidders provided estimates ranging from a low of $30,000,000 to a high of $91,623,000, with an average one-time cost of $53,002,915.27.

The RFP also requested that Bidders provide an estimate of annual recurring costs for the five year period following the selection of the Plan Processor, and an estimate of the annual peak year costs, i.e., for the year that it will cost the most to run the CAT. The six Shortlisted Bidders provided estimates ranging from a low of $135,001,250 to a high of $465,050,000 over the course of the first five years of operation, with an average five-year cost of $255,640,125.02 and an average annual cost of $51,128,025.00. Estimates of peak year recurring costs range from a low of $27,001,250 to a high of $109,753,000, with an average of $59,389,916.

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 provide a range based on the reported combined build and annual recurring costs for the five year period following plan selection, discounted by a factor of 2%.[175] Estimates of total costs range from $157,263,407 to $527,887,443.

Participants sought insight into the economic drivers of the cost estimates from the Shortlisted Bidders. Specifically, Participants asked the Shortlisted Bidders to identify the factors, such as amount of message traffic, complexity of order life cycles, number and complexity of Participant and SEC data requests or administration and support costs that were material to their bid. Respondents identified the following as primary drivers of their bid cost: (1) transactional volumes of data ingested into the central repository, (2) the number of technical environments that would be required to build; (3) the CAT rate of increase in transaction volumes, (4) data archival requirements and (5) user support/help desk resource requirements.

(b) Estimated Cost to Members of Participants for Reporting Data required by the CAT NMS Plan

The population of respondents to the Cost to CAT Reporters study consisted of 118 small broker-dealers and 49 large broker-dealers.[176] Expected costs reported in the Survey to Firms for the two scenarios presented were quantitatively similar, therefore the

[175] 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.
As defined in SEC Rule 613

estimated costs presented here refer to responses for the scenario where reporters would be using their current systems. For costs related to the implementation and maintenance of technology and processes to comply with CAT requirements, in the sample of 57 firms (51 OATS reporters and 6 non-OATS reporting firms that disclosed a positive number for the current reporting costs), 24 large broker-dealers reported average (median) costs of roughly $981,167 ($89,000) and 33 small broker-dealers reported an average (median) implementation and maintenance cost of roughly $24,422 ($2,000) annually. For large firms, the average (median) change in costs would be $346,488 ($13,000), and the average (median) change for small firms would be $435,500 ($0). The large difference between average and median response is due to a few very large responses given especially by firms reporting no current regulatory reporting costs.

Under CAT, large firms reported that they would employ an average (median) of 35.58 (12.5) FTEs to meet their obligations. This estimate implies an average (median) increase of 16.19 (3.5) FTEs for large firms. Small firms reported that they would employ an average (median) of 6.75 (4.0) FTEs, implying an average (median) decrease of 1.40 (0.0) FTEs. The averages are again sensitive to a few large reported values and should be interpreted with caution.

Of the 167 respondent firms, 32 reported that they would incur costs associated with the retirement of current systems. Twelve large firms reported a mean (median) retirement cost of $146,102 ($94,000), whereas the same figure for small firms is $7,700 ($3,000). Average FTEs required for system retirement were less than one across all categories, though variances were large, with one firm reporting an estimated headcount of 50 for retirement of OATS reporting.

Of the 38 firms that incur outsourcing costs, 15 reported that they would incur no cost associated with the retirement of outsourcing systems when CAT is implemented. For the remaining 23 firms, the mean (median) cost for the 5 large firms is $102,500 ($60,000), and the same figure reported is $22,095 ($6,000) for the 21 small firms.

Based upon the responses to the Survey to Vendors, 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 associated with implementation and maintenance of the CAT, all respondents indicated that Approach 1 would require more FTE resources to implement (ranging from 14 to 170 FTEs for Approach 1 and from 4 to 45 for Approach 2), while Approach 2 would require more FTE resources to maintain (ranging from 4.5 to 35 for Approach 1 and from 2 to 56 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.

Three of the four respondents to the vendor survey 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 to 23 FTEs.

Under CAT Approach 1, two respondents expected ongoing maintenance to cost less than current regulatory reporting requirements, with the remaining two expecting higher costs. Under CAT Approach 2, two respondents expected ongoing maintenance to cost less than 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.

(c) Estimated Cost to Participants for Reporting Data required by the CAT NMS Plan

Hardware and software costs expected for implementation of the CAT varied widely, from $13,200 to $5,000,000. Costs for ongoing maintenance of the CAT also varied widely, from $9,600/year to $5,000,000/year.

Current surveillance hardware and software costs ranged from $200,000 per year to $17,000,000 per year, and Participants provided estimates of future surveillance hardware and software costs of $125,000 per year to $17,000,000 per year.

Retirement costs were not provided with sufficient consistency to facilitate conclusions, though one Participant did indicate that they expected to save $4,000,000 in development costs, $4,000,000 in legal costs, and $1,000,000 in consulting costs through the adoption of the CAT.

Responses from Participants were considered to be tentative and highly subject to change based on selection of a bidder and finalization of a cost model.

(d) Method of Funding the Creation, Implementation, and Maintenance of the Consolidated Audit Trail

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 are committed to funding the CAT in accordance with the following principles:

- to create transparent, predictable revenue streams for the Company that are aligned with the anticipated costs to build, operate and administer the consolidated audit trail and the other costs of the Company;

- 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 consolidated audit trail, distinctions in the securities trading operations of Participants and Industry Members and their relative impact upon Company resources and operations;

- to provide for ease of billing and other administrative functions;

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

- to build financial stability to support the Company as a going concern.

To fund the initial development and implementation of the CAT, the Plan provides for 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 initial development and implementation costs. The Participants are mindful of the need to balance the potential impact on CAT Reporters resulting from having fees imposed prior to commencement of their CAT reporting obligations against the need to recover costs incurred to build the CAT.[177]

With respect to recovering costs to operate the CAT, the Plan provides that the Operating Committee may establish fixed fees to be payable by Participants and Industry Members, and may establish categories of such fees, depending on the securities trading operations of the Participant or Industry Member, the type of business in which the Participant or Industry Member engages and any other factors the Operating Committee reasonably determines appropriate. In addition, the Plan provides that the Operating Committee may establish Industry Member and Participant activity fees based on the aggregate dollar amount of trading volume, share or contract trading volume, message traffic, or any other factors that the Operating Committee reasonably determines appropriate, and may establish differing levels of such fees depending on the types of securities traded and any other factors the Operating Committee reasonably determines appropriate.

Finally, the Plan provides that the Operating Committee may establish any other fees ancillary to the operation of the CAT System that it deems appropriate, including, e.g., fees for late or inaccurate reporting; fees for correcting submitted information; and fees based on access and use of the CAT System for regulatory and oversight purposes.

Section 11.3(d) of the Plan expressly provides that notwithstanding anything to the contrary in any of Sections 11.3(a), 11.3(b) or 11.3(c), the Operating Committee may establish, as it reasonably determines appropriate, any fixed fee, any variable fee, any combination of a fixed fee and a variable fee, or any other fee.

Participants considered a number of alternate specifications for establishing the basis for cost allocation among CAT Reporters. These specifications ranged from a strict pro-rata distribution, regardless of entity size to a distribution based purely on CAT Reporter activity. Participants considered a variety of measures of activity including, notional value of trading (as currently applied for purposes of Section 31 fees today), trades, quotations and all message traffic sent as part of the audit trail. Further, Participants considered the comparability of audit trail activity across different securities.

[177] Pursuant to SEC Rule 613(a)(3), Participants are required to report to the CAT within one year of the effectiveness of the CAT NMS Plan, while Industry Members are required to report two years after the effectiveness of the Plan, or three years for Industry Members that qualify as small broker-dealers.

The Participants recognize that there are a number of different approaches to funding the CAT and have considered a number of different funding models. Each model has its potential advantages and disadvantages. For example, a fixed fee structure would provide CAT Reporters greater certainty regarding their fee obligations. A variable fee structure may make it easier for Industry Members to pass fees to their customers, however, it may be more complex and difficult to administer. A tiered approach, particularly for fixed fees, based on such factors as size of firm, message traffic or trading dollar volume, 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. 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 1000 orders for the month and other broker-dealers submitting millions and even billions of orders. Irrespective of the approach, fees should be aligned to the costs of building, implementing and operating the CAT, and if fees collected are in excess of costs for any given year, then fees would be reduced the following year.

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 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.

The Participants discussed potential approaches to funding, including the above principles and an illustrative funding model, with the DAG on September 17, 2014.

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 the 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 SEC's rule proposal and during the CAT NMS Plan development process. In addition, the Participants considered the input of the DAG. Finally, the Participants utilized 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.

(a) Impact on Competition

Through an analysis of the data and information described above, the Participants have evaluated the 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 Plan were to burden a group or class of participants 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.

Participants have identified a series of potential impacts on competition that may arise as a result of the terms and conditions of the Plan. These potential impacts may be related to: 1) the technology ultimately used by the consolidated audit trail and differences across CAT Reporters in their efforts necessary to meet the 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 any disincentives such as placing an inappropriate burden on competition in the US 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 equity and options exchanges already incur significant costs to maintain and surveil an audit trail of activity concerning their trading venue. Each exchange bears these costs whether it expends its 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 fair and even manner. By calibrating the 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 Plan seeks to distribute costs in a fair and equitable manner, the Participants do not believe that it would discourage potential new entrants in a distorted or non-competitive fashion. For instance, an equity ATS – which would already be incurring costs under the Plan as a reporting broker-dealer – should not be discouraged from becoming a national securities exchanges because of the costs it would incur as an Participant based on its business model or pricing structure. Accordingly, the Participants do not believe that adoption of the 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 Plan would distort the marketplace for existing or potential national securities associations.

(ii) Broker-Dealers

Broker-dealer competition may be impacted if the direct and indirect costs associated with meeting the 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 their survey of broker-dealers and dialogue with industry to preliminarily conclude that the Plan will not likely have an adverse impact on competition. Under the 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 CAT. The Participants' efforts to align costs with market activity leads to an outcome where costs are being born significantly more by larger entities.

As discussed above, the Participants performed a study of the Plan's potential costs to broker-dealers. According to this study, for large firms, the average (median) increase in costs associated with audit trail compliance (i.e., the cost that CAT would impose on firms beyond the current economic baseline) would be $346,488 ($13,000), and the average (median) change for small firms would be $435,500 ($0). These averages could suggest that the increased costs imposed by CAT would represent a significantly larger percentage of small firms' regulatory budget than large firms' budgets. However, as noted above, the Participants believe the averages are inflated due to a few responses. Based on the median of responses, the Participants believe that the Plan would not materially disadvantage small broker-dealers vis-à-vis large broker-dealers.

For smaller broker-dealers, the Participants considered their contribution to market activity as an important determinant of the amount of the cost of the CAT they should bear. Further, the Participants understand that the Plan will require imposing a range of costs on the smallest market participants who currently benefit from exclusion or exemption from OATS reporting. While this allocation of costs may be significant for some smaller firms, and may even impact their business models materially, SEC Rule 613 requires these entities to report. Therefore Participants believe that there is no avenue to further minimize the costs to these firms within the context of the funding principles established as part of the Plan.

The Participants were particularly sensitive during the development of the CAT NMS Plan to the potential burdens the Plan could place on smaller broker-dealers. These firms 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 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 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 synchronization of manual business clocks, which are more likely to be in place at small broker dealers.

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 firm's business models might be affected more greatly than others. But, it is an open question as to whether and how changing these incentives impacts competition. Participants intend to monitor changes to over-all market activity and market quality and will consider appropriate changes to the cost allocation model where merited.

The Participants note that if the exemption requests that have been submitted to the SEC are not granted, the requirements of SEC Rule 613 may impose significantly greater costs that could cause smaller 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 that the CAT NMS Plan should have a net positive effect on efficiency.

Overall, the Participants believe that the 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 consolidated audit trail will enable the Participants and the Commission to detect more – and more sophisticated – wrong-doing more quickly, which may deter some market participants from taking such actions. 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.[178] A reduction in prohibited activity, and more and quicker 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

[178] http://www.finra.org/Newsroom/Speeches/Ketchum/P600785

related staffing reductions. Standardization of systems will improve efficiency both for, Participants as well as broker-dealers, in the form of resource consolidation, sun-setting of systems, consolidated legacy systems/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 SEC 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 use of data reported to the Central Repository and Participant access to such data will require the development of data mapping and data dictionaries which will impose burdens in the short term. In addition, in the short term, CAT Reporters may incur additional time and costs to comply with new encryption mechanisms in connection with PII connectivity (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.[179]

The Participants intend to monitor changes to over-all market activity and market quality and will consider appropriate changes to the cost allocation model where merited.

(c) Impact on Capital Formation

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 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

[179] See, for example, IIROC's analysis of its market regulation fee model, available at http://www.iiroc.ca/Documents/2011/5f95e549-10d1-473e-93cf-3250e026a476_en.pdf[iiroc.ca], http://www.iiroc.ca/Documents/2012/bf393b26-7bdf-49ff-a1fc-3904d1de3983_en.pdf[iiroc.ca]

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 Plan would not discourage capital formation. As discussed in greater detail above, the Participants have analyzed the degree to which the Plan should cover primary market transactions. Based on this analysis, the Participants believe that the 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 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 Plan's provisions to secure the data collected and stored by the Central Repository, the Plan should not discourage participation by market participants who are worried about data security and data breaches. As described more fully in the Plan and Section A.4 of this Appendix C, 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 SEC staff, 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, an 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.

C. IMPLEMENTATION AND MILESTONES OF THE CAT

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	**Projected 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: • The Participants' rules that implement the exchange-wide Consolidated Options Audit Trail System (e.g., CBOE Rule 6.24, etc.) • FINRA rules that implement the Order Audit Trail System (OATS) including the relevant rules of the Nasdaq Stock Market, Nasdaq OMX BX, and Nasdaq OMX PHLX • Option exchange rules that require the reporting of transactions in the equity underlier for options products listed on the options exchange (e.g., PHLX Rule 1022, portions of CBOE Rule 8.9, etc.)	Each Participant should complete its analysis within twelve (12) months after Industry Members (other than Small Industry Members) are required to begin reporting data to the Central Repository or, if such Participant determines sufficient data is not available to complete such analysis by such date, a subsequent date determined by such Participant based on the availability of such data.
Identification of Partially Duplicative Rules and Systems	
Each Participant will initiate an analysis of its rules and systems to determine which require information that is partially duplicative of the information available to the Participants through the Central Repository. The analysis should	Each Participant should complete its analysis within eighteen (18) months after Industry Members (other than Small Industry Members) are required to begin reporting data to the Central Repository or, if such Participant determines sufficient data is not

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. Examples of Participants' rules to be reviewed include: • Options exchange rules that require the reporting of large options positions (e.g., CBOE Rule 4.13, etc.) • 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 • Portions of CBOE Rule 8.9 concerning position reporting details	available to complete such analysis by such date, a subsequent date determined by such Participant based on the availability of such data.
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	Each Participant should complete its analysis within eighteen (18) months after Industry Members (other than Small Industry Members) are required to begin reporting data to the Central Repository or, if such Participant determines sufficient data is not

duplicative by 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)	available to complete such analysis by such date, a subsequent date determined by such Participant based on the availability of such data.
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 might eliminate or modify as a result of the implementation of CAT include: • Rule 17a-25 under the Exchange Act which requires brokers and dealers to submit electronically to the SEC information on customer and firms securities	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. The Participants will coordinate with the SEC regarding modification of the Plan to include information sufficient to eliminate or modify those Exchange Act rules or systems that the SEC deems appropriate. With respect to 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

trading • Rule 17h-1 under the Exchange Act concerning the identification of large traders and the required reporting obligations of large traders	Plan.[180] Based on preliminary industry analyses, broker-dealer large trader reporting requirements under Rule 17h-1 could be eliminated via the CAT. The same appears true with respect to broker-dealer recordkeeping. Large trader reporting responsibilities on Form 13H and self-identification would not appear to be covered by the CAT.[181]
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 to the SEC the relevant rule change filing to eliminate or modify its rules within six (6) months of the Participant's determination that such modification or deletion is appropriate.
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.

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

[180] See SEC Rule 613 – Consolidated Audit Trail (CAT) Preliminary EBS-CAT Gap Analysis, at http://catnmsplan.com/web/groups/catnms/@catnms/documents/appsupportdocs/p450537.pdf

[181] See FIF CAT WG: Preliminary Large Trader Rule (Rule 13h-1) – CAT (Rule 613) Gap Analysis (prepared February 11, 2014).

originated, received, transmitted, modified, canceled, or executed by members relating to OTC equity securities[182] and NMS stocks.[183] 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. Most obviously, 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.[184]

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.[185] The Participants believe it is appropriate to incorporate all 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 ensure FINRA can continue to

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[182] See FINRA Rule 7410(l).

[183] Other self-regulatory organizations have rules requiring their members to report information pursuant to the OATS Rules. See, e.g., NYSE Rule 7400 Series; NASDAQ Rule 7400 Series.

[184] This expansion of the CAT reporting requirements to OTC equity securities was generally supported by members of the broker-dealer industry.

[185] 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 SEC 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.

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 it is receiving is sufficient for surveillance purposes. 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 projected completion dates, toward implementation of the consolidated audit trail.

(a) Publication and implementation of the methods for obtaining a CAT-Reporter-ID and providing information to the Customer-ID database

Milestone	Projected Completion Date
Selection of Plan Processor	
Participants jointly select the winning Shortlisted Bid and the Plan Processor pursuant to the process set forth in Article V of the CAT NMS Plan	2 months after Effective Date.
Participants	
Plan Processor assigns and provides a CAT-Reporter-ID to each Participant	3 months before Participants are required to begin reporting data to the Central Repository
Industry Members (other than Small Industry Members[186])	
Plan Processor publishes the procedure for all Industry Members to obtain a CAT-Reporter-ID	9 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 process of submitting required information to Plan Processor to receive a CAT-Reporter-ID	6 months before Industry Members (other than Small Industry Members) are required to begin reporting data to the Central Repository
Plan Processor assigns and provides a CAT-Reporter-ID to each Industry Member (other than Small Industry Members) that has submitted the requisite information to the Plan Processor to receive a CAT-Reporter-ID	3 months before Industry Members (other than Small Industry Members) are required to begin reporting data to the Central Repository
Plan Processor publishes the procedures, connectivity requirements and Technical Specifications for Industry Members to report Customer Account Information to the Central Repository	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	3 months before Industry Members (other than Small Industry Members) are required to begin reporting data to

[186] Small broker-dealers are defined in Rule 0-10(c) under the Securities Exchange Act.

Repository	the Central Repository
Industry Members (other than Small Industry Members) begin reporting customer / institutional / firm account information to the Central Repository for processing	1 month before Industry Members (other than Small Industry Members) are required to begin reporting data to the Central Repository
Small Industry Members	
Small Industry Members begin process of submitting required information to Plan Processor to receive a CAT-Reporter-ID	6 months before Small Industry Members are required to begin reporting data to the Central Repository
Plan Processor assigns and provides a CAT-Reporter-ID to each Small Industry Member that has submitted the requisite information to the Plan Processor to receive a CAT-Reporter-ID	3 months before Small Industry Members are required to begin reporting data to the Central Repository
Small Industry Members begin connectivity and acceptance testing with the Central Repository	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	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	Projected Completion Date
Participants	
Plan Processor begins developing Technical Specification(s) for Participant submission of Order and MM Quote data	10 months before Participants are required to begin reporting data to the Central Repository
Iterative drafts of Technical Specification(s) are published	As needed before publishing of the final document

Plan Processor publishes Technical Specification(s) for Participant submission of Order and MM Quote data	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	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	Beginning 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	15 months before Industry Members (other than Small Industry Members) are required to begin reporting data to the Central Repository
Iterative drafts of Technical Specification(s) are published	As needed before publishing of the final document
Plan Processor publishes Technical Specification(s) for Industry Member submission of Order data	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	6 months before Industry Members (other than Small Industry Members) are required to begin reporting data to the Central Repository
Plan Processor begins connectivity testing and accepting Order data from Industry Members (other than Small Industry Members) for testing purposes	6 months before Industry Members (other than Small Industry Members) are required to begin reporting data to the Central Repository
Plan Processor plans specific testing dates for Industry Members (other than Small Industry Members) testing of Order submission	Beginning 3 months before Industry Members (other than Small Industry Members) are required to begin reporting data to the Central Repository
Participant exchanges that support	1 month before Industry Members

options MM quoting begin accepting Quote Sent time on Quotes	(other than Small Industry Members) are required to begin reporting data to the Central Repository
Small Industry Members	
Plan Processor begins connectivity testing and accepting Order data from Small Industry Members for testing purposes	6 months before Small Industry Members are required to begin reporting data to the Central Repository
Plan Processor plans specific testing dates for Small Industry Members testing of Order submissions	Beginning 3 months before Small Industry Members are required to begin reporting data to the Central Repository

(c) Linkage of Lifecycle of Order Events

Milestone	Projected 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	3 months before Participants are required to begin reporting data to the Central Repository
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	6 months before Industry Members (other than Small Industry Members) are required to begin reporting data to the Central Repository
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	6 months before Small Industry Members are required to begin reporting data to the Central Repository

(d) Access to the Central Repository for Regulators

Milestone	Projected Completion Date
Plan Processor publishes a draft document detailing methods of access to the Central Repository for regulators	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	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	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)	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	6 months before Small Industry Members are required to begin reporting data to the Central Repository

(e) Integration of Other Data ("Other Data" includes SIP quote and trade data, OCC data, trade and quote information from Participants and reference data)

Milestone	Projected Completion Date
Operating Committee finalizes Other Data requirements	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	3 months before Participants are required to begin reporting data to the Central Repository

Specifications, if required	
Plan Processor begins testing with Other Data sources	1 month before Participants are required to begin reporting data to the Central Repository
Plan Processor begins accepting Other Data sources	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' members and other appropriate parties regarding the creation, implementation, and maintenance of the Consolidated Audit Trail (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 have developed the following guiding principles (the "Guiding Principles"):

- 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.
- 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.
- 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.
- 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 Consolidated Audit Trail NMS Plan website, which includes a dedicated email address for firms or the public to submit views on any aspect of the CAT. [187] This 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:

- *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 participants 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 participants attended the October 15 event in person, and a total of 162 industry participants attended it by phone. A total of 130 industry participants attended the October 16 event in person, and a total of 48 industry participants attended it by phone.

- *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 participants attended the February event in person, and a total of 123 industry participants attended it by phone. A total of 46 industry participants attended the April event in person, and a total of 76 industry participants attended it by phone.

- *CAT Cost Study Webinar* (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 participants on each call.

The Participants also received industry feedback in response to general solicitations by the Participants for industry viewpoints as follows:

- *RFP Concept Document (December 5, 2012).* The Participants published via the Consolidated Audit Trail website[188] this document to solicit feedback on the feasibility

[187] http:catnmsplan.com
[188] http://catnmsplan.com/web/groups/catnms/@catnms/documents/appsupportdocs/p197699.pdf

and cost of implementing the CAT reporting requirements being considered by the Participants.

- *Representative Order Scenarios Solicitation for Feedback* (February 1, 2013). The Participants solicited feedback via the Consolidated Audit Trail website[189] 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 Consolidated Audit Trail website[190] on four components of the NMS Plan: (1) primary market transaction, (2) Advisory Committee, (3) Time Stamp Requirement and (4) Clock Synchronization. Approximately 80 industry members provided responses. Both FIF and SIFMA, as well as an industry member, 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 Consolidated Audit Trail website[191] 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.

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), the Securities Industry and Financial Markets Association (SIFMA), and the Financial Information Forum (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 May 2014, the DAG consisted of the Participants and representatives from 27 firms and industry associations.

The DAG has had 36 meetings since April 2013. Topics discussed with the DAG have included:

[189] **http://catnmsplan.com**
~~[190]~~ **http://catnmsplan.com**
~~[191]~~ **http://catnmsplan.com**

- *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" timestamp to messages sent to exchanges by all options market makers The Participants intend to submit a letter for exemptive relief to the Commission 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 identifier to each customer and the CAT plan processor creates and stores the Customer-ID. This concept was supported by the DAG and the Participants intend to submit a letter for exemptive relief to the Commission related to the CAT Customer ID to reduce the reporting on CAT Reporters.

- *Timestamp, Clock Synchronization and Clock Drift:* The DAG discussed timestamps in regards to potential exemptive relief on the timestamp requirements for allocations and manual order events. In addition, industry clock synchronization processes was discussed as well as the feasibility of specific clock drift requirements (e.g., 50ms). The Participants intend to submit a letter for exemptive relief to the Commission related to manual timestamps.

- *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 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 CATS 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 Large Trader ID 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.

- *Cost and Funding of the CAT:* The DAG helped to develop the cost study that was distributed to industry participants. 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 6 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 Sponsors Took Those Views Into Account in Preparing NMS Plan

The various perspectives of members and other industry participants 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 discuss 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 Rule 613, and which will be detailed in a request for exemptive relief that the Participants intend to submit to the Commission related to manual timestamps.

Customer ID: Extensive DAG discussions reviewed the Customer-ID requirements in 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 Rule 613. Working with industry members, the Participants proposed a customer information approach in which broker-dealers would assign a unique firm-designated identifier to each customer which

the CAT 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 will be included in a request for exemptive relief that the Participants intend to submit.

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 that data errors not cause linkage breaks. This feedback was incorporated into the RFP and relevant portions of the Plan Processor Functional Requirements.

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 representatives 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 SROs have discussed CAT governance considerations with the DAG at several meetings. The SROs incorporated industry feedback into the CAT NMS Plan to the extent possible in light of the regulatory responsibilities placed solely upon the SROs under the provisions of 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.

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 SROs and the bidders. After extensive discussion, DAG members declined to sign such an NDA. The SROs 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. In addition, industry members

recommended that time stamps not be required for allocation reports. 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 participants to comply with a change to the current one-second clock drift. Participants conducted active discussions with industry members on this topic, and intend to request exemptive relief for manual orders.

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 will continue to be discussed within the DAG as cost and funding approaches are taken into consideration during the ongoing development the CAT solution.

Order ID/Linkages: The DAG formed an order scenarios working group to discuss approaches to satisfy the order linkage requirements of 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 intend to submit in a request for exemptive relief.

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 others, FINRA's Order Audit Trail System ("OATS"), the Electronic Blue Sheets ("EBS") reporting system, and Large Trader reporting. In addition, FIF provided a gap analysis of CAT requirements against certain Large Trader reporting obligations.

The Participants conducted a gap analyses of CAT requirements against their own rules and systems supporting those rules and will publish a timeline for elimination, taking into consideration the feedback provided by Industry associations.

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 to Creating, Implementing and Maintaining the CAT which the Participants considered (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.

The Participants leveraged their own extensive experience with regulatory, technical and securities issues in formulating, drafting and filing the 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 for critical pre-formal CAT NMS Plan topics, 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 and CAT RFP documents;
- 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
- 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 planned the outreach to non-securities regulators and the expansion of the CAT to other products.

Representatives from all subcommittees met to discuss the overall progress of the CAT initiative in the Operating Committee.

To support the Participant's internal expertise, the Participants also engaged outside experts to assist in formulating the 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 Plan, both of which have extensive experience with issues raised by the CAT.

Furthermore, as discussed in more detail above in Section D.11, the Participants have been engaged in meaningful dialogue with industry participants with respect to the

development of the CAT through the Development Advisory Group and through 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 the Introduction to Appendix C, the Participants have, among other things, developed a plan for selecting the Plan Processor, created and published an RFP, evaluated bids, and chose a shortlist of bids. Correspondingly, the Participants have drafted the Plan set forth herein to reflect the recommendations that have resulted from the above analysis and engagement.

(a) RFP

The SROs considered various means to explore and discover a reasonable approach to create, implement and maintain the CAT, including issuance of an RFI (Request for Information) and RFP (Request for Proposal). After due consideration, with a view to meeting demanding timeframes, the SROs decided to use their expertise to craft an RFP to outline the main requirements. This approach was designed to solicit imaginative and competitive proposals from the private sector. Ten competitive proposals were submitted on March 21, 2014. These were carefully reviewed by the SROs and reduced to six proposals. The proposals offer a variety of solutions as discussed below.

(b) Organizational Structure

Of the bids submitted, three organizational structures emerged: consortiums or partnerships, single firms, and dedicated corporate entities (e.g., in which CAT operations would be spun off into a separate LLC). Consortiums and partnerships can provide for financial stability, and can provide access to broader pool of expertise than might a single firm or entity. However, communication and coordination within a consortium or partnership may present challenges, and there may be competing interests between firms within the consortium or partnership. A single firm would streamline communication, and would provide a single point of accountability. It could also provide efficiencies through a more concentrated group of resources with experience working together. However, a single firm may have a lower level of resource availability. A dedicated corporate entity would provide for legal independence, but could also have a larger amount of administrative overhead.

The Participants have not mandated an organizational structure for the Plan Processor. The Participants may consider the advantages and disadvantages of each structure as part of their calculation for selecting the Plan Processor.

(c) Primary Storage

Two methods of primary data storage were considered: traditionally-hosted storage architecture, and infrastructure-as-service. Traditionally-hosted storage architecture would provide economies of scale and predictable storage costs. It would also make the Plan Processor less reliant on a vendor, and would provide full control over the storage architecture. However, its large fixed costs would be dependent on accurate forecasts of

usage patterns, and it may be less flexible in response to changes in use. It would also require significant administrative expense (e.g., system administrators). Infrastructure-as-service would provide flexibility and ease of scaling, with lower fixed costs and lower administrative costs. The Plan Processor would also pay only for actual usage, and so would not be reliant on forecasting. However, infrastructure-as-service would provide lower economies of scale, and possibly higher costs. It would also make the Plan Processor reliant on the service provider, and could create security concerns, due to data residing on third-party systems.

The Plan Processor has not mandated a method for primary data storage. As long as the primary data storage environment can meet the security, reliability and accessibility requirements for the CAT, including storing PII data separately, the Plan Processors do not believe it is necessary to prescribe the format.

(d) Customer/Account Data

All bidders proposed a solution that is consistent with the Customer Information Approach in which broker-dealers would report a unique firm-designated identifier for each customer and the Plan Processor creates and stores the Customer-ID . The use of existing unique identifiers (such as internal firm customer identifiers) could minimize potentially large overhead in the CAT System required to create and transmit back to the CAT Reporters system generated unique identifiers. However, allowing multiple identifiers will still require mapping of identifiers, to connect all trading associated with a single beneficial entity. But it will also ease the burden on CAT Reporters because each CAT Reporter will report information using existing identifiers which it currently uses in its internal systems. As such, the CAT system will not be sending a CAT Customer ID back to the CAT Reporters. This reduces the burden on the CAT Reporters because they would not need to build an additional process to receive back a Customer ID and append that identifier to each order origination, receipt or cancellation. This may help alleviate storage and processing costs and potentially reduce the security risk of transmission of the Customer ID back to the CAT Reporter.

The Participants support the use of the Customer Information Approach and subject to approval of an exemption request by the Commission, the Central Repository will utilize this approach to link customer and account information. The Participants believe that this approach will be the more efficient for both the Plan Processor and CAT Reporters.

(e) Personally Identifying Information (PII)

All bidders proposed encrypting all PII data, 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, it 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 role-based access controls. These controls would allow for varying levels of access depending on user needs, and could 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. 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 a multi-factor authentication for access to PII. The Participants believe that any increased costs to the Plan Processor and any delays that this could cause to accessing PII are balanced by the need to protect PII.

(f) Data Ingestion Format

Several approaches were considered for the ingestion format for CAT data: uniform format, leveraging existing messaging protocols or a hybrid approach whereby data can be submitted in a uniform format or leveraging existing message protocols. There are benefits to the industry under either format. A large portion of the industry currently reports to OATS in a uniform format. These firms have invested time and resources to develop a process for reporting to OATS. The uniform formats recommended by the Bidders intended to leverage OATS format and enhance it to meet the requirements of SEC Rule 613 and therefore, may reduce the burden on certain CAT Reporters and simplify the process for certain CAT Reporters to implement the CAT. However, firms use message protocols, like FIX, as a standard point of reference with industry participants that is typically used across the order lifecycle and within a firm's order management processes. Leveraging FIX could result in quicker implementation times and simplify data aggregation at the Participants and CAT level.

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. creation of a new format.[192] However, FIF did indicate a preference for using the FIX protocol.[193]

(g) Process to Develop the CAT

Two processes for development of the CAT were considered: the agile or iterative development model, and the waterfall model. 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. But, the waterfall model could be less flexible

[192] *See* Appendix C Section B.7. for additional details on cost studies.

[193] *See* FIF Response to Proposed RFP Concept Document, dated January 18, 2013.

to changes, and particularly to 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 developments could be utilized to manage the development of CAT or even a combination of both methods.

(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. It would also not impact other ongoing operations (such as disaster recovery sites). However, developing and maintaining test environments would entail 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. It also would not require the test environment to be available at all times. However, scheduled events would not allow users to test on CAT systems until a dedicated time window is open.

Ongoing testing would allow users to test CAT systems as often as needed. However, this requires the test environment to be available at all time. 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 test environment that is equivalent to the production environment and available 24 x 6. 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 Staffing)

Quality assurance staffing proposals range between nine and sixty-six. Some firms proposed allocating QA resources after the third month. A larger number of QA resources

would facilitate structured, in-depth testing and validation of CAT systems. However, a larger set of QA resources would have higher fixed costs and administrative overhead.

The Participants are not mandating the size for QA Staffing. The Participants believe that 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 structure for proposed Central Repository.

(j) User Support

Bidders proposed user support staffing ranges from 5 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. The Participants believe that the number of FTEs varied in the bids so much because they are largely dependent on both the staffing philosophy of the Bidder as well as the structure for proposed central repository.

(k) Help Desk

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 would 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).

(l) CAT User Management

Bidders proposed several approaches to user management: help desk creation of user accounts, user (e.g., broker-dealer) creation of accounts, and multi-role. Help desk creation of accounts would allow for greater oversight and validation of user creation. However, it would increase administrative costs, particularly in the early stages of 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 or superuser 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 superuser or set-up administrator who has the ability to provide access to other users within its organization. However, such superusers 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.

(m) Required Data Attributes for Order Submission

Both results order event type and CAT feedback order event were considered as a reportable order event. Results order event type would not provide additional value over a "daisy chain" linkage method. CAT feedback order event can be generated by the CAT Processor, thereby removing the reporting burden from reporting firms.

(n) Data Retention Requirements

The Bidders proposed a six year retention time, rather than five years as defined in SEC Rule 613. The six year timeframe is a current requirement for broker-dealers under Exchange Act Rule 17a-4(a).

The Participants support the use of the longer timeframe as it complies with Exchange Act Rule 17a-4(a). The Participants are requiring all six years to be kept online in an easily accessible format to enable regulators to have access to full six years of audit trail materials for purposes of its regulation. The Participants understand that requiring this extra year of data storage may increase the cost to run the CAT; however, this cost will only be minimal and is outweighed by the needs of regulators for access to the information.

(o) 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 Plan Processor is not required to have real-time SIP connectivity.

(p) Disaster Recovery

Participants discussed both commonly accepted structures for disaster recovery, hot-hot and hot-warm. 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). In addition, costs for hot-hot between the primary and secondary sites were considered too high to require the Plan Processor to support this model.