

**OPRA SIP Server Failure/Data Center Failover Test Script**  
**Test Date & Time: August 22, 2020, 9:00am to 11:30am ET (approximate)**

| Hourly Test Script |                  |   |              |  |  |
|--------------------|------------------|---|--------------|--|--|
| #                  | Time             | Test Category   | Action By    | Test Description   | Expected Results   |
| 1                  | 6:10:00 AM       | SOD   | SIP          | OPRA Regular Session Start of Day messages sent  | Data Subscriber to capture the Start of Day messages   |
| 2                  | 6:30:00 AM       | Open Interest Message   | SIP          | Open Interest messages sent over OPRA Extended Session   | Data Subscribers to capture the Open Interest messages   |
| 3                  | 6:45 - 9:30 AM   | Participant Connectivity/Input  | Participants | Participants to establish connectivity for OPRA Input lines<br>Participants to start submitting Options data   | Participants establish connections<br>Quotes and trades accepted and disseminated via the multicast output lines   |
| 4                  | 9:15:00 AM       | Output Publication Primary Process Failure                              | SIP          | Simulate Primary Output Publication process failure<br>Data Publication to switch to backup process  | -- Subscribers may see a momentary outage in data flow on the output lines<br>-- Subscriber can request retransmission for any gaps  |
| 5                  | 9:30:00 AM       | Market Open   | SIP          | Market Open  |  |
| 6                  | 9:30 - 10:00 AM  | Input server failure at Primary Data Center                             | SIP          | SIP to simulate primary input line failure of a subset of OPRA input lines for each Participant  | Participants will see primary input lines disconnected   |
|                    |                  |   | Participants | For the affected lines, Participants to reconnect to SIP on their backup lines and establish sequence numbers by sending Block Sequence Number Status Inquiry Request (Category H / Type L and Message Count Status Inquiry Request (Category H / Type R). Participants to start submitting Quote and Trade data via their Primary connections       | -- SIP to accept input connections and respond with Block Sequence Response (Category H / Type M) and Message Count Status Response (Category H / Type S)<br>-- Quotes and trades accepted and disseminated on the output lines  |
| 7                  | 10:00 - 11:00 AM | Site failover from Primary Data Center to Disaster Recovery Data Center | SIP          | OPRA to simulate Production site failure   | Disconnection of all OPRA and Retransmission input lines for all Participants and Data Subscribers<br>Subscribers: disruption in output multicast data dissemination for all lines   |
|                    |                  |   |              | OPRA to failover to DR site and publish following messages:<br>1) Reset Block Sequence Number (Category H Type K) for each OPRA line to be generated at 750M<br>2) Disaster Recovery Data Center Activation (Category H Type P) message<br>3) Zero Quotes (Quote messages with Zero Price and Size) on behalf of all participants across all symbols | -- Subscribers to receive and process sequence reset message (Category H / Type K) disseminated from the DR site<br>-- Subscribers to receive the new Disaster Recovery Site Activation Control Message (Category H, Type P) over the multicast lines<br>-- Subscribers to receive the zero quotes disseminated upon failover<br>Note: This is not an actual gap that can be retransmitted                             |
|                    |                  |   |              | OPRA to enable input lines and Retransmission lines of the DR site   | DR Input IP/Ports available to establish connections   |
|                    |                  |   | Participants | Participants to reconnect to SIP input IP/ports on OPRA DR site and establish sequence numbers by sending Block Sequence Number Status Inquiry Request (Category H / Type L and Message Count Status Inquiry Request (Category H / Type R).<br>Participants to start submitting Options data from the latest Sequence Numbers                        | -- SIP to accept input connections and respond with Block Sequence Response (Category H / Type M) and Message Count Status Response (Category H / Type S)<br>-- Quotes and trades accepted and disseminated on the output lines<br>-- Subscribers to accept Quotes and trades disseminated on the output lines.<br>-- Subscribers can request Retransmission for any gaps via the retransmission lines on the DR site. |
| 8                  | 11:30:00 AM      |   | SIP          | OPRA to recover Production site for redundancy<br>End of Test  |  |