July 2019 Outages in Manhattan and Brooklyn

Implementation Plan of
Consolidated Edison Company of New York, Inc.

Case Nos. 20-E-0588 and 20-E-0587

New York, New York
December 21, 2020

Executive Summary

In July 2019, Consolidated Edison Company of New York, Inc. ("Con Edison" or "Company") experienced two events on its electric system, one in Manhattan and one in Brooklyn, that resulted in customers losing service. On November 19, 2020, the New York State Department of Public Service ("Department") issued a Report on these two events.[1] The Report includes 40 Department recommendations: 13 based on the Manhattan event, 18 based on the Brooklyn event, and 9 communications-based recommendations that arise from both events. In addition, the Report includes 27 Manhattan event recommendations and 21 Brooklyn event recommendations from an expert panel that the Department consulted.

On the same day, the Public Service Commission issued an order that, among other things, directed Con Edison to provide an implementation plan for all recommendations accepted by the Company as well as justification and proposed alternatives for any recommendation not fully accepted.[2] The Order states that the Company should provide implementation steps including start and end dates, significant interim milestones, a priority ranking for each recommendation, and deliverables. This Implementation Plan complies with the Commission's Order. Table 1 below provides the numbering sequence,[3] recommendation, status, Company priority,[4] and planned completion for the implementation of each recommendation. Appendix A provides each recommendation's implementation plan.[5]

In developing this Implementation Plan, Con Edison has been consulting with the Department to review and clarify the recommendations and discuss their implementation. The Company's Implementation Plan reflects the Department input received. The consultation has been helpful and the Company herein accepts most of the recommendations and dates for completion.[6] The

[1] Case 20-E-0588 - In the Matter of an Investigation Into Consolidated Edison Company of New York, Inc.'s July 2019 Manhattan Customer Service Outages and Case 20-E-0587 - In the Matter of an Investigation Into Consolidated Edison Company of New York, Inc.'s July 2019 Southeast Brooklyn Customer Service Outages, *New York State Department of Public Service Investigation Report on Con Edison's July 2019 Outages in Manhattan and Brooklyn*, November 19, 2020 ("Report").

[2] Case 20-E-0588 - In the Matter of an Investigation Into Consolidated Edison Company of New York, Inc.'s July 2019 Manhattan Customer Service Outages and Case 20-E-0587 - In the Matter of an Investigation Into Consolidated Edison Company of New York, Inc.'s July 2019 Southeast Brooklyn Customer Service Outages, *Order Instituting Proceeding and to Show Cause*, issued and effective November 19, 2020 (Order).

[3] The Company used a naming convention to create item numbers. Item numbers beginning with "A" represent Staff recommendation, "B" denotes panel recommendations. The "B" recommendations are further identified as "BO" for recommendations related to Brooklyn outages and "MO" for Manhattan Outages. The numbering is fully consistent with that provided in the Staff report.

[4] The Company has categorized the priorities into 3 tiers, with "Tier 1" items being the highest priority.

[5] In several cases, a number of recommendations are being addressed by one action plan. In these instances, all of the recommendations addressed are listed at the beginning of the implementation plan details.

[6] For completion of those items that Con Edison has not already completed, the Company will notify the appropriate members of technical staff that it has completed the recommendation.

Company also notes that it has already completed some recommendations and they require no further action. The Implementation Plan gives all other recommendations a projected date of completion.

The Company responded today to the relevant legal allegations contained in the Order to Show Cause and Report. The Company also makes here a brief statement with regard to the Report's allegations that the Company did not conduct an appropriate after-action review for the Brooklyn event, which are unrelated to prudence. First, the Report incorrectly states that the Company waited until 30 days after the event to hold a meeting to develop an after-action report. The Company formed a technical team to manage the Company's post-event review during the week following the event. This included coordinating lessons learned from across relevant Company groups. Second, the team published an internal evaluation report on October 2, 2020 – separate from the after-action document that the Report criticizes – that included a number of technical recommendations for the Company to implement. The Report acknowledges the October 2 evaluation,[7] and agrees with its recommendations, but nevertheless criticizes the effectiveness of the Company's process. While the Company is open to suggestions for improvement, it strongly disagrees with the Report's implication that the Company did not conduct an active, thorough, and effective post-event review and stands by its diligent and comprehensive efforts to continuously improve service to our customers by capturing and implementing the event's lessons. Nevertheless, the Company has a proposal herein for implementing the Department's recommendation to have the Company develop a more formal after-action review procedure.

The Company recognizes that the Report's findings, observations, and recommendations represent an opportunity to implement improvements that will benefit the Company's customers. As stated above, the Company is committed to continuous improvement and has already implemented many of the Report's. The Company has, and, as appropriate, will continue to assess each of the recommendations carefully and will implement the recommendations in collaboration with the Department's Staff.

[7] Report at 71.

Table 1 – Summary of Recommendation Responses

Item #	Recommendation	PSC Report Location	Response	Status	Priority	Planned Completion
A-1	Con Edison should fully discuss in its implementation plan how the design drawing feedback process it developed after this incident will be monitored and self-audited to ensure there are no inconsistencies between Company's and vendor's wiring drawings that could lead to a similar situation as in July 2019.	pg. 9	Accept	Complete	Tier 1	N/A
A-2	Con Edison should update its inspection procedures to include a process for inspecting transformers cooling systems on a regular basis to verify that the valves are in the proper operational positions. This should include verification by a supervisor after the valve position is changed for any reason.	pg. 9	Accept	Complete	Tier 2	N/A
A-3	Con Edison should seek ways to further expedite the verification of the correct installation and operation of 87N relays that were taken out of service following the incident.	pg. 11	Accept	In-Progress	Tier 1	3/31/2021
A-4	Given its decision following the incident to use other methods besides primary injection testing to verify the proper operation of the 87N relays, Con Edison should provide an analysis that validates using either the review of pertinent historical operations, the installation of non-intrusive monitors, or making relay adjustments will be able to verify the correct installation and operation of 87N relays.	pg. 11	Accept	In-Progress	Tier 1	2/28/2021
A-5	Con Edison should produce a Training Enhancement Report to further improve its overall training program and meet the challenges of the future. The report should address a number of topics including classroom, online and on-the-job training, new technologies and procedures, improvements in company manuals, sessions to review lessons learned, operational drills, and discussions between departments and disciplines to improve communication and coordination. Additionally, the report should implement or improve follow-up testing to validate employee understanding and competence.	pg. 13	Accept	In-Progress	Tier 3	2/28/2021
A-6	Con Edison should review all technical documents to replace unclear language with clear-cut specific terminology.	pg. 13	Accept	Complete	Tier 2	N/A
A-7	Con Edison should continue to seek ways to improve system reliability and resiliency, as identified in post event preliminary findings, at just and reasonable costs including consideration of and responding to the Panel's recommendations pertaining to system planning. The Company should provide detailed justifications for any recommendation it does not believe should be implemented.	pg. 15	Accept	Complete	Tier 1	N/A
A-8	Con Edison should improve its system upgrade quality control processes with an emphasis on investigating and adopting industry standards, in furtherance of the initiative the Company commenced following this incident.	pg. 18	Accept	Complete	Tier 3	N/A

Item #	Recommendation	PSC Report Location	Response	Status	Priority	Planned Completion
A-9	Con Edison should verify that all new, retrofitted or out-of-service for maintenance facilities with 87N relays will be tested and validated using primary injection testing before being placed into service.	pg. 18	Accept	Complete	Tier 1	N/A
A-10	Con Edison should develop a program to upgrade and enhance its testing and inspection protocols and procedures.	pg. 19	Accept	Complete	Tier 3	N/A
A-11	Con Edison should develop improvements in its contingency plans and procedures and develop improvements in its overall operation and maintenance procedures for all of its power system equipment in order to achieve reliable performance and to prevent equipment damage.	pg. 20	Accept	Complete	Tier 3	N/A
A-12	Con Edison should improve its overall System Monitoring procedures to enhance situational awareness, particularly with respect to critical equipment such as transformers and should improve the clarity of protocols for responding to system abnormalities.	pg. 22	Accept	In-Progress	Tier 3	12/31/2021
A-13	Preliminary findings led Con Edison to develop an initial listing of lessons learned, Con Edison should now produce a more comprehensive Lessons Learned Report following the occurrence of any significant problem or failures it encounters, and widely disseminate the report to relevant employees for discussions and training.	pg. 23	Accept	In-Progress	Tier 2	4/1/2021
A-14	Con Edison should develop a plan by December 31, 2020 to expand the use of 27kV automatic interrupter switches in the Flatbush network and throughout its territory based on the success of interrupter prototypes that the Company plans to install on Feeder 4B06.	pg. 37	Accept	Complete	Tier 2	N/A
A-15	Con Edison should seek to expand the installation of Kyle switches on 4kV feeders, where operationally feasible, in other 4kV grids throughout the Company's territory to limit impact of distribution feeder faults.	pg. 40	Accept	In-Progress	Tier 2	6/1/2021
A-16	Considering that Kyle switches have been installed on all feeders in the Flatbush 4kV grid and that enhanced SCADA control functions are available to operators, Con Edison should operate the Flatbush 4kV grid and other 4kV grids that are supplied by a network system in radial mode when appropriate.	pg. 40	Accept	Complete	Tier 1	N/A
A-17	Company Specification EO-4095 should reflect the use of enhanced SCADA functions and the radial operations of 4kV grids	pg. 40	Accept	Complete	Tier 1	N/A
A-18	Con Edison should replace all remaining Westinghouse type CM electromechanical phase balance relays with microprocessor relays as soon as operationally feasible to enhance the means of detecting and clearing faults at 4kV unit substations throughout the Company's territory.	pg. 43	Accept	In-Progress	Tier 1	6/1/2021

Item #	Recommendation	PSC Report Location	Response	Status	Priority	Planned Completion
A-19	By December 31, 2020, Con Edison should establish a workplan to apply investment actions identified during the Flatbush event (e.g., replacement of Paper Insulated Lead Cable, vintage XLPE cable, Raychem 3W-1W joints) to networks associated with 4kV grid systems throughout the Company's territory.	pg. 47	Accept	In-Progress	Tier 2	12/31/2020
A-20	During expected heat events, Con Edison should save all cable and joint failure specimens so that each can be studied and used in internal Post Event Analyses.	pg. 47	Accept	In-Progress	Tier 2	1/31/2021
A-21	Con Edison should establish more detailed waiver criteria in the Company's Hipot testing specification (EO-4019) to ensure that feeders are assessed and tested appropriately during an outage event.	pg. 50	Accept	Complete	Tier 3	N/A
A-22	Con Edison should determine whether the time frame to proactively Hipot test primary distribution network feeders (currently over three years) is appropriate and strengthen the Company's testing procedure accordingly to ensure all feeders are tested adequately.	pg. 52	Accept	In-Progress	Tier 3	6/1/2021
A-23	Con Edison should revise EO-4095 Distribution System Operation Under Contingency and/or Elevated Load Conditions, or create a new procedure entirely, to provide detailed guidance for the preparations, decision factors, responsibility, required communications, and operator step-by-step direction to perform load shedding or de-energization of the 4kV grids.	pg. 55	Accept	Complete	Tier 2	N/A
A-24	Given 4kV grid load shed events do not occur on a routine basis and Con Edison is currently lacking any procedure or written guidance for restoration, Con Edison should develop a written guidance on how to restore a 4kV grid efficiently and effectively.	pg. 58	Accept	In-Progress	Tier 1	4/30/2021
A-25	Con Edison should develop a process to better evaluate and implement measures to restore customers served by 4kV feeders with no equipment or overload issues in the Flatbush 4kV grid and other 4kV grids that are supplied by a network system. These measures could include the use of mobile electric generators and other distributed energy resource technologies.	pg. 58	Accept	In-Progress	Tier 1	4/30/2021
A-26	Con Edison should clarify its procedures to transition to a condition red when load shedding occurs on a 4kV grid.	pg. 61	Accept	Complete	Tier 1	N/A
A-27	Con Edison should change its voltage restoration algorithm to restore voltages based on actual conditions rather than solely the N-1 conditions required by the current algorithm.	pg. 64	Accept	In-Progress	Tier 1	4/1/2021
A-28	Con Edison should revise the Distribution System Condition Yellow system operation procedure to require the three-hour status updates from the Feeder Boss be written records regardless of whether or not verbal updates are provided.	pg. 66	Accept	Complete	Tier 1	N/A

Item #	Recommendation	PSC Report Location	Response	Status	Priority	Planned Completion
A-29	Con Edison should establish guidelines to improve its use of mobile electric generators for the Flatbush 4kV grid and other 4kV grids with similar system configurations to facilitate timely restoration of customers after an outage event.	pg. 69	Accept	In-Progress	Tier 1	4/30/2021
A-30	Con Edison should develop a formal after action process for the Operations and Communication organizations. The Company should provide training for supervisory personnel within the Operations organizations to lead after action meetings following unusual and/or major system events.	pg. 72	Accept	In-Progress	Tier 2	4/1/2021
A-31	Con Edison should revise the Corporate Response to Incidents and Emergencies procedure to specify threshold(s) at which the after action process will be performed on a smaller scale (organization by organization) rather than Company-wide.	pg. 73	Accept	In-Progress	Tier 2	4/1/2021
A-32	Con Edison should revise Corporate Instruction 810-2 and Emergency Operations Procedure 5023 to provide clarity to all actions to be taken by the Company when the ONIM is triggered and include that such actions will not be discretionary.	pg. 82	Modify	In-Progress	Tier 3	2/28/2021
A-33	Con Edison should develop a comprehensive and detailed communications procedure that requires Con Edison to notify customers and the public prior to and during load shedding, as well as Condition Yellow and / or Red events, in the affected areas within its service territory. The process should be included in the Company's ERP. The process will provide, at a minimum: -Specific examples of system conditions that would warrant a load shedding event, e.g., prevent loss of an entire grid or network, the span of load shed may enlarge depending on worsening system conditions, etc.; and, -Specifics on how the Company will educate customers and the public about load shedding activities when advanced notice is and is not available (e.g. incorporating into voltage reduction messaging, automatic notifications, etc.).	pg. 82	Modify	Complete	Tier 2	N/A
A-34	Con Edison should develop a process to issue press releases and/or company statements as soon as practicable before or immediately following a significant load shedding event or other notable events that warrant detailed communications. Press releases should contain pertinent and detailed information at the beginning of each release, e.g., cause and extent of outages, speak to customers who have not been restored, etc. The process should be included in the Company's ERP.	pg. 86	Accept	In-Progress	Tier 2	2/28/2021
A-35	Con Edison should develop more accurate and depictive press release templates that provide timely, clear and thorough details to customers regarding actions the Company has, is, or will be taking in response to adverse system conditions, e.g., load shedding, de-energization, flooding, etc. The templates should be included in the Company's ERP.	pg. 86	Accept	In-Progress	Tier 2	2/28/2021

Item #	Recommendation	PSC Report Location	Response	Status	Priority	Planned Completion
A-36	Con Edison should develop a comprehensive, consistent and detailed process for conducting press conferences and/or briefings during outage events. The process should include, but not be limited to, a clear decision-making process and threshold requirements to be used by the Company. The process should be included in the Company's ERP.	pg. 87	Accept	In-Progress	Tier 3	2/28/2021
A-37	Con Edison should develop a detailed process for promptly communicating outage causes and specific ETR information, reasons for and timely notification of ETR revisions to its customers. This process should be included in the Company's ERP.	pg. 89	Accept	In-Progress	Tier 2	2/28/2021
A-38	Con Edison should develop a process and related materials that provides targeted communications to customers that remain out of service as restoration efforts continue until all customers have been restored. This should include advanced notice to customers whose ETRs will not be met along with a clear explanation of why ETRs are not being met. This process should be included in the Company's ERP.	pg. 89	Modify	Complete	Tier 2	N/A
A-39	To resolve the omission identified by Staff, in its internal procedures, Con Edison should develop a comprehensive and detailed process to notify federal, state, and local government officials as well as community organizations when sizable outages occur in a focused area. The process should be included in the Company's Communications with the Public During Load Management Power Outage procedure as well as in its ERP. The procedure should include, at a minimum, the following: -A comprehensive contact list of federal, state, and local elected and government officials, and community organizations for each of Con Edison's Regional Corporate Affairs Departments and Westchester County, to be used for communicating targeted emergency and / or outage information to local elected and government officials before and during significant outage events This list should be reviewed and updated semi-annually each year; -Specific information to be shared with government and elected officials before, during and after an outage event, how that information will be shared, and the minimum frequencies of communications; and, -A dedicated electronic system to be used for memorializing and tracking all communications, e.g., emails, telephone calls, made to and received by federal, state, and local government officials as well as community organizations, that memorializes all relevant details regarding such communications.	pg. 91	Modify	In-Progress	Tier 2	12/31/2020

Item #	Recommendation	PSC Report Location	Response	Status	Priority	Planned Completion
A-40	Con Edison should develop a detailed and comprehensive process for issuing blast e-mails to customers in accordance with internal procedures and Commission Orders, e.g., Outage Notification Incentive Mechanism, Orders approving Emergency Response Plans, etc.; and, content will include, but not be limited to, summaries of the information contained in press releases. The process should be included in the Company's ERP.	pg. 94	Accept	In-Progress	Tier 2	2/28/2021
B-BO-1	Further Explore Existing Cable Testing Technologies	App. B - Bkln	Accept	In-Progress	Tier 3	5/31/2021
B-BO-2	Evaluate Emerging Cable Assessment Technologies	App. B - Bkln	Accept	In-Progress	Tier 3	5/31/2021
B-BO-3	Rejuvenate Old XLPE and EPR Cable Systems	App. B - Bkln	Modify	In-Progress	Tier 3	3/31/2021
B-BO-4	Investigate and Address Increased Failure Rates for the 27 kV Flatbush Network	App. B - Bkln	Accept	In-Progress	Tier 3	6/1/2021
B-BO-5	Modify Feeder Testing Specifications to Completely Eliminate the Use of DC Hipot Tests	App. B - Bkln	Accept	In-Progress	Tier 3	2024+
B-BO-6	Avoid Splicing Old PILC Cables to New Cables	App. B - Bkln	Modify	Complete	Tier 3	N/A
B-BO-7	Consider Upgrade of Voltage on 27 kV and 4 kV Networks	App. B - Bkln	Accept	In-Progress	Tier 3	2/28/2021
B-BO-8	Ensure Adequate Training of Personnel Responsible for Heat and Cold Shrink Cable Splices	App. B - Bkln	Accept	In-Progress	Tier 2	3/31/2021
B-BO-9	Review Settings on Phase Balance Relays Prior to the Summer Peak Loads	App. B - Bkln	Accept	Complete	Tier 2	N/A
B-BO-10	Implement Digital Protection Technologies	App. B - Bkln	Accept	In-Progress	Tier 2	6/1/2021
B-BO-11	Implement Improved Fault Isolation Mechanisms	App. B - Bkln	Accept	In-Progress	Tier 2	6/1/2021
B-BO-12	Increase AC Hipot Testing Voltage on 5 kV Class Breakers to Comply with Manufacturers' Recommendations	App. B - Bkln	Reject	Complete	Tier 3	N/A
B-BO-13	Optimize Breaker Ground Connections by Replacing Aluminum Ground Buses with Copper Where Possible, or Using Antioxidation Posts on Aluminum Ground Bus Tabs Rapid Restoration and Situational Awareness	App. B - Bkln	Modify	In-Progress	Tier 3	2/28/2021
B-BO-14	Implement Technologies to Detect Down Conductors	App. B - Bkln	Accept	Complete	Tier 2	N/A
B-BO-15	Enhance the SCADA System by Implementing Automated Alarms and Regular Maintenance Procedures	App. B - Bkln	Accept	In-Progress	Tier 2	2/28/2021
B-BO-16	Enhance Transformer Situational Awareness	App. B - Bkln	Accept	Complete	Tier 2	N/A
B-BO-17	Estimate and Track Data for Transformer Loss of Life in an Asset Database, Accounting for Phase Loading to Identify Greatest Accumulated Loss of Life	App. B - Bkln	Accept	Complete	Tier 2	N/A
B-BO-18	Validate Calculations for Top Oil and Hot Spot Temperatures to Assess and Monitor the Effectiveness of External Cooling	App. B - Bkln	Accept	Complete	Tier 2	N/A
B-BO-19	Ensure Adequate Demand Response Resources Prior to Summer Peak Loads	App. B - Bkln	Accept	Complete	Tier 2	N/A

Item #	Recommendation	PSC Report Location	Response	Status	Priority	Planned Completion
B-BO-20	Review NRI Data and Calculations to Identify Best Practices from High Performing Networks that can be Applied to Other Operating Areas	App. B - Bkln	Accept	Complete	Tier 2	N/A
B-BO-21	Eliminate Ambiguous Terminology with Respect to Cable Classifications	App. B - Bkln	Accept	In-Progress	Tier 2	3/31/2021
B-MO-1	Develop and Issue Lessons Learned Debriefing Document.	pg. 23	Accept	In-Progress	Tier 2	4/1/2021
B-MO-2	Publicize Improvements to System.	App. B - Mnhtn	Accept	Complete	Tier 2	N/A
B-MO-3	Enhance 87N Relay Verification Plan.	App. B - Mnhtn	Accept	In-Progress	Tier 1	3/31/2021
B-MO-4	Implement Primary Injection Testing in Commissioning Procedures.	pg. 17	Accept	Complete	Tier 2	N/A
B-MO-5	Quality Control to Ensure Correct Technical Drawings.	pg. 17	Accept	Complete	Tier 1	12/31/2020
B-MO-6	Implement Existing Cable Assessment Technologies.	pg. 20	Accept	In-Progress	Tier 3	5/31/2021
B-MO-7	Evaluate Emerging Cable Assessment Technologies.	pg. 19	Accept	In-Progress	Tier 3	5/31/2021
B-MO-8	Consider Rejuvenation of Old XLPE Cable Systems.	pg. 20	Modify	In-Progress	Tier 3	3/31/2021
B-MO-9	Modify Feeder Testing Specifications and Eliminate the Use of DC Hipot Tests.	pg. 19	Accept	In-Progress	Tier 3	2024+
B-MO-10	Prevent Connection of Old PILC Cables to New Splices.	pg. 20	Modify	Complete	Tier 3	N/A
B-MO-11	Reassess and Shorten Fault Clearing Times.	pg. 15	Accept	Complete	Tier 1	N/A
B-MO-12	Proactively Search for Hidden Protection System Failures.	pg. 19	Accept	Complete	Tier 1	N/A
B-MO-13	Implement Emerging Technologies to Detect System Abnormalities and Hidden Failures in Real-Time.	pg. 21	Accept	In-Progress	Tier 1	12/31/2021
B-MO-14	Ensure Time Synchronization Across All Systems Rapid Restoration and Situational Awareness.	pg. 15	Accept	Complete	Tier 3	N/A
B-MO-15	Update Rapid Restoration Procedures to Include Remote/ Manual Resetting Guidelines and Traffic Contingency Plans for Reaching Unmanned Substations.	pg. 20	Accept	In-Progress	Tier 1	12/31/2021
B-MO-16	Regularly Test Remote Controls and SCADA Connectivity.	pg. 19	Accept	Complete	Tier 3	N/A
B-MO-17	Enhance Personnel Training Program.	App. B - Mnhtn	Accept	In-Progress	Tier 3	2/28/2021
B-MO-18	Ensure Data Captured and Transmitted by Digital Relays Enable Adequate Situational Awareness.	App. B - Mnhtn	Accept	In-Progress	Tier 1	12/31/2021
B-MO-19	Enhance Transformer Situational Awareness.	pg. 22	Accept	Complete	Tier 2	N/A
B-MO-20	Implement Regular Visual Checks to Ensure Early Identification of Malfunctioning Equipment.	pg. 19	Accept	Complete	Tier 2	N/A
B-MO-21	Verify Transformer Commissioning and Maintenance Procedures Ensure Full Cooling and Capabilities.	App. B - Mnhtn	Accept	Complete	Tier 2	N/A
B-MO-22	Quantify and Track Transformer Loss of Life Through Hot Spot Device Data.	pg. 15	Accept	In-Progress	Tier 2	12/31/2020

Item #	Recommendation	PSC Report Location	Response	Status	Priority	Planned Completion
B-MO-23	Update Arrester Selection Procedure to Ensure Appropriate Voltage and Energy Ratings.	Pg. 15	Accept	Complete	Tier 3	N/A
B-MO-24	Implement Adequate Fault Isolation Mechanisms.	pg. 15	Accept	Complete	Tier 2	N/A
B-MO-25	Eliminate Ambiguous Terminology.	App. B - Mnhtn	Accept	Complete	Tier 1	N/A
B-MO-26	Improve Quality Control Processes Company-Wide.	pg. 17	Accept	In-Progress	Tier 2	9/1/2021
B-MO-27	Improve Proactive Asset Management Company-Wide.	pg. 15	Accept	In-Progress	Tier 3	12/31/2021

Appendix A

Implementation Plans
For Staff Recommendations

Recommendation Number: A-1, B-MO-5

Recommendation A-1: Con Edison should fully discuss in its implementation plan how the design drawing feedback process it developed after this incident will be monitored and self-audited to ensure there are no inconsistencies between Company's and vendor's wiring drawings that could lead to a similar situation as in July 2019.

Recommendation B-MO-5: Quality Control to Ensure Correct Technical Drawings.

Staff Target Completion: 12/31/20

Company Timeframe for Completion: Complete

Company Response: Accept
Company Priority: Tier 1
Status of Recommendation: Complete

Con Edison has processes, guidelines, and instructions in place to verify the consistency between Company and vendor drawings. The processes, guidelines and instructions require that (1) schematic wiring diagrams are on one single drawing, (2) our design staff use a project design checklist as part of project documentation, and (3) the field groups of the Protective System Testing (PST) department report back on any discrepancies to the design staff to complete the feedback loop.

Relevant Protocols/Procedures:
CE DI 2113: Preparation of Schematic Wiring Diagrams
Engineering Operations Manual: CE-0401 Engineering Drawings Management

Recommendation Number: A-2

Recommendation: Con Edison should update its inspection procedures to include a process for inspecting transformers cooling systems on a regular basis to verify that the valves are in the proper operational positions. This should include verification by a supervisor after the valve position is changed for any reason.

Staff Target Completion: 2/28/21

Company Timeframe for Completion: Complete

Company Response: Accept
Company Priority: Tier 2
Status of Recommendation: Complete

Verifying the proper position of valves on transformer cooling systems is needed only when the valves need to be operated (open or closed) at the start, or the completion, of maintenance and construction activities. Otherwise, the position of radiator valves is not altered; they are normally in the open position, except for these occasional work activities. The position of the valves are verified via new administrative controls the Company put in place following the Event. The operation of the valves during maintenance is governed by a SSO Maintenance Instruction. The instruction provides guidance for verification of proper valve status for any maintenance and construction work that involves the operation of valves on Substation Equipment. Included in the instruction is a tag to be applied after valve operation and Valve Status Change tracking sheet to record the status of valve (open/close) before and after valve operation and requires a peer check by a qualified Substation Operations employee to verify that the valves are in the proper operational position before returning equipment to operation.

Relevant Protocols/Procedures:
SSO Maintenance Instruction 0500-0041 - *General Instruction for Operating Valves During Maintenance of Equipment*

Recommendation Number: A-3

Recommendation: Con Edison should seek ways to further expedite the verification of the correct installation and operation of 87N relays that were taken out of service following the incident.

Staff Target Completion: 2/28/21

Company Timeframe for Completion: 3/31/21

Company Response: Accept
Company Priority: Tier 1
Status of Recommendation: In-Progress

Overall, the 87N Relay Verification Plan has made significant progress in verifying and restoring all 211 affected relays. A variety of methods have been, and will continue to be, employed to expedite the process without compromising the quality of the results. In some cases, verification of the 87N circuit requires removing substation bus sections from service in order to perform primary injection testing when other methods are not feasible. The Company has a recurring monthly meeting with the DPS staff to report on progress made, and any challenges for timely completion. At the monthly meetings, the Company provides an "87N Relay Restoration" report documenting the progress reached to date. This report shows that as of the date of this submission, the Company has verified and approved 77% of the 211 87N relay population for restoration. Please refer to the latest report (dated December 3, 2020) for the full details of the number of relays that have been verified, restored to service, and those that are pending.

<u>Key Constraints:</u>
1) Outages required to complete the primary injection testing.
2) Different types of relays (*i.e.*, microprocessor versus electromechanical and solid state) lend themselves to different methods).

Recommendation Number: A-4

Recommendation: Given its decision following the incident to use other methods besides primary injection testing to verify the proper operation of the 87N relays, Con Edison should provide an analysis that validates using either the review of pertinent historical operations, the installation of non-intrusive monitors, or making relay adjustments will be able to verify the correct installation and operation of 87N relays.

Staff Target Completion: 2/28/21

Company Timeframe for Completion: 2/28/21

Company Response: Accept
Company Priority: Tier 1
Status of Recommendation: In-Progress

The methods Con Edison has, and continues to use to verify proper operation of the 87N relays following the incident were developed with great care after considerable evaluation. None were adopted without certitude of their thoroughness. The use of non-intrusive monitors and the capture of fault data in microprocessor relays (with their 87N elements in stand-by, *i.e.*, non-tripping, mode), for example, take advantage of the opportunities presented by actual disturbances on the distribution system to verify the correctness of all wiring and connections to the relays. This is as close to real time response as possible. It exercises all aspects of the circuits from the primary equipment through the instrument transformers, right into the very operating elements of the relays. An analysis of the veracity of all methods that Con Edison used as alternative to primary injection testing will be provided by way of reporting on illustrative examples fault events, accompanied by pertinent oscillography and description of the waveforms captured. This will be completed by February 28, 2021.

Recommendation Number: A-5, B-MO-17

Recommendation A-5: Con Edison should produce a Training Enhancement Report to further improve its overall training program and meet the challenges of the future. The report should address a number of topics including classroom, online and on-the-job training, new technologies and procedures, improvements in company manuals, sessions to review lessons learned, operational drills, and discussions between departments and disciplines to improve communication and coordination. Additionally, the report should implement or improve follow-up testing to validate employee understanding and competence.

Recommendation B-MO-17: Enhance Personnel Training Program

Staff Target Completion: 2/28/21

Company Timeframe for Completion: 2/28/21

Company Response: Accept
Company Priority: Tier 3

Status of Recommendation: In-Progress
Con Edison will compile the recommended Training Enhancement Report by February 28, 2021. The Report will capture the sundry programs and courses that encompass the rigorous training administered to and received by Company personnel involved in the engineering, design, and commissioning of protective relaying systems. Training has always been at the core of the Company's drive to develop and maintain a skilled, world-class workforce. Con Edison's training has evolved and has been refined over the years to adapt to and meet the challenges of new technologies, changing operational environments, lessons learned, and best practices industry wide. This is an on-going process. No Con Edison employee or contractor is ever expected to attempt a task or assignment that he or she has not been trained to undertake and successfully accomplish. The Training Enhancement Report will provide an accounting of programs and courses presently utilized in the engineering, design, and testing departments, thereby providing a broader view for the Company's existing Training Effectiveness Committees to evaluate opportunities for enhancement.

Recommendation Number: A-6

Recommendation: Con Edison should review all technical documents to replace unclear language with clear-cut specific terminology.

Staff Target Completion: 2/28/21

Company Timeframe for Completion: Complete

Company Response: Accept
Company Priority: Tier 2
Status of Recommendation: Complete

Con Edison's design drawing feedback process was overhauled and is laid out in technical document instructions and guidelines with language that clearly outlines requirements and responsibilities. These responsibilities include schematic wiring diagrams on one drawing, drawing verification and the use of an expanded and clarified project design checklist by both Central Engineering and Substation Operations departments. The instructions and guidelines are on a periodic five-year review cycle.

Relevant Protocols/Procedures:
CE DI 2113: Preparation of Schematic Wiring Diagrams
Engineering Operations Manual: CE-0401 Engineering Drawings Management

Recommendation Number: A-7

Recommendation: Con Edison should continue to seek ways to improve system reliability and resiliency, as identified in post event preliminary findings, at just and reasonable costs including consideration of and responding to the Panel's recommendations pertaining to system planning. The Company should provide detailed justifications for any recommendation it does not believe should be implemented.

Staff Target Completion: 2/28/21

Company Timeframe for Completion: Complete

Company Response: Accept
Company Priority: Tier 1
Status of Recommendation: Complete

The Panel recommendations mentioned here in Staff recommendation A-7 are repeated below for reference. The Company has accepted each Panel recommendation and provides our proposed plans to address them in detail in the applicable responses for each item.

- Reassess and augment asset management practices company-wide particularly addressing data monitoring, collection and analyses to enhance maintenance strategies (Panel Recommendation #27).
- Monitor operating conditions of transformers and apply estimation techniques to determine potential loss of life on transformers to assist in determining replacement or refurbishment schedules (Panel Recommendation #22).
- Install additional circuit breakers to individually isolate only faulted equipment while leaving non-faulted equipment in service to protect equipment while also enhancing reliability (Panel Recommendation #24).
- Reassess protective device coordination with the intent of adopting shorter clearing times (Panel Recommendation #11).
- Migrate to relays and recording equipment that are accurately and precisely synchronized system-wide to an absolute time standard (Panel Recommendation #14).
- Update the surge arrestor selection process for both new and existing installation with an emphasis on protecting equipment in terms of voltage ratings and energy ratings (Panel Recommendation #23).

The principle themes of enhanced monitoring, effective data analysis, precise and rapid isolation of faults, universal timekeeping, and protection against electrical surges have been longstanding themes in the Company's pursuit of operational excellence. They have driven 1) studies resulting in the optimum application of equipment, 2) the on-going refinement of practices and procedures, and 3) the continuing upgrading of monitoring, isolating, and protection systems to provide enhanced visibility of system conditions and swift response to disturbances.

Recommendation Number: A-8

Recommendation: Con Edison should improve its system upgrade quality control processes with an emphasis on investigating and adopting industry standards, in furtherance of the initiative the Company commenced following this incident.

Staff Target Completion: 2/28/21

Company Timeframe for Completion: Complete

Company Response: Accept
Company Priority: Tier 3
Status of Recommendation: Complete

Con Edison has played an active role in the development of industry standards from the very inception of the industry. This has continued unabated to the present day. Company engineers and operators participate in technical committees and working groups of the Northeast Power Coordinating Council (NPCC), the North American Electric Reliability Corporation (NERC), and the Institute of Electrical and Electronic Engineers (IEEE), all three of which have issued and maintain a significant body of standards related to the planning, design, and operation of power systems and the components thereof. In fact, Con Edison personnel have and continue to populate standards development committees. Furthermore, with respect to the bulk power system, Con Edison is an active corporate member of the North American Transmission Forum (NATF). Through this venue, the Company's technical staff stays abreast of interpretation of, and compliance with, standards industry-wide. Methods of adoption of standards requirements into everyday work practices are among the most frequently discussed topics in this forum.

Recommendation Number: A-9

Recommendation: Con Edison should verify that all new, retrofitted or out-of-service for maintenance facilities with 87N relays will be tested and validated using primary injection testing before being placed into service.

Staff Target Completion: 2/28/21

Company Timeframe for Completion: Complete

Company Response: Accept
Company Priority: Tier 1
Status of Recommendation: Complete

The Company has verified that all new, retrofitted or out-of-service for maintenance facilities with 87N relays will be tested and validated using primary injection testing before being placed into service. Accordingly, as part of commissioning activities associated with new or retrofitted protection schemes involving 87N circuits, Con Edison will perform primary injection testing before placing the equipment into service provided there are no other system conditions that would prevent the injection testing. Equipment out of service for maintenance activities which have had the 87N circuitry previously verified through fault verification or injection testing will not be retested.

Recommendation Number: A-10

Recommendation: Con Edison should develop a program to upgrade and enhance its testing and inspection protocols and procedures

Staff Target Completion: 2/28/21

Company Timeframe for Completion: Complete

Company Response: Accept
Company Priority: Tier 3
Status of Recommendation: Complete

As it pertains to testing and inspection protocols and procedures associated with relay protection systems, Con Edison has a program which uses a document management system to manage procedure lifecycle. Con Edison reviews procedures on a five-year cycle in addition to revising procedures on an as needed basis. In addition to its existing procedures and creation of new procedures internally, Con Edison regularly participates in peer reviews and seminars with other utilities to learn best practices and incorporate relevant items into its procedures.

Recommendation Number: A-11

Recommendation: Con Edison should develop improvements in its contingency plans and procedures and develop improvements in its overall operation and maintenance procedures for all of its power system equipment in order to achieve reliable performance and to prevent equipment damage.

Staff Target Completion: 2/28/21

Company Timeframe for Completion: Complete

Company Response: Accept
Company Priority: Tier 3
Status of Recommendation: Complete

Con Edison participates in utility industry exercises in which participants are subjected to large scale events and drill on their ability to enact their operating procedures and response plans. Pertinent events the Company participates in include:

- The NERC Gridex Exercise, a distributed play grid exercise that allows participants to engage remotely and simulates a cyber and physical attack on the North American electric grid and other critical infrastructure.
- The Defense Advanced Research Projects Agency (DARPA) Rapid Attack Detection Isolation and Characterization Systems (RADICS) program which has a goal to enable black start recovery of the power grid amidst a cyber-attack on the U.S. energy sector's critical infrastructure. RADICS research is developing technology that cybersecurity personnel, power engineers, and first responders can utilize to accelerate restoration of cyber-impacted electrical systems.
- Con Edison also participates in North American Transmission Forum (NATF) practice groups to share experiences and learn about industry related best practices.

After each of the above three activities debriefing sessions are held. Procedures and practices are modified where opportunities are presented through lessons learned from the activities. See Manhattan Panel Recommendations responses to #6, #8, #10 and #15 for additional responses.

Recommendation Number: A-12

Recommendation: Con Edison should improve its overall System Monitoring procedures to enhance situational awareness, particularly with respect to critical equipment such as transformers and should improve the clarity of protocols for responding to system abnormalities.

Staff Target Completion: 2/28/21

Company Timeframe for Completion: 12/31/21

Company Response: Accept
Company Priority: Tier 3

Status of Recommendation: In-Progress
Alarms signaling abnormal conditions on critical equipment are essential to situational awareness. Con Edison has an alarm response procedure for every substation that provides a description of the alarms associated with major equipment and internal systems (e.g., transformers, circuit breakers, protective relaying, and emergency diesel generators) with guidance and instructions to operators on how to response when an alarm signals an abnormal condition. For transformers in particular, a typical substation's procedure delineates 29 alarms addressing a variety of parameters including temperature, oil levels, pressure, regulation, etc.

Con Edison is an industry leader in their implementation of On-line Dissolved Gas in Oil Analysis (DGOA) monitors, which are currently installed on approximately 70 percent of the Company's power transformer fleet. Completion of the project to install monitors on all transformers will be completed by end of 2021. The DGOA monitors provide continuous monitoring of the dielectric fluid to detect dissolved gas in the fluid, which provides early detection of transformer insipient faults. Alarms are provided to alert Operating personnel of any immediate abnormal conditions. The long-term trends of the gas in the transformers are also monitored to identify abnormal trends which may require attention.

Engineering Specification CE-ES-1044, "Engineering Instructions Following Operation of Temperature Alarms on Mineral Oil and Synthetic Ester Filled Power Transformers," provides detailed instructions on how to address temperature alarms on transformers. Con Edison is initiating a multi-year program to enhance the temperature monitoring of transformers and make it accessible remotely to operating personnel in the Energy Control Center. A description of the program including its general scope will be prepared by February 28, 2021.

On May 16, 2013, the Federal Energy Regulatory Commission (FERC) issued Order No. 779, directing the North American Electric Reliability Corporation (NERC) to develop reliability standards to mitigate the effects of Geomagnetic Disturbances (GMD) on the Bulk-Power System. NERC developed two standards in response to this order.

- EOP-010 – Geomagnetic Disturbance Operations
- TPL-007 – Transmission System Planned Performance for Geomagnetic Disturbance Events

Con Edison undertook a study to determine any potential vulnerabilities to GMDs on its system. The study results indicated eleven transformers on the Con Edison system may be negatively impacted by a severe GMD event. All eleven had a magnetic core design that is no longer being used on new transformers that the Company procures. Con Edison has replaced two of these transformers and is in the process of replacing a third. Nonetheless, in response to the study results, the Company installed Geomagnetic Induced Currents (GIC) monitoring at fifteen locations including these eleven locations and on four additional transformers that were deemed likely to experience higher GICs even though those transformers are designed to withstand them. The monitoring devices are microprocessor-based and measure the transformer temperature and the harmonics generated due to saturation of their magnetic cores. These devices also measure the GIC current entering or exiting the transformer through the grounded neutral and provide three settable alarm levels as an output. These alarms, along with measured data such as neutral GIC, transformer temperature, and harmonic levels, are sent through the Remote Terminal Unit (RTU) to the Energy Control Center (ECC) for use by the System Operators. The fifteen transformer locations span Con Edison's service territory from north to south and therefore, even though they comprise only a small fraction of the transformer fleet, are representative of conditions on a geographically wide scale.

Recommendation Number: A-13, A-30, A-31, B-MO-1

Recommendation A-13: Preliminary findings led Con Edison to develop an initial listing of lessons learned, Con Edison should now produce a more comprehensive Lessons Learned Report following the occurrence of any significant problem or failures it encounters, and widely disseminate the report to relevant employees for discussions and training.

Recommendation A-30: Con Edison should develop a formal after action process for the Operations and Communication organizations. The Company should provide training for supervisory personnel within the Operations organizations to lead after action meetings following unusual and/or major system events.

Recommendation A-31: Con Edison should revise the Corporate Response to Incidents and Emergencies procedure to specify threshold(s) at which the after action process will be performed on a smaller scale (organization by organization) rather than Company-wide.

Recommendation B-MO-1: Develop and Issue Lessons Learned Debriefing Document

Staff Target Completion: 12/31/20

Company Timeframe for Completion: 4/1/21

Company Response: Modify
Company Priority: Tier 2
Status of Recommendation: In-Progress

Con Edison participates in working groups at the Federal, State, and local level where best practices are discussed for after-action reviews, lessons learned and continuous improvement programs. Organizations include FEMA, EEI, NAMAG, and AEIC. For transmission events, the Company participates in NATF and NERC lessons learned and evaluation processes.

Con Edison currently conducts an after-action review after a Serious or Full-Scale Response. Emergency Preparedness manages the Company-wide after-action review process. As appropriate, all Company organizations conduct or participate. Corporate Instruction 260-4 details this process. The Company conducted an after-action review for the Manhattan and Brooklyn outages.

Company organizations also conduct lessons learned following significant events. The Company prepared after-action reports for the Manhattan and Brooklyn outages and included lessons learned in both. Con Edison's Electric Operations Organization conducted an after-action review following the Brooklyn outages.

The Company will review and incorporate the Department's recommendations into current plans, processes, and procedures. The Company will also review and develop thresholds for smaller

scale events at the organizational level (*see recommendation A-31*). Finally, the Company will review and develop processes for disseminating lessons learned to employees for discussions and training (*see recommendation A-13*) and develop a formal lessons learned debriefing document (*see recommendation B-MO-1)*. Con Edison plans to complete this by April 1, 2021.

Work Plan:

Con Edison will implement the recommendations as described to develop a formal after-action review process. The modification is that Corporate Instruction 260-4 is for responding to emergencies and not for conducting after action reviews or lessons learned. The Company will develop a separate procedure for conducting after action reviews or lessons learned.

Recommendation Number: A-14

Recommendation: Con Edison should develop a plan by December 31, 2020 to expand the use of 27kV automatic interrupter switches in the Flatbush network and throughout its territory based on the success of interrupter prototypes that the Company plans to install on Feeder 4B06.

Staff Target Completion: 12/31/20

Company Timeframe for Completion: Complete

Company Response: Accept
Company Priority: Tier 2

Status of Recommendation: Complete
Con Edison has an existing network resiliency program in place that was approved in its last rate proceeding to target the installation of approximately 16 interrupter switches per year during the 2020-2022 period. Manufacturing issues, the COVID-19 pandemic, and additional development delays have slowed the initial implementation of this program. However, Con Edison has completed the first four installations (two on 27kV and two on 13kV) of the newly developed fault interrupting switches in 2020. In addition, Con Edison has scheduled installation of eight interrupters pending some manufacturer design enhancements for 2021. In line with the funding approved in the last rate case, Con Edison plans to install an additional 64 interrupters consistent with our reliability strategy over the next four years. The Company will evaluate the need to request additional funding in our next rate filing to expedite installations in later years.

Work Plan:
The Company plans to install 16 units/year in 2021-2024.

Recommendation Number: A-15

Recommendation: Con Edison should seek to expand the installation of Kyle switches on 4kV feeders, where operationally feasible, in other 4kV grids throughout the Company's territory to limit impact of distribution feeder faults.

Staff Target Completion: 2/28/21

Company Timeframe for Completion: 6/1/2021

Company Response: Accept
Company Priority: Tier 2

Status of Recommendation: In-Progress
Con Edison has Kyle/STS tie switches on all 4kV locations except for five, which are pending installation and/or commissioning. Four locations in Brooklyn/Queens have switches installed but require commissioning. Con Edison plans to commission these by June 1, 2021. One location in Staten Island requires both installation and commissioning, Con Edison plans to complete this by June 1, 2021.

Recommendation Number: A-16, A-17

Recommendation A-16: Considering that Kyle switches have been installed on all feeders in the Flatbush 4kV grid and that enhanced SCADA control functions are available to operators, Con Edison should operate the Flatbush 4kV grid and other 4kV grids that are supplied by a network system in radial mode when appropriate.

Recommendation A-17: Company Specification EO-4095 should reflect the use of enhanced SCADA functions and the radial operations of 4kV grids

Staff Target Completion: 12/31/20

Company Timeframe for Completion: Complete

Company Response: Accept
Company Priority: Tier 1

Status of Recommendation: Complete
Con Edison updated EO-4095, to advise its operators to consider operating the seven 4kV grids supplied by networks in a temporary radial configuration when the projected loads are greater than 86° TV and/or the system is in third or higher contingency, and to operate in this configuration when appropriate effective June 1, 2020. Con Edison also setup enhanced SCADA (XA21) systems in June 2020 to allow for single command execution to configure these seven 4kV grids in radial mode. (The seven grids in question are the Southeast Bronx, Flatbush, Richmond Hill, Glen Oaks, Jamaica, Flushing, & Rego Park.)

Recommendation Number: A-18

Recommendation: Con Edison should replace all remaining Westinghouse type CM electromechanical phase balance relays with microprocessor relays as soon as operationally feasible to enhance the means of detecting and clearing faults at 4kV unit substations throughout the Company's territory.

Staff Target Completion: 12/31/20

Company Timeframe for Completion: 6/1/21

Company Response: Accept

Company Priority: Tier 1

Status of Recommendation: In-Progress

Con Edison replaced all Westinghouse type CM electromechanical phase relays ("CM Relays") with microprocessor relays prior to the summer of 2020 at the Bensonhurst No. 2 substation in Brooklyn. This involved fifteen 27 kV feeders.

Con Edison conducted a system-wide review to identify other locations where type CM relays may be susceptible to trip for imbalances in 4 kV systems, particularly during high load periods, for which they are not intended to trip. The Company found eleven feeders spread out across five area substations in Westchester County fell within this category, all at the 13 kV voltage level. Of these, Con Edison replaced the CM relays on five with microprocessor relays. Con Edison will replace the remaining six pre-summer 2021.

Recommendation Number: A-19

Recommendation: By December 31, 2020, Con Edison should establish a workplan to apply investment actions identified during the Flatbush event (e.g., replacement of Paper Insulated Lead Cable, vintage XLPE cable, Raychem 3W-1W joints) to networks associated with 4kV grid systems throughout the Company's territory.

Staff Target Completion: 12/31/20

Company Timeframe for Completion: 12/31/20

Company Response: Accept

Company Priority: Tier 2

Status of Recommendation: In-Progress

Con Edison is developing a work plan consistent with our Network Reliability Index ("NRI") reliability model to continue to enhance the reliability of our networks including those with 4kV grids. We expect to complete and submit this plan to the Department by December 31, 2020.

In addition, from 2021 to 2022 the Company plans to improve the reliability of networks associated with 4kV grids systems through the replacement of Paper Insulated Lead Cable (PILC) and Vintage cross linked polyethylene ("XLP") underground sections, PILC and Vintage XLP aerial spans, aluminum aerial cable, and installation of 27kV fault interrupting VISO switches. (These interrupter switches will prevent the feeder from automatically opening out of service when a fault occurs downstream from the interrupter.)

Con Edison is also evaluating enhancements to higher quartile NRI networks in line with work performed in Flatbush. Con Edison has incorporated this reliability guidance into EO-2152, which supports the Company's strategy as standard process across the Con Edison system.

Recommendation Number: A-20

Recommendation: During expected heat events, Con Edison should save all cable and joint failure specimens so that each can be studied and used in internal Post Event Analyses.

Staff Target Completion: 2/28/21

Company Timeframe for Completion: 1/31/21

Company Response: Accept

Company Priority: Tier 2

Status of Recommendation: In-Progress
Con Edison is issuing an Engineering Bulletin to implement this recommendation. For heat events with a forecasted Temperature Variable of 82 deg. or higher, all cable and joint failure specimens shall be collected.

Con Edison will issue the Bulletin by January 31, 2021.

Recommendation Number: A-21

Recommendation: Con Edison should establish more detailed waiver criteria in the Company's Hipot testing specification (EO-4019) to ensure that feeders are assessed and tested appropriately during an outage event.

Staff Target Completion: 12/31/20

Company Timeframe for Completion: Complete

Company Response: Accept

Company Priority: Tier 3

Status of Recommendation: Complete

While EO-4019 Revision 35 did provide detailed waiver criteria for Hipots, the Company has made additional refinements regarding the appropriate use of Hipots during forced outages in the most recent version of EO-4019, Revision 36. These refinements include:

- Recommendation to waive a Hipot when multiple phases are damaged, found in one location, and can be attributed to a detected second fault. Please refer to Section 6.5
- Advice on when to perform a Hipot on the isolated portion of a feeder (section on the load side of a manual disconnect switch) that has been isolated for processing. Please refer to Section 6.9.

Recommendation Number: A-22

Recommendation: Con Edison should determine whether the time frame to proactively Hipot test primary distribution network feeders (currently over three years) is appropriate and strengthen the Company's testing procedure accordingly to ensure all feeders are tested adequately.

Staff Target Completion: 12/31/20

Company Timeframe for Completion: 6/1/21

Company Response: Accept

Company Priority: Tier 3

Status of Recommendation: In-Progress

The Company's present policy, outlined in Specification EO-4019, outlines that feeders should be Hipot tested after Open Auto's and other types of outages if certain requirements are met. In addition, the specification states that for networks where the NRI is greater than 0.2 (25 of the 64 networks) a Hipot test should be carried out following an outage if that feeder has not received a Hipot tests in the previous three calendar years.

Con Edison will commission a study whether this three-calendar year requirement is appropriate. The study will determine if additional Hipots are beneficial to the system and, in particular, whether additional Hipots would be effective and efficient at identifying components that otherwise would fail during periods of elevated loading/temperature. The Company will compare the effectiveness of the Hipot program (and the associated failures/repairs it generates) against a program that specifically targets the removal of a similar number of components that are known to have a higher rate of failure during periods of elevated loading/temperature.

Con Edison plans to engage an external consultant to assist in this study and to update its Hipot testing specification accordingly based on the outcome of this study. Con Edison estimates a completion date of June 1, 2021.

Recommendation Number: A-23

Recommendation: Con Edison should revise EO-4095 Distribution System Operation Under Contingency and/or Elevated Load Conditions, or create a new procedure entirely, to provide detailed guidance for the preparations, decision factors, responsibility, required communications, and operator step-by-step direction to perform load shedding or de-energization of the 4kV grids.

Staff Target Completion: 2/28/21

Company Timeframe for Completion: Complete

Company Response: Accept

Company Priority: Tier 2

Status of Recommendation: Complete

Con Edison revised EO-4095 (effective as of June 1st, 2020) to include the required communication and decision factors associated with de-energizing a 4kV grid. The conditions to consider in a decision to de-energize a 4kV grid include:

- Multiple and/or increasing number of primary network supplies or unit stations cascading out of service.
- Primary 4kV feeders and/or feeder sections overload increasing above their emergency reading and accumulating as load shifts from out of service unit stations to in-service unit stations.
- Inability to support supply voltage.
- All viable load management options, including radialization of the 4kV grid, load management programs, customer appeals, etc. have been exhausted or cannot be achieved in time.

Step-by-step directions for de-energization of the 4kV grid, including the associated preparations and responsibilities, is covered under EOP-5045, which was also issued effective June 1st, 2020.

Recommendation Number: A-24, A-25, A-29

Recommendation A-24: Given 4kV grid load shed events do not occur on a routine basis and Con Edison is currently lacking any procedure or written guidance for restoration, Con Edison should develop a written guidance on how to restore a 4kV grid efficiently and effectively.

Recommendation A-25: Con Edison should develop a process to better evaluate and implement measures to restore customers served by 4kV feeders with no equipment or overload issues in the Flatbush 4kV grid and other 4kV grids that are supplied by a network system. These measures could include the use of mobile electric generators and other distributed energy resource technologies.

Recommendation A-29: Con Edison should establish guidelines to improve its use of mobile electric generators for the Flatbush 4kV grid and other 4kV grids with similar system configurations to facilitate timely restoration of customers after an outage event.

Staff Target Completion: 2/28/21

Company Timeframe for Completion: 4/30/21

Company Response: Accept

Company Priority: Tier 1

Status of Recommendation: In-Progress

While the Company did not have specific written procedures for restoration of 4kV grids, the Company has historically maintained specific load shedding procedures and used its Operator and Engineering personnel's training and knowledge in these areas, which is extensive, to determine the optimal process for restoration following an event. Restoration is often a very dynamic process which is situational in nature, not lending itself well to a static procedural approach.[8]

Nevertheless, the Company recognizes there are aspects of the restoration process that could be spelled out procedurally and that our load shedding procedures could include discussion on restoration processes that will occur subsequent to a load shedding event. As such, Con Edison will revise existing procedures EO-4095 (conditions for emergency load shed) and EOP-5045 (4KV load shedding by Regional control centers using USA/XA21/CDMS) to provide guidance and technical restoration responsibilities, procedures, generator deployment strategies, and customer and feeder prioritization for the 4kV grids.

[8] The Company also notes that it disagrees with the Report's review of two specific generators alleging that they could have been deployed more quickly.

Recommendation Number: A-26

Recommendation: Con Edison should clarify its procedures to transition to a condition red when load shedding occurs on a 4kV grid.

Staff Target Completion: 12/31/20

Company Timeframe for Completion: Complete

Company Response: Accept

Company Priority: Tier 1

Status of Recommendation: Complete
Con Edison updated the Condition Red definition in procedure SO 05-12-31 to clarify shedding of a 4kV grid will transition us to a Condition Red.

Con Edison procedure SO 05-12-31 currently states: Condition Red – A Condition Red shall be declared when

- emergency overloads exist,
- part of the system is in voltage reduction, except as noted in section 3.9.2.3 and 3.9.2.4 above
- load shedding has been initiated
- an instantaneous loss of 15,000 or more customers has occurred due to an event (an accumulation of customer outages due to weather events is excluded)
- a substation, network or 4kV grid has been shut down.

Recommendation Number: A-27

Recommendation: Con Edison should change its voltage restoration algorithm to restore voltages based on actual conditions rather than solely the N-1 conditions required by the current algorithm.

Staff Target Completion: 2/28/21

Company Timeframe for Completion: 4/1/21

Company Response: Accept

Company Priority: Tier 1

Status of Recommendation: In-Progress

Con Edison will enhance its voltage restoration decision aid tool described in EOP-5022, which advises operators when system conditions may permit voltage restoration to provide its Operating and Engineering personnel the best guidance information possible. The aim of the updated algorithm will be to better reflect actual system conditions and the risks associated with restoring voltage. Con Edison uses variables such as: analysis of next worst contingency, system peak, and NRI to make a determination. The Company notes that its voltage restoration algorithm is meant as a guideline tool to aid Operating and Engineering personnel, who have extensive training in and knowledge of restoration activities, during decision making in the restoration process. It will not and cannot cover the specifics and dynamic nature of a grid restoration.

The subject decision aid tool will be enhanced by April 1, 2021.

Recommendation Number: A-28

Recommendation: Con Edison should revise the Distribution System Condition Yellow system operation procedure to require the three-hour status updates from the Feeder Boss be written records regardless of whether or not verbal updates are provided.

Staff Target Completion: 12/31/20

Company Timeframe for Completion: Complete

Company Response: Accept

Company Priority: Tier 1

Status of Recommendation: Complete

Con Edison has revised SO5-3 Distribution Condition Yellow to require four-hour status updates (revised from three-hour updates to align with Distribution Engineering's Situation Room call schedule) from the Feeder Boss be written records (in e-mail form) regardless of whether or not verbal updates are provided. Additionally, Con Edison has clarified that the four-hour status updates are provided to System Operation leadership personnel.

Recommendation Number: A-32

Recommendation: Con Edison should revise Corporate Instruction 810-2 and Emergency Operations Procedure 5023 to provide clarity to all actions to be taken by the Company when the ONIM is triggered and include that such actions will not be discretionary.

Staff Target Completion: 12/31/20

Company Timeframe for Completion: 2/28/21

Company Response: Modify

Company Priority: Tier 3

Status of Recommendation: In-Progress

ONIM requirements are not discretionary and are specified in the Commission's 2002 Order in Case 00-M-0095. In its investigation, the Department expressed concern about the application of the ONIM requirements for conducting press briefings. Following the July 2019 outages, Con Edison made changes to Corporate Instruction 810-2 and committed to holding press briefings more often than required by the ONIM. The Company included the changes to CI 810-2 in its 2020 ERP and those changes were approved by the Commission in May 2020. As a result, no further changes are required to CI 810-2 to meet the requirements of this recommendation.

Con Edison included the Commission approved ONIM in its ERP. The Company will review all other communication activities required by the ONIM and will revise the ERP to provide clarity, if necessary, to those sections. After those updates to the ERP are completed, the Company will retire EOP 5023.

Work Plan:
The Company will review the content of the ONIM, EOP-5023, and the current Electric ERP to conduct a gap analysis and identify opportunities to further clarify, within the ERP, roles and responsibilities for required ONIM actions.

Once approved, modifications to the ERP will be reviewed, informally, with Staff. The modifications will then be formally added to the Electric ERP during the next-scheduled filing.

Once the updated Electric ERP is filed, Distribution Engineering will retire EOP-5023.

Recommendation: A-33

Recommendation: Con Edison should develop a comprehensive and detailed communications procedure that requires Con Edison to notify customers and the public prior to and during load shedding, as well as Condition Yellow and/or Red events, in the affected areas within its service territory. The process should be included in the Company's ERP. The process will provide, at a minimum:

- Specific examples of system conditions that would warrant a load shedding event, e.g., prevent loss of an entire grid or network, the span of load shed may enlarge depending on worsening system conditions, etc.;
- Specifics on how the Company will educate customers and the public about load shedding activities when advanced notice is and is not available (*e.g.*, incorporating into voltage reduction messaging, automatic notifications, etc.).

Staff Target Completion: 12/31/20

Company Timeframe for Completion: Complete

Company Response: Modify
Company Status: Tier 2
Status of Recommendation: Complete

Con Edison has procedures in the ERP, including Guidelines for Communication with the Public During Load Management Power, that call for communications in advance of load shedding events, when possible and practicable, and as quickly as possible during events.

Voltage reduction is a tool commonly used by Con Edison and other utilities to maintain service, particularly during heat waves. Therefore, Con Edison does not issue press releases or other communications when voltage is reduced *and there is no call for customer conservation*, though this is a Condition Yellow event. When the voltage reduction *is* accompanied by a call for customer conservation – which is also a Condition Yellow event – Con Edison *does* issue a press release explaining that voltage has been reduced to help ensure reliability. Voltage reduction accompanied by a call for customer conservation also does not indicate that large outages are imminent, and thus we avoid language that might indicate otherwise. Con Edison does, however, include a description of the conditions that exist. The Company does not use the term "Condition Yellow" in these releases because we avoid technical utility terms that may not be understandable to members of the press or public.

Placing language in these press releases indicating that load shedding or significant outages are imminent would provide customers with inaccurate information. Mentioning possible large-scale outages would give the media, customers, and other stakeholders an unnecessary and inaccurate impression that large-scale outages are imminent.

Load shedding is a rarely used but necessary emergency measure to prevent cascading equipment failures, potential equipment damage, and longer and/or wider outages. Con Edison has a press release template for load shedding events. It is unlikely that Con Edison would be able to notify customers in advance of this action, given the necessarily short amount of time between the decision to shed load and shedding load. Our Guidelines recognize this in section 4.0-4.1: "When a Communication Organization has received advance notice of an outage, its responsibility is to provide 'initial communications' or 'initial notification' to external organizations including providing advance notice of the outage *when it is practical, particularly in view of time constraints."*

For reference:
3.5 Condition Yellow
The next contingency (excluding breaker failure) either will result in an outage to more than 15,000 customers or will result in some equipment being loaded above emergency ratings, and methods to relieve the overloads will impact the general public through customer appeals to reduce load or load shedding or, there is a need to implement voltage reduction to relieve voltage and the thermal stresses on the primary distribution feeders in a network/load area that is at or over design limit to prevent feeder failures from cascading.

3.6 Condition Red
Some equipment is loaded above emergency ratings or, part of the system, for reasons other than defined in Section 2.5, is in voltage reduction due to problems on the Con Edison system or, more than 15,000 customers have been interrupted due to one event or, voltage reduction is implemented due to bulk power generation or substations above design limits.

Recommendation Number: 34

Recommendation: Con Edison should develop a process to issue press releases and/or company statements as soon as practicable before or immediately following a significant load shedding event or other notable events that warrant detailed communications. Press releases should contain pertinent and detailed information at the beginning of each release, e.g., cause and extent of outages, speak to customers who have not been restored, etc. The process should be included in the Company's ERP.

Staff Target Completion: 2/28/21

Company Timeframe for Completion: 2/28/21

Company Response: Accept
Company Priority: Tier 2
Status of Recommendation: In-Progress

Con Edison currently has a press release template for load shedding events. Con Edison will revise Corporate Instruction 810-2 to make specific note of the Company's use of press releases for load shedding situations, including cause and ETR information to the extent available. CI 810 is included in the Company's Commission approved ERP.

Con Edison will issue press releases and/or statements, based on information that is available and confirmed, as soon as practicable before and during load shedding events. The press releases/statements will confirm the load shed and include available information regarding the reasons for the load shed (such as failing equipment due to heat), the number of customers affected by the load shed and any other outages in the area, ETR information and revisions as they become available, and the number of customers restored. In some instances, it may be more efficient to distribute a short, concise statement, instead of a press release, because information is still developing. The Company's statements are distributed to the press, posted on our website and on social media channels. These are the same channels Con Edison uses for press releases.

Recommendation Number: 35

Recommendation: Con Edison should develop more accurate and depictive press release templates that provide timely, clear and thorough details to customers regarding actions the Company has, is, or will be taking in response to adverse system conditions, e.g., load shedding, de-energization, flooding, etc. The templates should be included in the Company's ERP.

Staff Target Completion: 12/31/20

Company Timeframe for Completion: 2/28/21

Company Response: Accept
Company Priority: Tier 2
Status of Recommendation: In Progress

Con Edison regularly reviews its press release templates and makes appropriate changes and additions to those templates. The Company will continue that practice. Con Edison already has a press release template for load shedding/de-energization events. Following the 2019 Manhattan and Brooklyn events, the company added a voltage reduction template for each of its 64 New York City networks, identifying the networks by their boundaries and the neighborhoods they encompass. The company will add a template for flooding and other events, as necessary.

To speed the sharing of important information with Con Edison's customers via the media and meet regulatory requirements, Con Edison maintains a library of more than 100 template press releases in the following categories: Business Continuity, Cyber Intrusions, Gas Load Shedding, Hurricanes/Storms, Power Restoration, Summer Heat, Voltage Reduction, and Winter Storms. The Company will include these templates in its ERP in its next scheduled filing.

Recommendation Number: 36

Recommendation: Con Edison should develop a comprehensive, consistent and detailed process for conducting press conferences and/or briefings during outage events. The process should include, but not be limited to, a clear decision-making process and threshold requirements to be used by the Company. The process should be included in the Company's ERP.

Staff Target Completion: 2/28/21

Company Timeframe for Completion: 2/28/21

Company Response: Accepted
Company Priority: Tier 3
Status of Recommendation: Procedures in place, slight modification to 810-2 (virtual briefings) pending

Con Edison has a comprehensive, consistent, and detailed process for conducting press conferences and/or briefings during outage events. Con Edison included that process in its Commission approved 2020 ERP. The Company conducts press conferences/briefings based on the number and duration of outages: i.e. 40,000 customers out of service for two hours and 70,000 customers out of service for one hour. These triggers are based on Company ONIM requirements and are included in Corporate Instruction 810-2 (please see the response to Recommendation 32).

As detailed in CI 810-2, during press briefings the Company provides specific information such as the cause of the outage, the geographic area affected, the estimated number of customers impacted, and an estimated time of restoration, if known. The press releases also include safety information. The company will update 810-2 to add that it can hold briefings virtually (such as via Zoom or other medium, as the company did following Tropical Storm Isaias). Adding virtual press conferences is in keeping with best practices during a health emergency such as Covid.

The director of Media Relations serves as the Corporate Spokesperson unless the Senior Vice President, Corporate Affairs, selects a subject-matter expert from an operating department or designates a Corporate officer to serve as the Corporate Spokesperson.

The Media Relations staff sends an advisory to media outlets in advance of the briefing. The advisory includes the time of the briefing and the access information (such as the location, call-in information or Zoom link).

The briefing provides information on the event, outages, areas with the greatest impact, other critical service-related information, the company's response, how to reach the company, safety tips, and ETR information, if available. Media Relations follows up by responding to any additional press inquiries.

Recommendation Number: A-37

Recommendation: Con Edison should develop a detailed process for promptly communicating outage causes and specific ETR information, reasons for and timely notification of ETR revisions to its customers. This process should be included in the Company's ERP.

Staff Target Completion: 12/31/20

Company Timeframe for Completion: 2/28/21

Company Response: Accept
Company Priority: Tier 2

Status of Recommendation: In-Progress

The Company accepts the recommendation for development of a process for promptly communicating outage causes and specific ETR information and revisions to customers. As the Company indicated in its response to Recommendation 34, updates will be made to procedure 810-2 to make specific note of the Company's use of press releases for load shedding situations, including cause and ETR information, if available.

In addition, as described in the Company's most recent ERP filing on December 15, 2020, the Company has developed a process to notify customers in the area prior to (when possible), during, and upon the completion of an imposed load shed action via text message and automated call. These messages include notifying customers of the cause (as available), as well as the reason for the Company implementation of a load shed action.

These communications will continue to direct customers to use the outage map where they can find the latest ETR and cause information for a specific outage, once available. The Company will prompt customers to register their outage to receive text or automatic call updated which includes specific ETR information for their premise, and revisions and cause information as available in communications and on the outage map.

The Company will make any necessary revisions to the ERP to reflect these processes.

Recommendation Number: A-38

Recommendation: Con Edison should develop a process and related materials that provides targeted communications to customers that remain out of service as restoration efforts continue until all customers have been restored. This should include advanced notice to customers whose ETRs will not be met along with a clear explanation of why ETRs are not being met. This process should be included in the Company's ERP.

Staff Target Completion: 12/31/20

Company Timeframe for Completion: Complete

Company Response: Modify
Company Priority: Tier 2

Status of Recommendation: Complete

The Company agrees with the intent of the recommendation to develop a process that provides targeted communications to customers remaining out of service as restoration efforts continue and until all customers have been restored, but modifies the recommendation to reflect situations where advance notice to customers whose ETRs will not be met, or providing the associated reason, is not practical

As noted in the Company's response to Recommendation 37, to provide targeted communications to impacted customers and keep them informed as restoration continues, the Company has developed a process to notify customers in the area prior to (when possible), during, and upon the completion of an imposed load shed action via text message and automated call. These messages include notifying customers of the cause (as available) as well as the reason for the Company implementation of a load shed action.

These communications will direct customers to use the outage map where they can find the latest ETR and cause information for a specific outage, once available. The Company will prompt customers to register their outage to receive text or automatic call updates which includes specific ETR information for their premise, the reason for the outage, and revisions as available in communications and on the outage map. The Company will provide these updates for each customer at least daily should the event last for more than a day.

Customers who register their outage will receive updates if their ETR changes, however the Company will not be able to provide advanced notice of an ETR that will not be met in all cases. For example, in large events with complex restorations, when an ETR can be completed within one hour of the ETR expiration, the Company believes the sending a revised ETR would cause further delays if the crew doing the restoration had to pause work to update the ETR when their primary focus should be completing the restoration work.

ETRs can be updated for a number of reasons, including a repair scope change, defective equipment, or an embedded outage. Customer research has shown that the most desired information for a customer during an outage is timely issuance and updating of ETRs.

Identifying and communicating the specific reason for a change in ETRs would require a departure from the Company's use of pre-scripted text and automated call messages to communicate ETR information, which supports the speed of information which customers' desire and does not provide information that is relevant to customers.

The Company made revisions to its ERP filed on December 15, 2020 to reflect these communication practices.

Recommendation Number: A-39

Recommendation: To resolve the omission identified by Staff, in its internal procedures, Con Edison should develop a comprehensive and detailed process to notify federal, state, and local government officials as well as community organizations when sizable outages occur in a focused area. The process should be included in the Company's Communications with the Public During Load Management Power Outage procedure as well as in its ERP. The procedure should include, at a minimum, the following:

- A comprehensive contact list of federal, state, and local elected and government officials, and community organizations for each of Con Edison's Regional Corporate Affairs Departments and Westchester County, to be used for communicating targeted emergency and / or outage information to local elected and government officials before and during significant outage events This list should be reviewed and updated semi-annually each year;
- Specific information to be shared with government and elected officials before, during and after an outage event, how that information will be shared, and the minimum frequencies of communications; and,
- A dedicated electronic system to be used for memorializing and tracking all communications, e.g., emails, telephone calls, made to and received by federal, state, and local government officials as well as community organizations, that memorializes all relevant details regarding such communications.

Staff Target Completion: 12/31/20

Company Timeframe for Completion: 12/31/20

Company Response: Modify
Company Priority: Tier 2
Status of Recommendation: In-Progress

Con Edison has detailed procedures for communications with elected officials during an outage in its Commission-approved 2020 ERP. As such the Company believes Staff's recommendation to create new procedures to achieve these objectives should be considered satisfied, as the action items in each bullet of this recommendation are part of our procedures on file with the PSC, including those communications enhancements put in place since the July 2019 outage events. The Company commits to modifying language in its procedures to explicitly meet the recommendations as set forth below.
Con Edison's 2020 ERP and Corporate Instruction 810-2 detail the Corporate Affairs Crisis Communications Plan. Communication measures are initiated, pursuant to the ERP and CI 810-2, whenever system problems have a major impact on customers, *e.g.*, voltage reductions or outages. The measure to be taken, as specified in CI 810-2, would automatically be implemented within the Company's Communications with the Public During Load Management Power Outage once the outage levels are triggered. As another level of communication, the 2020 ERP provides that As of 2020, Corporate Affairs New York City Regional & Community Affairs (RCA) teams will initiate Operator-Assisted (O/A) calls – similar to Westchester RCA "muni"

calls -- to update federal, state, and local elected and government officials, and community *boards* if the following conditions are met:

- 5,000 customers are out in one region for more than 30 min
- OR
- 20,000 customers are out company-wide for more than 30 min.

Con Edison will continue these calls once daily in each affected region until 90% of the customers are restored.

With respect to RCA's list of stakeholders, *i.e.*, RCA's "Key Contacts", with whom the RCA teams maintain contact through events, twice each year RCA teams update a comprehensive contact list of federal, state, and local elected and government officials, and community *boards* as set forth in CI 810-2. This practice has been in existence for over a decade and should be continued. However, the language used in both the Company's Communications with the Public During Load Management Power Outage procedure as well as the Staff's Recommendation A-39 should be amended to note that Corporate Affairs reaches out to NYC's "community boards" rather than the less precisely defined "community groups."

RCA began to automate the above-mentioned "Key Contacts" update process in 2019. The migration to the new system is still underway, but has already measurably improved the comprehensive process of updating more than 900 key contacts, including our contacts' district office and mobile phone numbers, district office addresses (and in the case of Federal elected officials, Washington DC offices) and, similarly, contact information for designated emergency and off-hours staff for each Key Contact. The updates to the process allow the Company to conduct searches by legislative office, community board, region, or electric network/loop so that the proper elected official staff contacts can be easily reached during an outage. This information can also be accessed via a company-hosted phone application.

NYC RCA conducts O/A calls for elected and municipal officials. Information shared with government and elected officials before, during, and after an outage, when available, includes the most current information available regarding the total number of customers out of service, boundaries of the outage, cause of outage if known, and the estimated time of restoration as well as crew deployment, communication with critical facilities and LSE customers, and 24/7 contact information for the RCA teams. This information is disseminated by RCA and regional Electric Operations staff via a daily phone call until 90% of customers in the borough/county are restored. In addition to the daily call, designated RCA staff will continue to share press releases and conduct outreach via phone calls, texts and emails as needed.

All communications made and received will be archived during and after the event in the Salesforce Customer Relationship Management (CRM) system RCA uses to track inquiries from elected officials, government agencies, and Community Boards. The Company has saved this information in this manner beginning with Tropical Storm Isaias in August 2020. Con Edison will continue to use this CRM system for the foreseeable future.

Relevant Protocols/Procedures:
Corporate Instruction 260-7
Corporate Instruction 810-2
Outage Notification Incentive Mechanism
Con Edison's ERP

Work Plan:
Corporate Affairs has these measures in place. Twice each year, RCA updates its Key Contacts lists and, in advance of the summer heat season, the RCA teams host trainings and participate in drills to reinforce and remind the teams of all extant regulatory requirements pertaining to communications.

RCA will continue working with Emergency Preparedness to modify language in CI 260-7 (load shedding plan) to clarify that 810-2 will be followed.

Recommendation Number: A-40

Recommendation: Con Edison should develop a detailed and comprehensive process for issuing blast e-mails to customers in accordance with internal procedures and Commission Orders, e.g., Outage Notification Incentive Mechanism, Orders approving Emergency Response Plans, etc.; and, content will include, but not be limited to, summaries of the information contained in press releases. The process should be included in the Company's ERP.

Staff Target Completion: 12/31/20

Company Timeframe for Completion: 2/28/21

Company Response: Accept
Company Priority: Tier 2
Status of Recommendation: In-Progress

Con Edison's 2020 ERP includes a process for issuing email blasts. (ERP sections 7.1.3, 8.2.3) The Company will, however, update the ERP to include a process for using email blasts to update customers during and after a load-shedding event. It is important to note that it takes longer to prepare and send emails than providing customers with notifications through other communication channels including automated texts and/or phone calls to affected customers, website banners, press releases, and the outage map.

Recommendation Number: B-BO-1, B-BO-2, B-MO-6, B-MO-7

Recommendation B-BO-1: Further Explore Existing Cable Testing Technologies.
Recommendation B-BO-2: Evaluate Emerging Cable Assessment Technologies.
Recommendation B-MO-6: Implement Existing Cable Assessment Technologies.
Recommendation B-MO-7: Evaluate Emerging Cable Assessment Technologies.

Staff Target Completion: 2/28/21

Company Timeframe for Completion: 5/31/21

Company Response: Accept
Company Priority: Tier 3

Status of Recommendation: In-Progress
Con Edison remains committed to monitoring and evaluating both established and emerging cable assessment technologies. An example of the programs we are involved in includes the Cable Diagnostic Focused Initiative performed by the National Electric Energy Testing, Research and Applications Center (NEETRAC) for the Department of Energy. A great deal of the work on cable evaluation has focused on Underground Residential Distribution (URD) type installation and does not fully address the more complicated nature of assessing cables in an urban network system.

The Hipot test is the most widely used method by Con Edison to assess the health of its installed cables and splices. Additionally, Partial Discharge (PD) Testing is also a widely used industry assessment technique of field aged URD cables and Con Edison is looking into determining its applicability for network systems. PD testing is minimally destructive and can identify and monitor the progression of cable system defects such as voids in cable and gaps in cable/accessory interfaces. Testing can be done either online to detect at operating voltages or off- line using higher voltages to evaluate the systems' susceptibility to PD initiation due to surge voltages as well as providing trends in system performance.

The Company is currently evaluating the use of PD in branched network feeder circuits. An active pilot program is underway evaluating handheld PD detecting devices from a range of manufacturers and the use of accessories with sensing devices that can be used either in conjunction with a handheld device for spot testing or for connection to a continuous monitoring device. Con Edison has also investigated the use of offline PD testing, but these are more complicated for use on branched network feeders. Factors that make this less practical to implement include the need for prolonged feeder outages and logistics issues with isolating equipment to conduct testing.

Other diagnostic techniques such as Tan Delta, Time Domain Reflectometry, and cable neutral evaluation have been evaluated but have been deemed insufficient to locate defects or are not applicable to branched network systems. Specifically, meaningful Tan Delta results cannot be acquired when evaluating a feeder comprised of hybrid cable insulations and while connected to equipment (transformers or switches). Con Edison feeders are comprised of varied cable

insulation materials (XLPE, EPR, PILC) making some of these techniques less suitable for Con Edison's network systems. In addition, Con Edison has reviewed the findings outlined in a 2016 NEETRAC study detailing the available in-situ tests and their advantages and disadvantages. See http://www.neetrac.gatech.edu/cdfi-publications.html.

The Company will continue to monitor and assess existing and emerging assessment technologies, and look to implement those that prove they will enhance reliability, reduce costs, improve safety, etc.

Deliverables/Milestones:
Con Edison will complete the pilot program by 3/31/21 and will review the results and develop any resulting recommendations by 5/31/21.

Recommendation Number: B-BO-3, B-MO-8

Recommendation B-BO-3: Rejuvenate Old XLPE and EPR Cable Systems
Recommendation B-MO-8: Consider Rejuvenation of Old XLPE Cable Systems

Staff Target Completion: 2/28/21

Company Timeframe for Completion: 3/31/21

Company Response: Modify
Company Priority: Tier 3

Status of Recommendation: In-Progress

The Company will consider the rejuvenation of old XLPE & EPR Cable Systems. The Company will conduct a study to determine the technical feasibility, advantages, disadvantages, and economics of carrying out this process on network feeders. The Company will report on its findings by March 31st, 2021.

Recommendation Number: B-BO-4

Recommendation: Investigate and Address Increased Failure Rates for the 27 kV Flatbush Network

Staff Target Completion: 2/28/21

Company Timeframe for Completion: 6/1/21

Company Response: Accept

Company Priority: Tier 3

Status of Recommendation: In-Progress

The Company has made improvements in the Flatbush network and will continue to do so in the future. Improvements from 2019 to present have focused on several areas. This includes PILC overhead and underground replacement, aluminum overhead and underground replacement, replacement of 4 kV Okonite risers and underground sections, installation of 4 kV Tie Kyle switches on feeders that previously had none, and installation of 27 kV fault interrupting VISO switches. These improvements have resulted in an NRI improvement from .601 to .346 during the period of June 1, 2019 to June 1, 2020.

In 2019, the following equipment was replaced:

- 7 underground sections of aluminum cable
- 8 aerial sections of aluminum cable

In 2020 (as of 12/7) the following equipment was replaced or installed:

- 71 underground sections of PILC
- 22 aerial sections of PILC
- 3 Okonite risers
- 9 Okonite sections
- 2 VISO switches
- 4 Tie Kyles
- 1 1000kVA shunt reactor

Additional improvements to the Flatbush network that the Company plans in 2021 includes replacement of 57 underground sections of PILC, installation of 4 VISO switches, and replacement of 5 Okonite risers.

Deliverables/Milestones:

The Company plans to complete all of the 2021 work noted above planned prior to 6/1/21.

Recommendation Number: B-BO-5, B-MO-9

Recommendation B-BO-5: Modify Feeder Testing Specifications to Completely Eliminate the Use of DC Hipot Tests

Recommendation B-MO-9: Modify Feeder Testing Specifications and Eliminate the Use of DC Hipot Tests.

Staff Target Completion: 2/28/21

Company Timeframe for Completion: 2024+

Company Response: Accept

Company Priority: Tier 3

Status of Recommendation: In progress

Con Edison eliminated the use of DC Hipot tests in its testing specifications provided an AC Hipot test set is available. Additional AC Hipot test set installations will be required to fully eliminate the use of DC Hipot tests. As per Con Edison specification EO-4019, the Very Low Frequency (VLF) AC Hipot Test is to be used whenever it is available, and a DC Hipot shall not be used when a VLF test set is available. Con Edison is currently in the process of installing VLF Hipot test sets in all Company area substations.

At this time, 73 percent of Con Edison area stations are equipped with VLF Hipot test sets and 100 percent of the Brooklyn/Queens area stations are complete.

Work Plan:

Con Edison currently plans to install AC Hipot test sets installation as follows:

Cherry St.	2021
E. 36th St.	2022
W. 42nd St. No. 2	2022
W. 42nd St. No. 1	2022
E. 36th St.	2022
Leonard St. No. 2	2023
Leonard St. No. 2	2023
E. 63rd St. No. 1	2024
W. 65th St. No. 2	2024
E. 63rd St. No. 2	2024
E. 63rd St. No. 2	2024
Seaport No. 1	TBD
Seaport No. 1	TBD

Recommendation Number: B-BO-6, B-MO-10

Recommendation B-BO-6: Avoid Splicing Old PILC Cables to New Cables.

Recommendation B-MO-10: Prevent Connection of Old PILC Cables to New Splices.

Staff Target Completion: 2/28/21

Company Timeframe for Completion: Complete

Company Response: Modify

Company Priority: Tier 3

Status of Recommendation: Complete

Con Edison already minimizes the connection of PILC cables to new splices where practicable and prevents this from occurring where it is practicable and cost effective. However, to completely avoid this from occurring in the future would be cost prohibitive and negatively impact reliability.

The Company's existing specification EO-2152 advises operating regions to replace PILC on the basis of NRI and provides high value target locations where the replacement of additional PILC cable maximizes the reduction of locations where PILC is connected to newer cable. In this way, the Company looks to expedite the replacement of connections between PILC and new cables, thus minimizing the number on the system, where it will be most beneficial to network performance.

If the Company were to completely stop the connection of PILC to new splices long runs (and multiple sections) of a feeder might need to be replaced any time a single section faults. This is not a practical approach because the cost of such replacements is very high. It would also require extensive outages which would limit the ability to do other, higher impact work. It would also be problematic during the summer period, when it is important to minimize the amount of work done on a feeder, in order to return it to service as soon as possible to it can continue to serve high loads.

Recommendation Number: B-BO-7

Recommendation: Consider Upgrade of Voltage on 27 kV and 4 kV Networks

Staff Target Completion: 2/28/21

Company Timeframe for Completion: 2/28/21

Company Response: Accept

Company Priority: Tier 3

Status of Recommendation: In-Progress

The Company will consider the upgrade of voltage on 27 kV and 4 kV Networks. A study will be conducted to determine the technical feasibility, advantages, disadvantages, and economics of making this upgrade. The Company will report on their finding by February 28, 2021.

Recommendation Number: B-BO-8

Recommendation: Ensure Adequate Training of Personnel Responsible for Heat and Cold Shrink Cable Splices

Staff Target Completion: 2/28/21

Company Timeframe for Completion: 3/31/21

Company Response: Accept

Company Priority: Tier 2

Status of Recommendation: In-Progress

Con Edison employees must go through a rigorous and extensive training and qualification process that takes over 3 years before they can become a Distribution Splicer and are qualified to make splices on the secondary and primary distribution system. The training they receive is part of a comprehensive career path that tracks and documents an employee's progress through all required instructor-led training, written and practical testing, and documented on-the-job observations.

The current curriculum has been in place for many years but has undergone multiple review/revision cycles to ensure it keeps up with changes in technology and other relevant industry best practices. The curriculum that supports the development of a splicer's working knowledge of the functional competencies of the title continues to have a continuous improvement life cycle. Technical and process changes are identified, specific and measurable learning objectives are developed, new or revised training plans based on those learning objectives are created, and follow-up coaching after training and program evaluations are performed.

To augment our training programs and incorporate the lessons learned from the 2019 Flatbush event, the findings from the joint analysis that was performed following the event have been disseminated to all distribution splicers, Underground Supervisors and Underground Managers. This was completed in the 2nd quarter of 2020.

As a follow up, we will be reinforcing the quality control processes that the splicers must maintain and have started another round of reviewing the Flatbush joint analysis results with our distribution splicers. This will be completed by the end of the 1st quarter of 2021.

Recommendation Number: B-BO-9

Recommendation: Review Settings on Phase Balance Relays Prior to the Summer Peak Loads

Staff Target Completion: 2/28/21

Company Timeframe for Completion: Complete

Company Response: Accept

Company Priority: Tier 2

Status of Recommendation: Complete

As mentioned in the Company's response to Staff Recommendation A-18, Con Edison reviewed phase balance relays system-wide for sensitivity to imbalances on the 4 kV systems, particularly during high load periods, for which these relays are not intended to trip. Con Edison identified eleven feeders having phase balance relays that might have been prone to tripping for imbalances on the 4 kV systems, all being 13 kV feeders in Westchester County. Settings on seven were revised to desensitize the relays prior to the summer of 2020, while still permitting them to achieve their intended purpose of detecting faults on the low side terminals of the 4 kV unit substation transformers. Settings on three were determined to be adequately secure as they were and did not need to be revised. One feeder only had a phase balance relay that could not be desensitized without compromising the protection it provides for 4 kV faults. That relay has, however, recently been replaced with a microprocessor relay that is not susceptible to tripping for imbalances on the 4 kV system.

As mentioned in the Company's response to Staff recommendation #18, all of the Westinghouse type CM phase balance relays that were previously susceptible to trip for imbalances in the 4 kV systems, prior to having their settings desensitized, will be replaced with microprocessor relays pre-summer 2021.

Recommendation Number: B-BO-10

Recommendation: Implement Digital Protection Technologies

Staff Target Completion: 2/28/21

Company Timeframe for Completion: 6/1/21

Company Response: Accept

Company Priority: Tier 2

Status of Recommendation: In-Progress

Con Edison has been implementing digital protection technologies for many years and will continue to do so. For example, a program was initiated in 2006 to upgrade the protective relays on 185 primary distribution feeders at 21 area substations to microprocessor digital relays to achieve faster clearing times on auto-loops where coordination with downstream protective devices and reclosers is required. Con Edison completed that program in 2010.

In addition, as indicated in the Company's response to Staff recommendation #18 and Technical Panel recommendation #9, Con Edison is replacing electromechanical phase balance relays on primary 13 kV and 27 kV feeder that are susceptible to tripping during imbalances on 4 kV systems with microprocessor relays, which will be completed prior to summer 2021.

Recommendation Number: B-BO-11

Recommendation: Implement Improved Fault Isolation Mechanisms

Staff Target Completion: 2/28/21

Company Timeframe for Completion: 6/1/21

Company Response: Accept

Company Priority: Tier 2

Status of Recommendation: In-progress

As noted in the response to PSC recommendation 18 and Panel recommendation 9, the phase unbalance relays on 13, 27 & 33kV distribution feeders have all been evaluated and have either have been or will be upgraded, or have had their settings appropriately de-sensitized.

In all of these cases, the relay and relay settings at the Area Station feeder have been designed to effectively detect and subsequently isolate and de-energize 4kV faults on the secondary of Unit Substations, without being sensitive to load imbalance.

Relay upgrades to be completed by June 1, 2021

Recommendation Number: B-BO-12

Recommendation: Increase AC Hipot Testing Voltage on 5 kV Class Breakers to Comply with Manufacturers' Recommendations

Staff Target Completion: 2/28/21

Company Timeframe for Completion: Complete

Company Response: Reject

Company Priority: Tier 3

Status of Recommendation: Complete

Con Edison performs Hipot testing of 4kV breakers in accordance with IEEE Std 95 – 2002, Section 6.2 (Test voltage for maintenance proof testing) which specifies Hipot test of 65 to 75 % of (2E + 1000V, where E is the rated line-to-line voltage). For 4.33kV line-to-line, this equates to 6.5 - 7.5kV RMS. General Electric recommended 14kV RMS for GE AM 4.16 – 250A circuit breakers.

The Company believes that testing these breakers at the manufacturers recommended voltage potentially subjects them to unnecessary damage and that the test voltage used by the Company is appropriate, given the voltage that the breakers are operated at (which is lower than the maximum allowable for this this breaker class).

Con Edison has conservatively established a test voltage at 10kV RMS (14kV dc) for in-service breakers which is in between the IEEE and General Electric recommended levels. Con Edison's Hipot test voltage of 10kV RMS is four times the rated phase-to-ground voltage and two and a half times the rated phase-to-phase voltage. This is based on acceptance of well-established IEEE standards and proven Con Edison test methods. Con Edison field tests are generally performed in open air and are subject to varying environmental parameters. Given the age of these breakers and the testing environments, the Company believes that the Hipot field test voltage of 10kV RMS is suitable.

Recommendation Number: B-BO-13

Recommendation: Optimize Breaker Ground Connections by Replacing Aluminum Ground Buses with Copper Where Possible, or Using Antioxidation Posts on Aluminum Ground Bus Tabs

Staff Target Completion: 2/28/21

Company Timeframe for Completion: 2/28/21

Company Response: Modify

Company Priority: Tier 3

Status of Recommendation: In Progress

The grounding stabs on the General Electric - GE AM 4.16-250-8H-1200 amp air circuit breakers were factory supplied as aluminum. There are approximately 233 of these breakers in 47 Unit Substations on the Con Edison 4kV non-network system. Notwithstanding the event of July 21, 2019, these breakers have performed reliably for over 50 years. The aluminum ground stab did not contribute to the breaker failure on July 21, 2019. Due to an abundance of caution, Con Edison will modify Inspection Procedure EO-10790 to inspect the aluminum ground stabs during routine maintenance inspections and to replace them with cooper if there is evidence of deterioration such as pitting, surface bubbling or erosion due to oxidation.

EO-10790 will be modified by February 28, 2021.

Recommendation Number: B-BO-14

Recommendation: Implement Technologies to Detect Down Conductors

Staff Target Completion: 2/28/21

Company Timeframe for Completion: Complete

Company Response: Accept

Company Priority: Tier 2

Status of Recommendation: Complete

The Con Edison overhead distribution system is currently designed and operated with shorter line segments protected by multiple relays than is typical for utilities in most of the world. This places protective relays nearer to, and thus more sensitive to, fault currents that occur when conductors fall to earth.

However, some downed wires, particularly in an urban environment (*e.g.*, roads/pavement), result in high-resistance faults whose fault current magnitudes are within or below the range of normal load currents and will not be picked up by traditional relays as faulted/downed wires.

To address this concern, Con Edison is engaged in collaborative research with other utilities to better detect and distinguish these high-impedance faults from normal load currents. In addition, there are protective relay manufacturers who offer relays that claim to provide such capabilities. The Company is looking into these relays and will continue to consider them, but thus far they have not been proven effective for widespread use in an urban environment.

Con Edison has also collaborated with other utilities to detect and distinguish broken conductors, including such work as represented in EPRI reports 3002012882 and 3002019883. This method uses Advanced Metering Infrastructure (AMI) and data analytics to detect customers who lose power not associated with operation of a protective device, such as a circuit breaker, fuse, or recloser etc.

The Company intends to continue to pursue opportunities such as these to develop detection technologies that will enhance or replace those that are already in use.

Recommendation Number: B-BO-15

Recommendation: Enhance the SCADA System by Implementing Automated Alarms and Regular Maintenance Procedures

Staff Target Completion: 2/28/21

Company Timeframe for Completion: 2/28/21

Company Response: Accept

Company Priority: Tier 2

Status of Recommendation: In-Progress
The XA21 SCADA system has the ability to prioritize alarms via color coding, which Con Edison utilizes. This allows Operations to see and address the most critical issues first.

The SCADA system has been undergoing significant improvements recently. Con Edison has new tools being piloted which the Company will be deploying for wider use. One of these allows the Company to automatically send emails to targeted maintenance groups for specific equipment alarms. In conjunction with this new ability to automatically email information to targeted sections, a new calculated alarm was developed which provides indication of possible incorrect tap changer operation. This calculated alarm has already flagged a number of 4kV tap changers which needed to be fixed. Con Edison will review automated emails to be sent to maintenance groups by December 31, 2020 and implement them by February 28, 2021.

Finally, the Company is also finishing a project to retire the older Realflex SCADA system. This has been completed in Brooklyn/Queens and Staten Island, and will be complete in the final region (Bronx/Westchester) by the end of 2020. The completion of this project will streamline and reduce the number of windows/screens the operators will be receiving alarms from the SCADA system.

(Note: all of these comments pertain only to the Distribution SCADA system and not ECC's SCADA system.)

Recommendation Number: B-BO-16

Recommendation: Enhance Transformer Situational Awareness

Staff Target Completion: 2/28/21

Company Timeframe for Completion: Complete

Company Response: Accept

Company Priority: Tier 2

Status of Recommendation: Complete

Con Edison continuously monitors Unit Substation Transformers via SCADA which captures all status points (every five seconds) and the load parameters (currents, voltages, kW, kVAR. kVA) (every 30 seconds). This data provides operators and engineering with up to date load information that is compared and displayed against Normal and Emergency ratings of the transformers in percentage values.

The Company enhanced this real time monitoring data set in 2020, when the Company implemented a new program that enhances the monitoring and control of the Unit Substation load tap changers (LTC's) by developing alarms that can be sent directly to maintenance groups when an LTC stops operating as designed. Since its implementation, this enhanced monitoring has already identified and alerted the maintenance groups to approximately 20 LTC issues which were subsequently resolved in a timely manner before they caused any operational issues.

In addition to the real time monitoring mentioned above, periodic Dissolved Gas in Oil (DGOA) samples are taken once per year following Summer (twice a year for the LTC compartment) with additional samples taken from units that exhibit a slight increase of certain gasses. Furan analysis are also conducted annually. Con Edison uses the results of these samples to effectively monitor the internal health of its Unit Substation Transformer fleet and, with regular physical inspections of the units (*e.g.*, corrosion, leaks), provide insight into any units that may be approaching end of life.

The Company has evaluated the use of on-line DGOA monitoring for our Unit Substation Transformers, but presently, the Company does not believe it is cost effective. Monitoring all four oil compartments in Company transformers would require a 4-channel monitor and would require a significant amount of external tubing to be installed, which would increase the risk of an oil release. The Company has estimated the cost of on-line DGOA monitoring to be approximately 25% of a new transformer.

Recommendation Number: B-BO-17

Recommendation: Estimate and Track Data for Transformer Loss of Life in an Asset Database, Accounting for Phase Loading to Identify Greatest Accumulated Loss of Life

Staff Target Completion: 2/28/21

Company Timeframe for Completion: Complete

Company Response: Accept

Company Priority: Tier 2

Status of Recommendation: Complete

The Company maintains a "Transformer Health index" database for all 284 Unit Substation Transformers. A key driver for this health index is the results of the DGOA and Furan analysis Con Edison performs each year following the Summer period on these units. In particular, the Furan analysis is seen by the industry as a direct measure of the loss of life of the paper insulation.

With regards to loading, Con Edison does monitor the loading (Amps) on each 4kV phase of its Unit Substation Transformers (and therefore each primary and secondary winding within the transformer). This loading is compared against the emergency rating of the transformer (and 4kV Bus) and on the extremely rare occasions where the emergency ratings are exceeded the Control Center operators take action to reduce the loading on the transformer. External cooling actions (*e.g.*, water spray) may also be deployed. Going forward, where an individual phase load exceeded the emergency rating of the transformers (in amps), regardless of the duration, and regardless of the loading of the other phases, Con Edison will call for oil samples (DGOA and Furan analysis) to be taken following the event and not wait for the post-summer oil sample.

It is noted that the vast majority of Unit Substation Transformer failures are not driven by paper insulation aging, but by failures in the primary capaciformer and primary pot-head and bushings.

Recommendation Number: B-BO-18

Recommendation: Validate Calculations for Top Oil and Hot Spot Temperatures to Assess and Monitor the Effectiveness of External Cooling

Staff Target Completion: 2/28/21

Company Timeframe for Completion: Complete

Company Response: Accept

Company Priority: Tier 2

Status of Recommendation: Complete

The RT3 is a real time calculated value of the hot spot and top oil temperature of network transformers. The RT3 is based on the transformer loading program (TNT) program, which is based on the "IEEE C57.91 Guide for Loading Mineral-Oil-Immersed Transformers and Step-Voltage Regulators." The TNT uses many of the formulas found in C57.91 and adds an additional component, the vault constant. The vault constant augments the formulas to better reflect the Company's below grade vaults. Because the Company's network transformers are installed in below grade vaults heat is not able to dissipate in the same way as if it were installed above grade. The vault constant rectifies this. The TNT returns various outputs, such as hot spot, top oil temperatures, and the calculated life span of a network transformer. RT3, is a "real time" calculated value of the hot spot and top oil temperature of the network transformer. It uses three days of loading information to calculate these two temperatures.

Distribution Engineering validates the top oil and hot spot temperatures during the design process of a network transformer. TNT will calculate these temperatures based on the load. The Company will compare these theoretical values to actual measured temperature and load data when the manufacturer performs a temperature rise or heat run test.

Recommendation Number: B-BO-19

Recommendation: Ensure Adequate Demand Response Resources Prior to Summer Peak Loads

Staff Target Completion: 2/28/21

Company Timeframe for Completion: Complete

Company Response: Accept

Company Priority: Tier 2

Status of Recommendation: Complete

Con Edison views Demand Response (DR) as an important tool to help respond to events on our system. We continue to rely on and improve these programs to both grow the number of participants as well as increase our confidence that they will be available when called upon.

DR programs rely on customer participation to reduce electric demand on days when they are called upon during the summer months. Customers are paid to provide this reduction with incentives that are deemed cost effective based on our Benefit-Cost Analysis Handbook. The primary barrier to participation has been the need for a communicating interval meter which were historically only provided free of charge to large customers who pay hourly pricing. Other customers wishing to participate were required to pay for the installation of such a meter and underlying communications at a cost of thousands of dollars.

This changed in the spring of 2020 with the integration of AMI data into the Company's new Demand Response Management System (DRMS). Now, all customers that can provide at least 10 Watts of reduction (or through an aggregator that provides at least 50 kW in total) can participate in the Company's performance-based DR programs. During this first season, over 200 new customers participated using their new AMI meter and the Company expects this number to grow considerably over the next few years. To aid in this growth, the Company is working with the aggregator community to streamline the enrollment process and raise awareness of the new capabilities of our DRMS so they can attract new customers.

Furthermore, the Company has recently launched two new Demand Response programs that were ordered by the PSC, Term-DLM and Auto-DLM, which will commence next spring during the 2021 Capability Period. Both programs allow participants to submit competitive bids to obtain 3-5-year contracts to provide load relief. These longer-term contracts could expand the variety of resources participating in the Company's Demand Response programs, especially for more capital-intensive solutions such as energy storage systems which could benefit from guarantees of longer-term fixed revenues. The availability of these new programs will give customers interested in participating in Demand Response a greater variety of options which could boost overall resource availability.

Both the Term- and Auto-DLM programs provide for more stringent performance standards and the possibility of financial penalties for especially poor performance. Combined with the ability to create long-term contracts for Demand Response in specific networks, these more stringent performance standards may allow the Company to count on higher levels of load relief resources as compared to CSRP and DLRP resources, increasing certainty for long-term planning.

Recommendation Number: B-BO-20

Recommendation: Review NRI Data and Calculations to Identify Best Practices from High Performing Networks that can be Applied to Other Operating Areas

Staff Target Completion: 2/28/21

Company Timeframe for Completion: Complete

Company Response: Accept

Company Priority: Tier 2

Status of Recommendation: Complete

As indicated in Con Edison specification EO-2073 and EO-2152, higher performing networks are generally characterized as having lower component failure rates, and having configurations with relatively balanced normal load distribution and contingency feeder shift and pick-up factors compared to networks with lower reliability. Reliability design best practices are captured in Con Edison's NRI algorithm. The program assesses each network's design characteristics and provides engineering departments with the necessary information to optimize design and maintain reliability.

Recommendation Number: B-BO-21

Recommendation: Eliminate Ambiguous Terminology with Respect to Cable Classifications

Staff Target Completion: 2/28/21

Company Timeframe for Completion: 3/31/21

Company Response: Accept

Company Priority: Tier 2

Status of Recommendation: In-progress

Con Edison's current Purchase and Test specifications reflect the use of EPR (or EAM) rubber insulation for primary or secondary cables. EO-11-2 is an obsolete Purchase and Test specification for cables the Company no longer installs and is preserved for reference only. There are two types of rubber mentioned for 5 kV cables: Oil Base Ozone Resistant Rubber per ASTM D574 and Butyl Ozone Resistant Rubber per ASTM D1352. The 15kV rubber insulated cable is shown as silicon rubber.

While Con Edison's ampacity specifications refer to the insulating materials as "Ozone Resistant Rubber," no additional changes are required to these specifications as the specific types of rubber are designated in the related Purchase and Test specifications.

Furthermore, Con Edison is conducting a review of our archived specifications to further determine whether any have generic references to rubber insulation. This review will be concluded by March 31, 2021. Thus far, the Company has not found any reference to non-descript rubber for primary voltage cables.

Recommendation Number: B-MO-2

Recommendation: Publicize Improvements to System

Staff Target Completion: 2/28/21

Company Timeframe for Completion: Complete

Company Response: Accept
Company Priority: Tier 2
Status of Recommendation: Complete

Con Edison proactively publicizes improvements to the system using a comprehensive mix of communications tools. Our ongoing efforts involve promoting company innovations that increase reliability and the impact on our residential and commercial customers. We communicate via press releases, media interviews, on our website and social media channels, with videos, podcasts, direct text messages to customers, community meetings and correspondence with government officials. We aggressively pitch stories to working journalists about Con Edison's Clean Energy Commitment and capital improvements, including our Westchester storm fortifications across our service area. Our multi-faceted media outreach demonstrates how the company has taken meaningful steps to increase safety, improve emergency response efforts, improve the customer experience through actions such as enhanced outage information, and smart meter installations. As part of our communications outreach, we target press opportunities, encompassing traditional and new media outlets, Spanish-language, and trade media publications.

Recommendation Number: B-MO-3

Recommendation: Enhance 87N Relay Verification Plan

Staff Target Completion: 2/28/21

Company Timeframe for Completion: 3/31/21

Company Response: Accept
Company Priority: Tier 1
Status of Recommendation: In-Progress

Con Edison has continuously evaluated the 87N Relay Verification Plan and has made improvements to the program since its inception. For example, the Company adjusted the Plan's methodology for verification so that fault data must be captured for each affected relay. This was an evolution from the original plan and was made to achieve the highest level of certainty in the circuitry in the most expeditious manner possible. The current plan uses three components to verify the circuits through actual fault data observed after the July 2019 event and primary injection testing.

1. The first component is increasing the sensitivity of the 87N elements on multifunction relays to capture the fault data associated with distribution level faults.
2. The second component is installing online relay monitoring equipment which records the distribution level fault data on new equipment.
3. The third component of the program is to perform primary injection testing on relays that are / were scheduled for capital improvement that would affect the circuit or scheduled for verification using this method.

Overall, the 87N Relay Verification Plan has made significant progress in verifying and restoring all 211 affected relays. As stated in the response to Staff question # A-3, the Company has a recurring monthly meeting with the DPS staff to report on progress made, and any challenges for timely completion. The Company provides an "87N Relay Restoration" report documenting the progress reached to date at all these monthly meetings. This report shows that as of the date of this submission, the Company has verified and approved 77% of the 87N relay population for restoration. Please refer to the latest report (dated December 3, 2020) for the full details of counts of relays that have been verified, counts of relays restored to service, and of those pending.

Con Edison is scheduled to complete the verification program by March 31, 2021.

<u>Key Constraints:</u>

1. Outages required to complete the primary injection testing.
2. Different types of relays (*i.e.*, microprocessor versus electromechanical and solid state) lend themselves to different methods.

Recommendation Number: B-MO-4

Recommendation: Implement Primary Injection Testing in Commissioning Procedures

Staff Target Completion: 2/28/21

Company Timeframe for Completion: Complete

Company Response: Accept
Company Priority: Tier 2
Status of Recommendation: Complete

Substation Operations-Protective Systems Testing has implemented a guideline, Substation Operations Instruction 0400-0401- *Guidelines for Primary Injection Testing,* for primary injection testing effective 12/30/2019.

Recommendation Number: B-MO-11

Recommendation: Reassess and Shorten Fault Clearing Times

Staff Target Completion: 2/28/21

Company Timeframe for Completion: Complete

Company Response: Accept

Company Priority: Tier 1

Status of Recommendation: Complete

The Company has recently completed a system-wide assessment of fault clearing times on primary distribution feeders, a population numbering more than 1,500 feeders at the 13 kV, 27 kV, and 33 kV voltage levels. All were confirmed to have instantaneous tripping elements that clear faults in high speed, typically three to six electrical cycles on a 60 Hz basis.

The two 13 kV light and power feeders supplying the 59th Street steam generating station from West 65th Street area substation that were involved in the Manhattan event of July 13, 2019 could not use instantaneous tripping elements because of the need for these feeders to coordinate with relay protection within the generating station. The light and power operating configuration in the generating station has since been modified, allowing these feeders to be retrofitted with relays that have instantaneous tripping elements. The retrofitting was completed in June of 2020.

Recommendation Number: B-MO-12

Recommendation: Proactively Search for Hidden Protection System Failures

Staff Target Completion: 2/28/21

Company Timeframe for Completion: Complete

Company Response: Accept

Company Priority: Tier 1

Status of Recommendation: Complete

Hidden protection system failures are by their very nature difficult to find. The tools and methods the Company employs to find such failures fall into three categories:

1) Rigorous testing. This begins with commissioning testing and progresses through routine periodic testing. It also includes testing prescribed during event analysis.

2) Monitoring and alarms. Protection systems, including relays, communications, and breaker tripping circuits, are monitored and issue alarm signals when functionality is compromised. Alarms are arranged in a hierarchy starting with the devices themselves, elevating to the substation control room and ultimately to the Energy Control Center. Further, the use of sensors that clamp onto relay circuits have to date shown to be very effective for the 87N Verification Plan. The Company has previously shared examples of the fault data observed through these sensors with DPS Staff through Interrogatory DPS-052. The Company envisions a wider range of application of this technology to provide online monitoring.

3) Event analysis and real-time system support. Con Edison established a section in the Central Engineering organization dedicated to these functions in 2012. The engineers in this section analyze each and every instance of relay operations during fault and non-fault events. Furthermore, they respond to questions from system operators and field personnel related to alarms on protective systems and adequacy of protection when unusual conditions present themselves. These functions were formerly handled by engineers who were also responsible for project work for relay upgrades or the protection of new facilities. Con Edison's establishment of the dedicated section relieved the engineers of the pressing demands of project-related work and deadlines, allowing them to focus their energies and attention full-time on the analysis of relay operations during faults and relay mis-operations.

The combined and coordinated efforts imbedded in these three categories, including frequent and open communications between operators, engineers, and technicians permit patterns to be identified that may be precursors to relay mis-operations. Trending of alarms and extent of condition reviews contribute significantly to identifying patterns that need to be addressed. This

prompts pre-emptive corrective action by proposing and initiating protection system upgrade projects to address and the underlying findings.

Recommendation Number: B-MO-13

Recommendation: Implement Emerging Technologies to Detect System Abnormalities and Hidden Failures in Real-Time

Staff Target Completion: 2/28/21

Company Timeframe for Completion: 12/31/21

Company Response: Accept

Company Priority: Tier 1

Status of Recommendation: In-Progress

Con Edison is in the process of installing non-intrusive monitoring using clamp-on sensors and data acquisition units on selected protective relaying circuits to harvest and record information when disturbances or abnormal conditions occur on the system. The trending of this information over time will offer opportunities to detect problems at their root and take preemptive corrective action before they lead to an event. A conceptually similar, although technologically different, system of monitoring and trending is already in place for dissolved gasses in the dielectric oil of transmission and area substation transformers.

There is an opportunity to make the large volume of data from Con Edison's population of microprocessor relays available in real-time to System Operators and Engineers. There are concerns about cyber security surrounding the transmission of this data outside of the substation's electronic security perimeter. Nevertheless, Con Edison has taken the initial steps to implement a solution to make relay data available through what is known as a data diode. This piece of equipment is installed at the electronic security perimeter of a particular substation to allow data transfer from networked microprocessor relays within that substation to the corporate network, while still maintaining a defense against cyber attacks.

This work is expected to be completed by 12/31/21.

Recommendation Number: B-MO-14

Recommendation: Ensure Time Synchronization Across All Systems Rapid Restoration and Situational Awareness

Staff Target Completion: 2/28/21

Company Timeframe for Completion: Complete

Company Response: Accept

Company Priority: Tier 3

Status of Recommendation: Complete

Con Edison, as much as any entity in the electric power industry, understands the value of, and appreciates the need for, time synchronization across all data collection systems. The initial pilot installation of non-intrusive monitoring mentioned in Con Edison's response to Technical Panel recommendation #13 was not connected to a GPS synchronized time source, resulting in a six second difference between its time stamping of captured event data and the time stamping of PQ nodes that are connected to a GPS synchronized time source. This anomaly was not unexpected and it was immediately recognized and accounted for. Instances where time stamping or time recording is not synchronized are noted and corrected.

Recommendation Number: B-MO-15

Recommendation: Update Rapid Restoration Procedures to Include Remote/Manual Resetting Guidelines and Traffic Contingency Plans for Reaching Unmanned Substations

Staff Target Completion: 2/28/21

Company Timeframe for Completion: 12/31/21

Company Response: Accept

Company Priority: Tier 1

Status of Recommendation: In-Progress

Con Edison plans to take the following steps with respect to rapid restoration procedures and will provide an update to DPS Staff on each of these items on or about 2/28/2021.

1. Assess the equipment that must be manually reset in the substations and prioritize their replacement, upgrade, or retirements. This will minimize or eliminate the need to have personnel report to substations if events occur and will allow the Company to more quickly restore equipment to service.
    a. The Company has already replaced 18% of the population of manual-reset lockout relays with self-resetting ones.
    b. Additionally, the Company has already removed 85% of the population of automatic ground switches (all of which require manual-resetting) and replaced them with alternate modes of transfer tripping that are self-resetting.

2. Presently, the Company relies on disturbance monitoring equipment (DME) that is connected to selected relay targeting in bulk electric transmission substations for event recording. The DME files are accessible to engineers and operators via internal data links for fast analysis prior to resetting relays, but the Company is investigating the feasibility of a data collection network that will allow engineers to access data directly from digital relays on a real-time basis using data diodes mentioned in the response to Panel recommendation #13. This is expected to improve the ability to analyze events by remotely retrieving relay targets that occur on the transmission system and simplify gathering data prior to providing direction on which relays to remotely reset.

Con Edison plans to enhance traffic contingency plans as follows:

3. Meet with New York City Office of Emergency Management to discuss feasibility of coordinating with NYPD to support Con Edison operator travel in response to large scale system events.

Recommendation Number: B-MO-16

Recommendation: Regularly Test Remote Controls and SCADA Connectivity

Staff Target Completion: 2/28/21

Company Timeframe for Completion: Complete

Company Response: Accept

Company Priority: Tier 3

Status of Recommendation: Complete

SCADA connectivity from the Energy Control Center to Transmission and Area Substations is monitored in real time via the Con Edison Energy Management System. Remote control of Substation Equipment is the normal method of control from the Energy Control Center to each Substation. While performing daily operations, if remote control is found inoperative to a piece of equipment, a work order is generated for the repair of the remote-control circuitry. This work order is then prioritized and issued to Substation Maintenance or Protective Systems Testing Departments based on the nature of the trouble. Additionally, remote control capability is tested by the Protective Systems Testing Department while performing trip checks at the frequencies defined in the Protection System Maintenance Program (PSMP).

Relevant Protocols/Procedures:
Substation Operations Instruction 0400-0400- *Protective System Maintenance Program (PSMP).*

Recommendation Number: B-MO-18

Recommendation: Ensure Data Captured and Transmitted by Digital Relays Enable Adequate Situational Awareness

Staff Target Completion: 2/28/21

Company Timeframe for Completion: 12/31/21

Company Response: Accept

Company Priority: Tier 1

Status of Recommendation: In-Progress

At present, on a limited but still noteworthy basis, selected relay targeting is connected to disturbance monitoring equipment (DME) in Con Edison's bulk electric transmission substations. Event files from the DME are accessible to engineers and operators via internal Company data links. The data diode mentioned in Con Edison's response to Technical Panel recommendation #13, when implemented, will allow engineers in the Relay Protection and Analysis section of Central Engineering to access data directly from digital relays on a real-time basis. Data captured during events will be immediately available to them, and they will also be able to query the relays for data at any time, including during quiescent periods. This will enable them to assess conditions on the system and provide guidance to operators, significantly enhancing their situational awareness as conditions change.

Recommendation Number: B-MO-19

Recommendation: Enhance Transformer Situational Awareness

Staff Target Completion: 2/28/21

Company Timeframe for Completion: Complete

Company Response: Accept

Company Priority: Tier 2

Status of Recommendation: Complete

As stated in Con Edison's response to Staff Recommendation #2, verifying the proper position of valves on transformer cooling systems is needed only when the valves need to be operated (open or closed) at the start, or the completion, of maintenance and construction activities. Otherwise, the position of radiator valves is not altered; they are normally in the open position, except for these occasional work activities. The position of the valves is verified via new administrative controls the Company put in place following the Event. The operation of the valves during maintenance is governed by a SSO Maintenance Instruction. The instruction provides guidance for verification of proper valve status for any maintenance and construction work that involves the operation of valves on Substation Equipment. Included in the instruction is a tag to be applied after valve operation and Valve Status Change tracking sheet to record the status of valve (open/close) before and after valve operation and requires a peer check by a qualified Substation Operations employee to verify that the valves are in the proper operational position before returning equipment to operation.

Relevant Protocols/Procedures:
SSO Maintenance Instruction 0500-0041 - *General Instruction for Operating Valves During Maintenance of Equipment*

Recommendation Number: B-MO-20

Recommendation: Implement Regular Visual Checks to Ensure Early Identification of Malfunctioning Equipment

Staff Target Completion: 2/28/21

Company Timeframe for Completion: Complete

Company Response: Accept

Company Priority: Tier 2

Status of Recommendation: Complete

As stated in Con Edison's response to Staff Recommendation #2, verifying the proper position of valves on transformer cooling systems is needed only when the valves need to be operated (open or closed) at the start, or the completion, of maintenance and construction activities. Otherwise, the position of radiator valves is not altered; they are normally in the open position, except for these occasional work activities. The position of the valves are verified via new administrative controls the Company put in place following the Event. The operation of the valves during maintenance is governed by a SSO Maintenance Instruction. The instruction provides guidance for verification of proper valve status for any maintenance and construction work that involves the operation of valves on Substation Equipment. Included in the instruction is a tag to be applied after valve operation and Valve Status Change tracking sheet to record the status of valve (open/close) before and after valve operation and requires a peer check by a qualified Substation Operations employee to verify that the valves are in the proper operational position before returning equipment to operation.

Relevant Protocols/Procedures:
SSO Maintenance Instruction 0500-0041 - *General Instruction for Operating Valves During Maintenance of Equipment*

Recommendation Number: B-MO-21

Recommendation: Verify Transformer Commissioning and Maintenance Procedures Ensure Full Cooling and Capabilities

Staff Target Completion: 2/28/21

Company Timeframe for Completion: Complete

Company Response: Accept

Company Priority: Tier 2

Status of Recommendation: Complete

As stated in Con Edison's response to Staff Recommendation #2, verifying the proper position of valves on transformer cooling systems is needed only when the valves need to be operated (open or closed) at the start, or the completion, of maintenance and construction activities. Otherwise, the position of radiator valves is not altered; they are normally in the open position, except for these occasional work activities. The position of the valves are verified via new administrative controls the Company put in place following the Event. The operation of the valves during maintenance is governed by a SSO Maintenance Instruction. The instruction provides guidance for verification of proper valve status for any maintenance and construction work that involves the operation of valves on Substation Equipment. Included in the instruction is a tag to be applied after valve operation and Valve Status Change tracking sheet to record the status of valve (open/close) before and after valve operation and requires a peer check by a qualified Substation Operations employee to verify that the valves are in the proper operational position before returning equipment to operation.

Relevant Protocols/Procedures:
SSO Maintenance Instruction 0500-0041 - *General Instruction for Operating Valves During Maintenance of Equipment*

Recommendation Number: B-MO-22

Recommendation: Quantify and Track Transformer Loss of Life Through Hot Spot Device Data

Staff Target Completion: 2/28/21

Company Timeframe for Completion: 12/31/20

Company Response: Accept

Company Priority: Tier 2

Status of Recommendation: In-Progress

Power transformer loss-of-life will be quantified and tracked based upon EPRI's (Electric Power Research Institute) Power Transformer Expert system (PTX) software. PTX assesses the condition of transformers by analyzing data from historical records and test results, together with nameplate information such as rating, model type, and year of manufacture. Using a rule-based expert system, the software provides a series of indices for each transformer that assess both a transformer's normal paper degradation and potentially abnormal incipient failure conditions. EPRI's PTX software is being integrated with TOA4 (Transformer Oil Analyst) advanced diagnostic software for transformer insulating liquid analysis. The integration of these two software systems will automatically update the assessment of the transformer fleet as dielectric fluid samples are analyzed. The integration of the two software systems is scheduled to be completed by end of 2020.

Recommendation Number: B-MO-23

Recommendation: Update Arrester Selection Procedure to Ensure Appropriate Voltage and Energy Ratings

Staff Target Completion: 2/28/21

Company Timeframe for Completion: Complete

Company Response: Accept

Company Priority: Tier 3

Status of Recommendation: Complete

Con Edison performs arrester selection based upon IEEE guidelines for protective margins, MCOV and energy Handling capability. The Company chooses arresters that will coordinate with the system voltage where they will be applied. For West 49th Street Substation, Con Edison modified the design such that the transformer tertiary winding would not be used as a source of Light & Power. Since the tertiary winding was not connected to the Light & Power transformer, the tertiary winding must be protected by grounding one corner of the delta winding, with the other two phases protected by surge arresters. This modified design applies the surge arresters at line-to-line voltage, instead of line-to-ground voltages. The required change in the surge arrester rating was not recognized in our review.

Con Edison field design changes will adhere to Central Engineering EOM-401 procedure (section 4.10.2.e). In addition, the Project Engineer or Lead Discipline Engineer will coordinate with Equipment Engineering Subject Matter Expert to evaluate field design modifications.

Recommendation Number: B-MO-24

Recommendation: Implement Adequate Fault Isolation Mechanisms

Staff Target Completion: 2/28/21

Company Timeframe for Completion: Complete

Company Response: Accept

Company Priority: Tier 2

Status of Recommendation: Complete

Con Edison's relay protection systems currently provide adequate fault isolation mechanisms within our substations. Con Edison's longstanding system-wide Area Substation Reliability capital program further enhances these mechanisms by adding an additional mode of high side clearing.

Other measures that Con Edison has taken to provide better fault isolation are:

- Removed auto ground switches at multiple locations
- Installed circuit breakers between transformer pairs at E. 13th Street Substation

Recommendation Number: B-MO-25

Recommendation: Eliminate Ambiguous Terminology

Staff Target Completion: 2/28/21

Company Timeframe for Completion: Complete

Company Response: Accept

Company Priority: Tier 1

Status of Recommendation: Complete

Con Edison addressed ambiguous terminology related to the Manhattan outage with regards to the design drawing feedback process, which is covered in Con Edison's response to Staff Recommendation #1 as stated below.

Con Edison has processes, guidelines, and instructions in place to verify consistency between Company and vendor drawings. The processes, guidelines and instructions require that (1) schematic wiring diagrams are on one single drawing, (2) our design staff use a project design checklist as part of project documentation and (3) the field groups of the Protective System Testing (PST) department are to report back on any discrepancies to the design staff to complete the feedback loop.

Relevant Protocols/Procedures:
CE DI 2113: Preparation of Schematic Wiring Diagrams
Engineering Operations Manual: CE-0401 Engineering Drawings Management

Recommendation Number: B-MO-26

Recommendation: Improve Quality Control Processes Company-Wide

Staff Target Completion: 2/28/21

Company Timeframe for Completion: 9/1/21

Company Response: Accept

Company Priority: Tier 2

Status of Recommendation: In-Progress

The response to this recommendation has two activities:
Activity 1. Development of the Company's Quality Center of Excellence (QCOE)
Activity 2. Business Unit Quality Management Teams' evaluate the control environment and enhance as needed

Activity 1
The Company has approved the creation of a new section called Quality Center of Excellence (QCOE). QCOE is a team that provides leadership, best practices, research, support, and training for the improvement of quality management. The QCOE is managed from a common central point, separate from the functional areas, and primarily engages with the leaders of the quality management teams. The design and development of the QCOE recently began with the hiring of the section manager in October of 2020.
The Quality Center of Excellence (QCOE) has been initiated with the following mission priorities:

- Champion a single harmonized quality management approach across the enterprise
- Share information, learning, data, and practices across organizational boundaries for effective integration of risk, compliance, and quality
- Enhance quality proficiency and expertise within the company
- Internal operational controls design, testing, and implementation
- Establish Assurance Framework – Evaluate external and internal threats, opportunities, and quality

Activity 2
There are twelve quality management groups at Con Edison. Quality management groups working with the applicable operational areas will review the existing control processes, risk prioritize for effectiveness, and enhance the control environment. QCOE will support by providing framework and tools for evaluation methods.

- To begin Activity 2, the initial project step will be to inventory the operational processes that support key business objectives.

Relevant Protocols/Procedures:
Activity 1: Quality Center Charter of Operation (does not exist presently, due September 1,2021)
Activity 2: Various standard operating procedures for each quality management group

Recommendation Number: B-MO-27

Recommendation: Improve Proactive Asset Management Company-Wide

Staff Target Completion: 2/28/21

Company Timeframe for Completion: 12/31/21

Company Response: Accept

Company Priority: Tier 3

Status of Recommendation: In-Progress

For the Company's Transmission System, Con Edison is working with the North American Transmission Forum (NATF) to develop a Principles of Excellence (POE) document. The objective is to define the features of a transmission asset management program that ensures excellence in all phases of the asset lifecycle (acquire, operate, maintain and dispose). The Company plans to follow the recommendations of the POE to implement improvements in our asset management program consistent with industry best practices. This document is expected to be completed in 2021.

Relevant Protocols/Procedures:
Principles of Excellence Document