

Climate Change Vulnerability Study and Resilience Plan Update

Public Service Law (PSL) § 66(29) – PSC Case 22-E-0222

O&R Climate Resilience Working Group
October 30, 2023

AGENDA

- Resilience Plan Progress Update
- Review of O&R Resilience Plan Portfolio
- Equity Considerations
- Feedback and discussion on Resilience Plan draft
- Next Steps

Climate Study and Resilience Plan

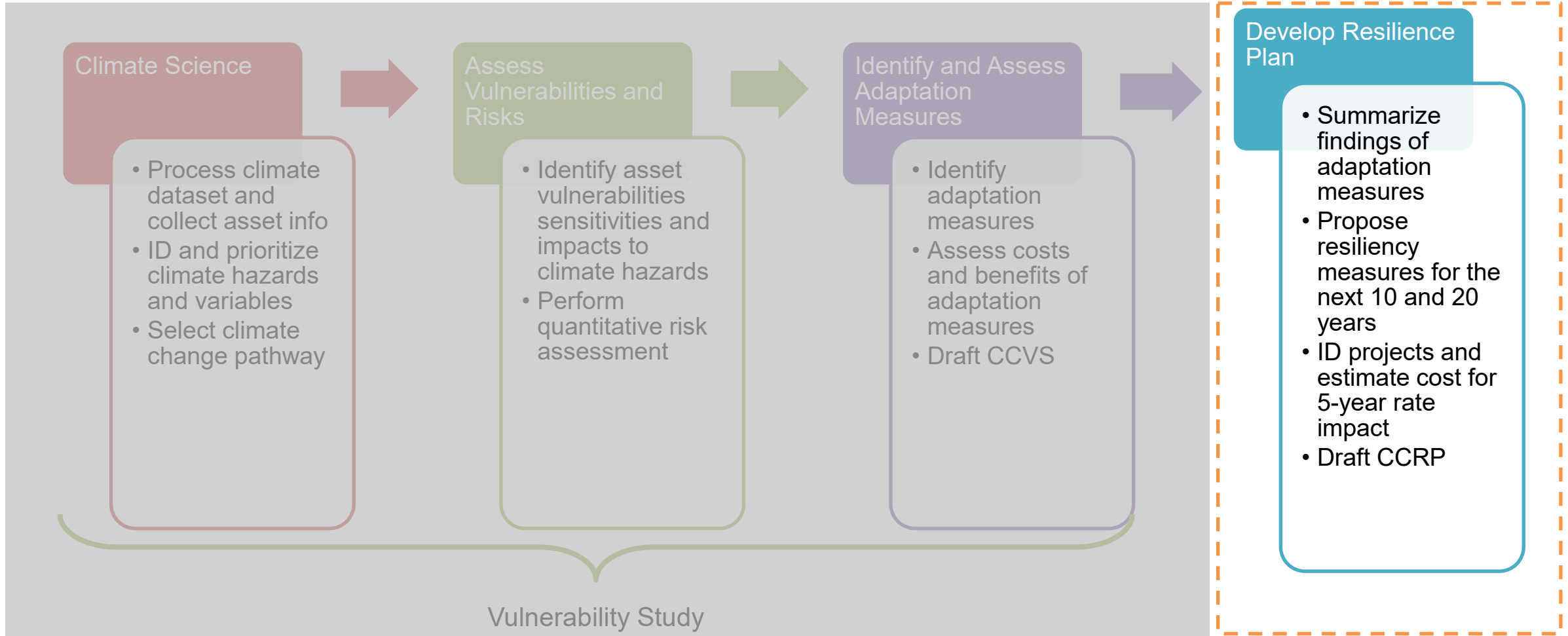
Working Group Input and Support

- ✓ **Awareness** of latest climate data projections and priority climate hazards
- ✓ **Alignment** on recommended climate pathways and associated risk tolerances
- ✓ **Considerations** for potential adaptation measures
- ☐ **Review feedback** of draft Resilience Plan

Timeline

Quarters	Key Milestones
2022 4Q	Review impacts and trends of latest climate data
2023 1Q	Share recommended pathways and risk tolerances
2023 2Q	Adaptation options and implementation schedules
2023 3Q	Climate Study Feedback from WG (8/23 – 9/6) Climate Vulnerability Study filing (September) Initial investment plans for resilience-related projects and programs
2023 4Q	Finalize climate resilience plans Climate Resilience Plan Feedback from WG (10/24 – 11/3) O&R files Resilience Plan with PSC (November)
2024	Commission’s action on Plan (October)

Orange & Rockland C CVS & CCRP Process Flow



Flood Mitigation

Flood Mitigation

Summitville Substation Flooding Mitigation

Program Scope & Resiliency Benefits

Program Scope:

- In the near term, install a paved 30” perimeter berm to prevent or control flow of water until substation retirement in 2032
- Summitville substation set to be retired and replaced with the Wurtsboro station

Resiliency Benefits:

- Reduced substation equipment vulnerability to damage failure from flooding due to extreme rain events, and location within FEMA 100-year floodplain
- Avoid restoration and replacement costs
- Avoid customer service outages

Climate Drivers

Climate Change Vulnerabilities:



Precipitation

- FEMA 100-year flood map shows possible inundation depth of up to ~2 feet
- Maximum 5-day precipitation could increase 13% by 2050 at Dobbs Ferry.
- The number of days per year with precipitation exceeding 2 inches could increase 45% by 2050 and 77% by 2080 at Dobbs Ferry.

Resiliency Funding Request & Drivers

- Total 5-yr funding request: \$0.14 million (capital)

	2025	2026	2027	2028	2029
Capital (\$000)	\$140	\$	\$	\$	\$
O&M (\$000)	–	–	–	–	–

Flood Mitigation

Hillburn Substation Flooding Mitigation

Program Scope & Resiliency Benefits

Program Scope:

- In the near-term Install 48” perimeter berm to prevent or control water, and waterproof control cabinets as extra layer of protection
- In the longer term, two possible paths to enhance resilience to flooding:
 - Relocate substation to area less susceptible to flooding
 - Elevate the entire facility on raised site grade elevation

Resiliency Benefits:

- Reduce substation equipment damage failure from extreme rain events
- Increased reliability and life expectancy of assets
- Avoid customer service outages

Climate Drivers

Climate Change Vulnerabilities:



Precipitation

- FEMA 100-year flood map shows possible inundation depth around 1 foot adjacent to the substation site.
- Maximum 5-day precipitation could increase 13% by 2050 at Dobbs Ferry.
- The number of days per year with precipitation exceeding 2 inches could increase 45% by 2050 and 77% by 2080 at Dobbs Ferry.

Resiliency Funding Request & Drivers

- Total 5-yr funding request: \$0.5 million (capital)

	2025	2026	2027	2028	2029
Capital (\$000)	\$500	\$ -	\$ -	\$ -	\$ -
O&M (\$000)	-	-	-	-	-

Flood Mitigation

Lovett 138kV Substation Flooding Mitigation

Program Scope & Resiliency Benefits

Program Scope:

- In the near-term construct two primary flood protection measures: raising the control house and installing waterproof cabinets
- In the longer term, two possible paths to enhance resilience to flooding:
 - Relocate substation to area less susceptible to flooding
 - Elevate the entire facility and fortify with a retaining wall

Resiliency Benefits:

- Increased ability to withstand climate-driven flood risks
- Avoid restoration and replacement costs
- Avoid customer service outages

Climate Drivers

Climate Change Vulnerabilities:



Precipitation / Sea Level Rise

- Projections show sea levels could rise 16 inches by the 2050s.
- FEMA 100-year flood map combined with sea level rise could result in inundation of 5 feet by 2050
- Maximum 5-day precipitation could increase 13% by 2050 at Dobbs Ferry.
- The number of days per year with precipitation exceeding 2 inches could increase 45% by 2050 and 77% by 2080 at Dobbs Ferry.

Resiliency Funding Request & Drivers

- Total 5-yr funding request: \$13.2 million (capital)

	2025	2026	2027	2028	2029
Capital (\$M)	\$ 2,550	\$ 5,250	\$ 5,400	\$	\$
O&M (\$M)	–	–	–	–	–

Flood Mitigation Shoreline Erosion Protection Program

Program Scope & Resiliency Benefits

Program Scope:

- Expand the existing inspection program with a more proactive mitigation approach
- Armoring additional structures along rivers per year
- Implement mitigation measures such as riprap or retaining walls to prevent erosion and potential failure of overhead structure

Resiliency Benefits:

- Provide long-term solution for shoreline erosion damage due to sea level rise and flooding from severe coastal storms
- Reduce flood risk to O&R's shoreline infrastructure
- Avoid customer service outages

Climate Drivers

Climate Change Vulnerabilities:



Precipitation / Sea Level Rise

- Projections show sea levels could rise 16 inches by the 2050s for assets near the Hudson River
- North Atlantic hurricanes could become more intense with rainfall amounts increasing approximately 10% to 15% relative to historical hurricanes.

Resiliency Funding Request & Drivers

- Total 5-yr funding request: \$5.3 million (capital) and \$1.04 million (O&M)

	2025	2026	2027	2028	2029
Capital (\$000)	\$ 1,000	\$ 1,030	\$ 1,060	\$ 1,090	\$ 1,130
O&M (\$000)	\$ 200	\$ 210	\$ 270	\$ 170	\$ 190

Wind & Ice

Wind & Ice

Selective Undergrounding Program

Program Scope & Resiliency Benefits

Program Scope:

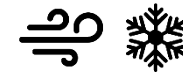
- 2025-2027: Identified specific projects for undergrounding ~11 miles of overhead distribution lines and 4 underground transmission projects
- 2028-2029: Program target to underground an additional 19 miles of overhead distribution line

Resiliency Benefits:

- Enhance durability and reliability of distribution and transmission systems
- Mitigate exposure to external hazards such as weather events, wildlife contact, and car accidents
- Avoid customer service outages

Climate Drivers

Climate Change Vulnerabilities:



Wind / Ice

- The service area is likely to experience higher wind speeds and gusts during tropical cyclones, extratropical cyclones, and thunderstorms.
- The potential remains for increased freezing rain frequency and ice accumulation.
- North Atlantic hurricanes could become more intense (~5% increase) relative to historical hurricanes.

Resiliency Funding Request & Drivers

- Total 5-yr funding request: \$143.4 million (capital)

	2025	2026	2027	2028	2029
Capital (\$000)	\$ 38,880	\$ 47,860	\$ 16,420	\$ 18,000	\$ 22,200
O&M (\$000)	–	–	–	–	–

Wind & Ice

Enhanced Overhead (Hendrix System)

Program Scope & Resiliency Benefits

Program Scope:

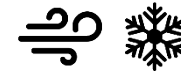
- 2025-2028: Identified specific projects for reinforcing ~23 miles of overhead distribution lines with Hendrix spacer cable
- 2025-2029: Program target of reinforcing an additional ~56 miles

Resiliency Benefits:

- Enhance durability and reliability of distribution system
- Mitigate exposure to external hazards such as weather events and tree contact
- Avoid customer service outages

Climate Drivers

Climate Change Vulnerabilities:



Wind / Ice

- The service area is likely to experience higher wind speeds and gusts during tropical cyclones, extratropical cyclones, and thunderstorms.
- The potential remains for increased freezing rain frequency and ice accumulation.
- North Atlantic hurricanes could become more intense relative to historical hurricanes.

Resiliency Funding Request & Drivers

- Total 5-yr funding request: \$66.8 million (capital) and \$16.7 million (O&M)

	2025	2026	2027	2028	2029
Capital (\$000)	\$ 14,040	\$ 10,800	\$ 13,910	\$ 14,250	\$ 13,800
O&M (\$000)	\$ 3,510	\$ 2,700	\$ 3,480	\$ 3,560	\$ 3,450

Wind & Ice

Overhead Structure Replacement Program

Program Scope & Resiliency Benefits

Program Scope:

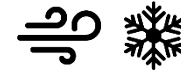
- Supplement inspection-based pole replacement with a proactive approach that gives a weighted consideration of pole age
- Would consider replacement of existing poles with either new wood poles or steel structures

Resiliency Benefits:

- Increased ability to withstand more frequent and intense storm events
- Reduces maintenance costs and minimizes unplanned repair expenditures
- Avoid customer service outages

Climate Drivers

Climate Change Vulnerabilities:



Wind / Ice

- O&R is likely to experience higher wind speeds and gust during tropical cyclones, extratropical cyclones, and thunderstorms in the future.
- Projections show that maximum wind gusts could reach 110 mph in the future.
- The potential exists for increased radial icing intensity during ice storms.

Resiliency Funding Request & Drivers

- Total 5-yr funding request: \$20.1 million (capital)

	2025	2026	2027	2028	2029
Capital (\$000)	\$ 2,250	\$ 3,090	\$ 3,980	\$ 4,920	\$ 5,910
O&M (\$000)	–	–	–	–	–

Wind & Ice

Expand Hazard Tree Removal

Program Scope & Resiliency Benefits

Program Scope:

- Expansion of Hazard tree program to a level to support removing ~4,000 hazard trees per year increased from the current level of ~1,300 per year
- Focus on ash trees weakened by impacts of the Emerald Ash Borer which elevate risk of impact to overhead lines under higher wind and rain projections
- Since program conception in 2018, over 7,100 hazards trees have been removed, of which 70% were ash trees

Resiliency Benefits:

- Avoid customer service outages from damage of downed trees to electric equipment, lines, and structures
- Increased ability of assets to withstand severe thunderstorms, strong winds, and ice accumulation

Climate Drivers

Climate Change Vulnerabilities:



Wind / Ice

- Projections show that the number of days per year with more than 2 inches of rain could increase 45% by 2050 and 77% by 2080 at Dobbs Ferry.
- North Atlantic hurricanes are projected to become more intense and have higher rainfall amounts (~10%-15% increase) relative to historical hurricanes.

Resiliency Funding Request & Drivers

- Total 5-yr funding request: \$12.7 million (O&M)

	2025	2026	2027	2028	2029
Capital (\$000)	–	–	–	–	–
O&M (\$000)	\$ 2,400	\$ 2,470	\$ 2,550	\$ 2,620	\$ 2,700

Multiple Hazards

Multiple Hazards Distribution Automation/Smart Grid

Program Scope & Resiliency Benefits

Program Scope:

- Accelerate the installation and commissioning of SCADA controlled devices (reclosers, smart capacitors, remotely operated switches, and power quality sensors) on a feeder-by-feeder basis
- Install and upgrade field devices with command-and-control schemes
- Three-tiered approach: (1) Feeder Optimization, (2) Field Automation, (3) Centralized Automation Control

Resiliency Benefits:

- Reduce potential customer outages during storms by automatically isolating faults
- Expedite storm response by remotely activating devices

Climate Drivers

Climate Change Vulnerabilities:



Extreme Events

- Projections show that maximum wind gusts could reach 110 mph in the future.
- The frequency of strong storms could increase in the future, with higher rainfall amounts and stronger winds.
- The number of days per year with precipitation exceeding 2 inches could increase 45% by 2050 and 77% by 2080 at Dobbs Ferry.

Resiliency Funding Request & Drivers

- Total 5-yr funding request: \$60.6 million (capital)

	2025	2026	2027	2028	2029
Capital (\$000)	\$ 12,000	\$ 12,100	\$ 12,100	\$ 12,200	\$ 12,300
O&M (\$000)	–	–	–	–	–

Multiple Hazards

Emergency Response Operation and Control Facility

Program Scope & Resiliency Benefits

Program Scope:

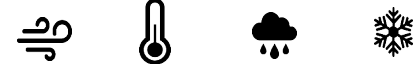
- Install a dedicated emergency response operation and control facility on existing land owned by O&R across from the Blooming Grove Operating Center
- This location is centrally located within the O&R service territory and has easy highway access for emergency storm response events.

Resiliency Benefits:

- Having a dedicated facility that will be configured as an emergency response control facility will save time when mobilizing for storm coordination and response.

Climate Drivers

Climate Change Vulnerabilities:



Extreme Events

- The service area is likely to experience more frequent and intense events such as high winds, icing, and high heat.
- North Atlantic hurricanes could become more intense and have higher rainfall amounts (~10% to 15% increase) relative to historical hurricanes.
- The probability of coincident extreme events will likely continue to increase in both frequency and intensity in the future.


Resiliency Funding Request & Drivers

- Total 5-yr funding request: \$14.6 million (capital) and \$1.1 million (O&M)

	2025	2026	2027	2028	2029
Capital (\$000)	\$ 2,100	\$ 5,040	\$ 7,410	–	–
O&M (\$000)	–	–	–	\$ 550	\$ 550

Multiple Hazards

Storm Material Management

Program Scope & Resiliency Benefits	Climate Drivers
<p>Program Scope:</p> <ul style="list-style-type: none"> This program will install a dedicated storm material warehousing facility on existing land owned by O&R across from the Blooming Grove Operating Center This location is centrally located within the O&R service territory and has easy highway access for emergency storm response events Facility will house critical spare equipment inventory for <ul style="list-style-type: none"> \$5 million for the transmission system \$9 million for the distribution system <p>Resiliency Benefits:</p> <ul style="list-style-type: none"> Reduces event recovery time by making spare parts available more quickly Mitigates elongated lead times from existing supply chain issues 	<p>Climate Change Vulnerabilities:</p> <p style="text-align: center;">  </p> <p style="text-align: center;">Extreme Events</p> <ul style="list-style-type: none"> The service area is likely to experience more frequent and intense events such as high winds, icing, and high heat. North Atlantic hurricanes could become more intense relative to historical hurricanes. The probability of coincident extreme events will likely continue to increase in both frequency and intensity in the future.

Resiliency Funding Request & Drivers

- Total 5-yr funding request: \$35.2 million (capital) and \$1.1 million (O&M)

	2025	2026	2027	2028	2029
Capital (\$000)	\$ 3,650	\$ 8,470	\$ 13,790	\$ 4,590	\$ 4,730
O&M (\$000)	–	–	–	\$ 550	\$ 550

Multiple Hazards Storm Resilience Center

Program Scope & Resiliency Benefits

Program Scope:

- State-of-the-art, joint use (Con Edison and O&R) storm response facility with two focus areas:
 - Reduce outage times through quicker mutual aid support facilitation
 - Provide training and coordination to better prepare and respond to extreme weather events

Resiliency Benefits:

- More efficient and faster recovery times after storms
- Promote utility and community collaboration

Climate Drivers

Climate Change Vulnerabilities:



Extreme Events

- The service area is likely to experience more frequent and intense events such as high winds, icing, and high heat.
- North Atlantic hurricanes could become more intense and have higher rainfall amounts (~10% to 15% increase) relative to historical hurricanes.
- The probability of coincident extreme events will likely continue to increase in both frequency and intensity in the future.

Resiliency Funding Request & Drivers

- Total O&R 5-yr funding request: \$12.6 million (capital) and \$0.37 million (O&M)

	2025	2026	2027	2028	2029
Capital (\$000)	\$ 2,060	\$ 1,280	\$ 3,410	\$ 2,910	\$ 2,960
O&M (\$000)	–	\$ 30	\$ 70	\$ 70	\$ 200

Multiple Hazards

Micronet Weather Station Expansion

Program Scope & Resiliency Benefits

Program Scope:

- As part of a Shared Service, O&R is looking to installing 7 Micronet weather stations and instrumentation in Orange and Rockland Counties
- These instruments can measure temperature, wind, precipitation, humidity, and barometric pressure to capture hyperlocal weather conditions

Resiliency Benefits:

- Better understanding of the hyperlocal impacts of climate change
- Reduce restoration times and outage costs by providing a more granular view of weather progression and impacts

Climate Drivers

Climate Change Vulnerabilities:



Extreme Events

- The service area is likely to experience more frequent and intense events such as high winds, icing, and high heat.
- The probability of coincident extreme events will likely continue to increase in both frequency and intensity in the future.

Resiliency Funding Request & Drivers

- Total O&R 5-yr funding request: \$0.38 million (capital) and \$0.41 million (O&M)

	2025	2026	2027	2028	2029
Capital (\$000)	\$ 380	–	–	–	–
O&M (\$000)	–	\$ 100	\$ 100	\$ 103	\$ 106

Proposed Performance Measures

The following are performance measures that are proposed for the Resilience Plan investments. We will continue to learn over time as we integrate resilience into our planning, operations, and response.

Program / Project	Proposed Implementation-Based Measures	Proposed Outcome-Based Measures
Distribution Automation/Smart Grid	Number of devices installed per year	Avoided outages
Hillburn, Summitville, Lovett 138kV Substations Flooding Mitigation	Completion of planned protection measures on schedule and on budget	Substation equipment impacted by flooding event
Overhead Structure Replacement Program	Number of overhead structures replaced per year	Average overhead pole health rating
Shoreline Erosion Protection Program	Number of structures armored per year	Average overhead pole health rating
Distribution Undergrounding Program	Miles of circuit undergrounded per year compared to planned miles	Average SAIFI (pre- and post- hardening, no storm exclusions)
Enhanced OH (Hendrix System)	Miles of overhead distribution line reinforced with Hendrix spacer cable per year compared to planned miles	
Storm Resilience Center / O&R Emergency Response Control Facility	Facility development on schedule and on budget	Time to onboard crews, Facility Utilization

Note: These measures will not be weather-normalized.

Equity Considerations

The following are equity considerations that are proposed in the Resilience Plan. We will continue to learn over time as we measure and report on investments in overburdened communities (i.e., DACs).

- Engineering, planning, safety and resilience needs remain primary drivers
- Biennial retrospective reporting on projects that impact DACs
 - Track our investments benefiting DACs
 - Report on customer outages in DAC vs. non-DAC areas
- For selective undergrounding, include equity considerations in project prioritization process as appropriate

DISCUSSION AND FEEDBACK

Feedback on Climate Change Resilience Plan (“CCRP”)

- **CCRP Outline:**

- Executive Summary
- Introduction and Background
- Engagement of the Climate Resilience Working Group
- Multi-pronged Resilience Strategy and Approach
- Consideration of Equity
- Investment Plan
- Governance
- Performance Measures
- Conclusion and Next Steps

CCRP REVIEW AND FILING SCHEDULE

Next Steps on the Resilience Plan

Date	Deliverable to Working Group
October 24	Sent draft of the Resilience Plan for review and feedback
October 30	The WG can provide additional feedback on the Plan submittal during the Working Group meeting
November 3	Request feedback from Working Group for incorporation into the Resilience Plan
By November 21, 2023	Resilience Plan filing



Orange & Rockland