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
August 29, 2023

AGENDA

- Progress Update
- Climate Change Vulnerability Assessment Process & Results
- Potential Adaptation Options
- Identified Climate Resilience Measures
- 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 (ongoing)
- ❑ **Review and feedback** of CCVS and Resilience Plan at key draft stages

Timeline

Quarters	Key Milestones
2022 4Q 2023 1Q	Review impacts and trends of latest climate data 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 (October)** O&R files Resilience Plan with PSC (November)
2024	Commission's action on Plan (October)

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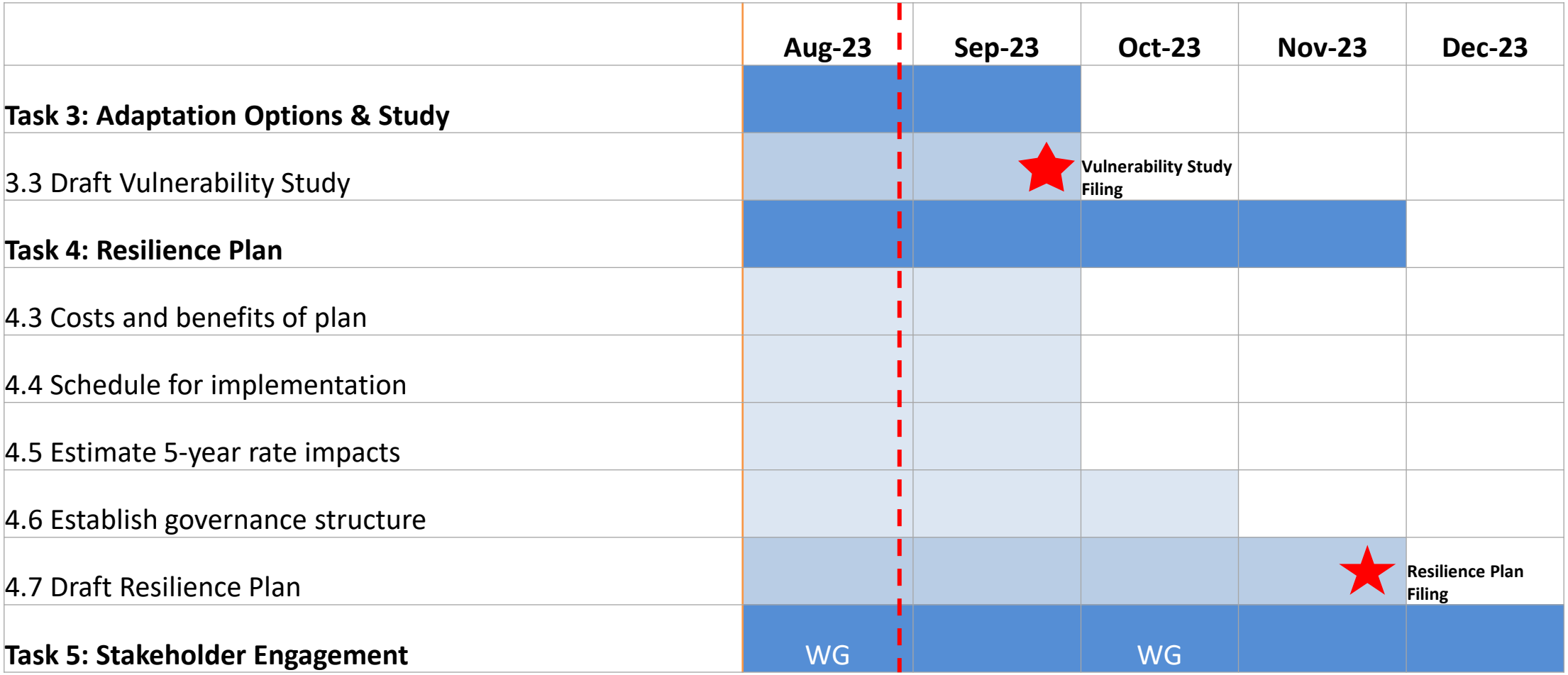
Timeline of Execution



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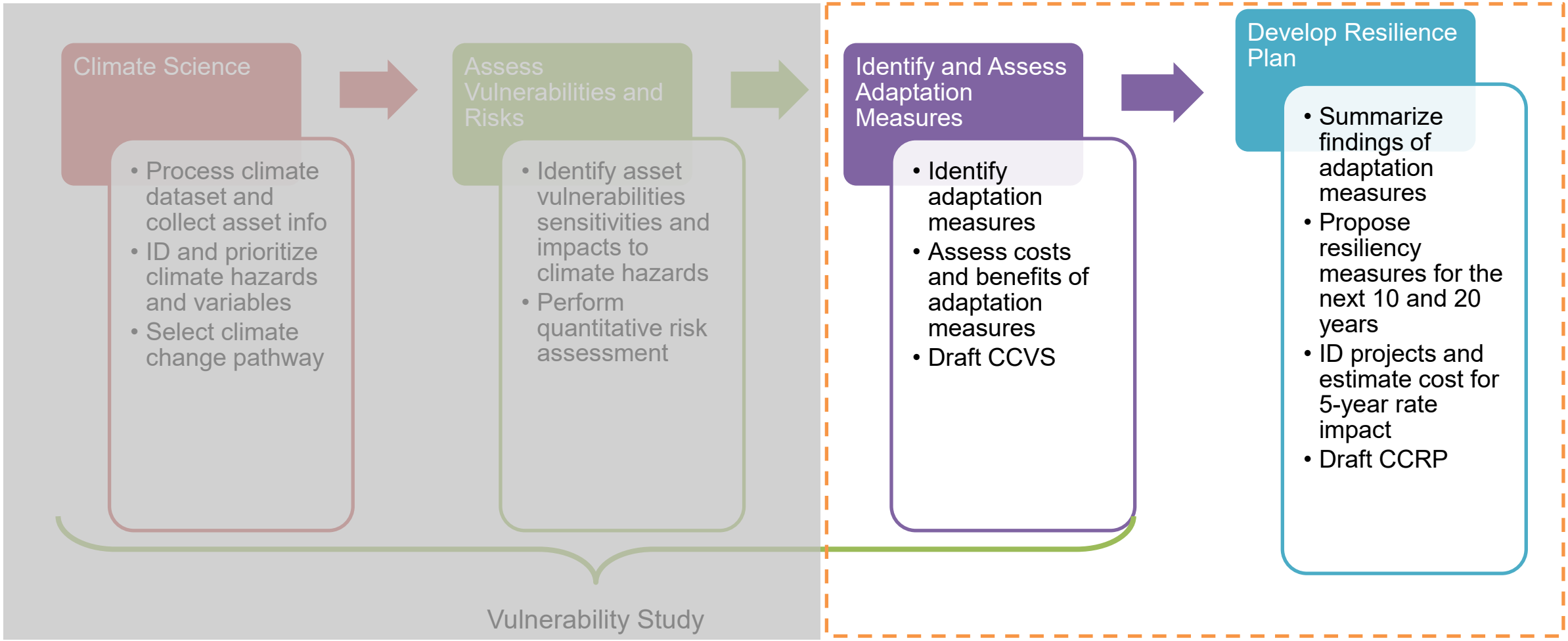
Orange & Rockland CCVS & CCRP Process Flow



Stakeholder Engagement

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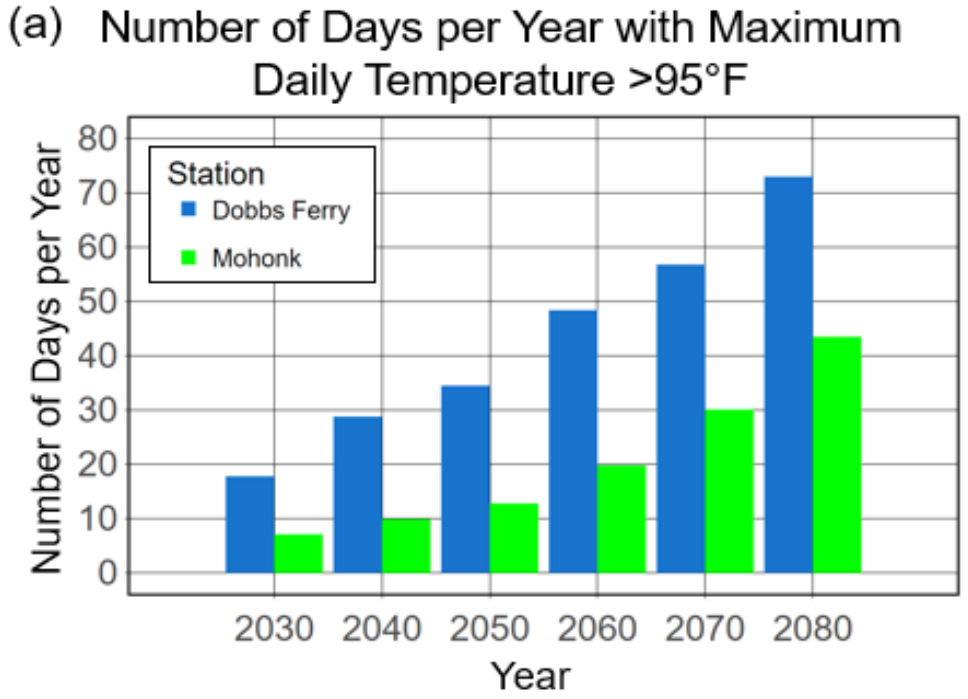
Extreme Heat and Humidity

Climate Data Highlights

- Coincident high heat and humidity events are expected to increase in magnitude and frequency
  - Highest annual maximum daily temperature projected to reach 105°F (2050s) and 112°F (2080s)
- Duration of extreme heat events are projected to increase
  - Longest duration heat waves with maximum daily temperatures > 95°F projected to be over 7 days (2050s) and 14 days (2080s)



Vulnerability Highlights

- Substations could experience reduced capacity and accelerated asset degradation
- High heat events and increased demand leading to reduced margin and possible load relief planning
- Increasing heat, humidity and poor air quality events resulting in more frequent worker breaks

Extreme Precipitation and Flooding

Climate Data Highlights

- Increasing intensity and frequency of heavy rain events
  - Days with more than 2 inches of rain increasing 44% by 2050
  - 5-day maximum precipitation increasing 13% by 2050
- Sea level in the Hudson River rising, increasing size of the floodplain
  - 16” sea level rise projected by 2050
  - 30” sea level rise projected by 2080

Vulnerability Highlights

- 3 substations exposed to potential flooding hazard:
  - Lovett Substation (Hudson River)
  - Hillburn Substation (Ramapo River)
  - Summitville Substation (Delaware and Hudson Canal)
- Underground transmission and distribution lines could experience more frequent inundation
- Potential operational implications for emergency response and service restoration

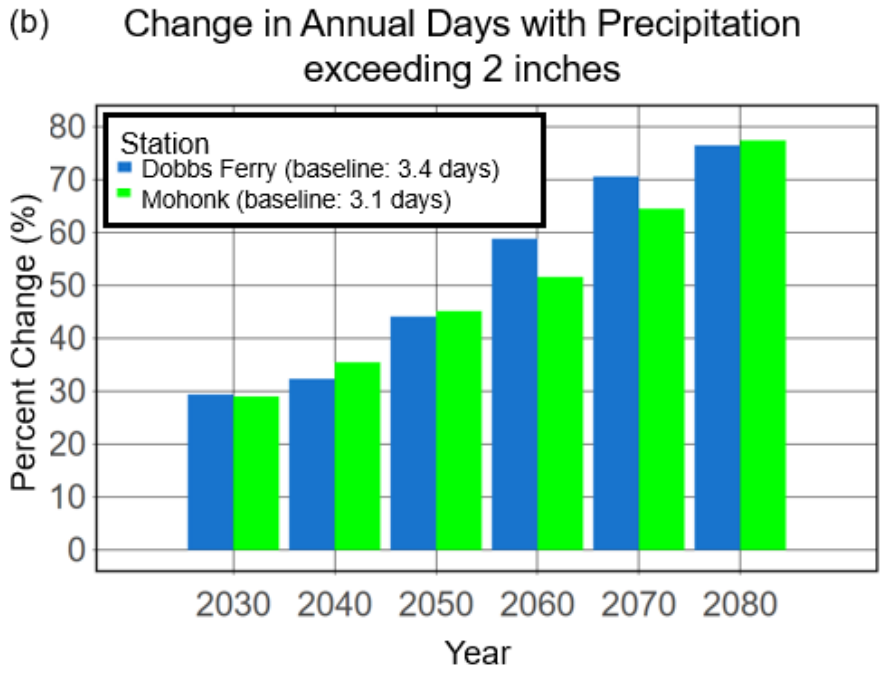


Figure. Summitville substation (red point) with the FEMA 100- and 500-year floodplains overlaid

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Extreme Wind and Icing Events

Climate Data Highlights

- Increasing intensity of storms with high wind, including hurricanes, tropical cyclones, nor'easters
- Potential for increasing intensity of freezing rain and ice accumulation, decreasing frequency

Extreme Event	Future Frequency	Future Intensity
Hurricanes and tropical cyclones	Unchanged	Increase
Lightning and tornadoes	Potentially Increase	Potentially Increase
Snow and ice	Decrease	Increase

Table. Summarized future changes in frequency and intensity of extreme events in the O&R service territory.

Vulnerability Highlights

- Overhead distribution lines are most vulnerable to ice and wind
- Overhead transmission lines are also vulnerable, but are designed to withstand higher wind speeds and have larger clearances
- Impacts from wind are primarily vegetation contact to overhead lines
- Implications for vegetation management, emergency response, reliability planning, workforce safety, spare equipment management

Physical Asset Vulnerability Assessment Results

The most vulnerable asset/hazard combinations for O&R were flooding with substations and wind with transmission. The Study Team has identified three substations with high flood exposure to inland and tidal flooding.

	Temperature & Temperature Variable (TV)	Flooding	Wind & Ice
Substations			
Overhead Transmission			
Overhead Distribution			
Underground T&D			
Critical Facilities			

High vulnerability
Medium vulnerability
Low vulnerability

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Identified Climate Resilience and Potential Adaptation Options

Assessment of highly vulnerable asset/climate hazard risk led to identification of potential adaptation options to address climate hazards

Climate Hazard	System	Asset	Adaptation Measures
Flooding	Substations	• All equipment	• Perimeter protection (temporary barrier or flood wall) • Elevate equipment • Relocate substation outside floodplain • Flood pumps • Install highest critical equipment in waterproof cabinets
Heat	Transmission	• Conductors	• Energy efficiency / demand response • Reconductoring to increase capacity • Install additional feeders • Non-wires solutions to reduce load
Heat	Substations	• Transformers • Regulators	• Replace with higher rated unit • Install additional transformers to reduce loading • Non-wires solutions to reduce load • Install additional cooling

Identified Climate Resilience and Potential Adaptation Options

Assessment of highly vulnerable asset/climate hazard risk led to identification of potential adaptation options to address climate hazards

Climate Hazard	System	Asset	Adaptation Measure
Wind & Ice	Transmission	• Conductors • Towers	• Replace towers • Reinforce towers • Undergrounding • Increase clearances
Wind & Ice	Distribution	• Conductors • Poles	• Undergrounding • Increase clearances • Retrofit with aerial cable and stronger poles
Various	Distribution	• All	• Intelligent grid technologies • Advanced voltage optimization • Self-healing technologies

Questions and Feedback on the CCVS

- Executive summary
- Introduction
- Climate Data and Future Projections
  - Data Sources
  - Selected Climate Change Pathway
  - Tailored Climate Data Analysis
  - Climate Data Results: Temperature, Humidity, Precipitation, Sea Level Rise and Coastal Flooding, Inland Flooding, Wind and Ice
- Extreme events
  - Hurricanes and Tropical Cyclones, Snow and Ice, Cold Snaps and Polar Vortex Events, Lightning and Thunderstorms, Drought, Wildfire, Multiple Extreme Events
- Physical vulnerability assessment
  - Methods
  - Summary of Findings
  - Temperature and Temperature Variable
  - Flooding
  - Wind and Ice
  - Compound and Sequential Events
- Operational vulnerability assessment
- Potential adaptation measures
- Conclusion and next steps
- References
- Appendices

CLIMATE CHANGE RESILIENCE PLAN (CCRP)

Preliminary List of Identified Resiliency Measures

The identified climate resilience measures include new projects (substation flood protection) and incremental changes to existing resilience programs based on the latest science.

Substation Flood Protection

- Hillburn Station Flood Protection
- Summitville Station Replacement
- Lovett 138 kV Station Flood Protection & Cabinet Retrofit

Shoreline Protection

- Erosion Monitoring Program
- Transmission Shoreline Restoration

- Load relief & capacity planning
- Overhead Hardening & Vegetation Management
- Accelerate Distribution Automation
- Storm Resilience Center*
- Worker Safety and PPE*
- Transmission Structures & Under-grounding
- Storm Material Management*
- Weather Monitoring*

***Denotes programs and projects that are Shared Services with CECONY (i.e., Emergency Preparedness, EH&S, Stores Operations)**

Climate Hazard Mitigation For:

- Flood
- Heat
- Wind
- Multiple

Next Steps on the CCVS and Resilience Plan

Date	Deliverable to Working Group
August 23 – September 6, 2023	Full draft of the CCVS for review and feedback
August 29, 2023	The Working Group can provide additional feedback on the CCVS during this meeting. We will also be discussing identified resilience measures for our Resilience Plan.
September 22, 2023	**CCVS filing**
Week of October 16	Send draft of the Resilience Plan for review and feedback
Week of October 23 (WG meeting)	The WG can provide additional feedback on the Plan submittal.
By November 21, 2023	**Resilience Plan filing**

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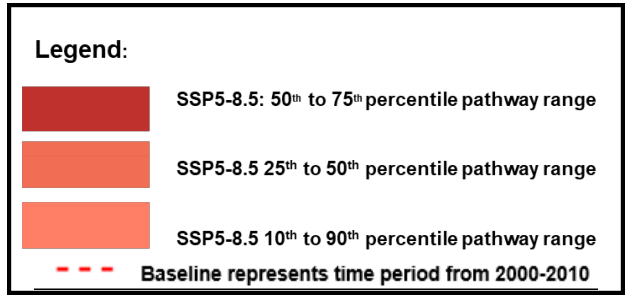
Orange & Rockland

Climate Change Pathways Background

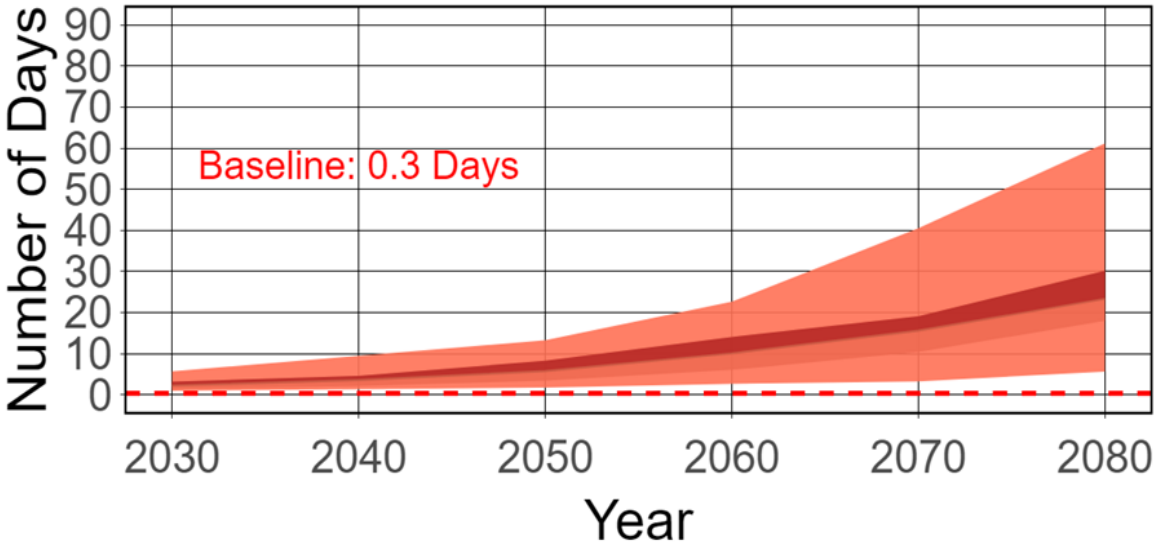
Climate Change Pathway selection to guide the design and planning process

Climate Change Pathways represent O&R's level of risk tolerance to future climate projections and are based on scenarios of socioeconomic activity, levels of GHG emissions and their atmospheric concentrations, known as Shared Socioeconomic Pathways (SSPs)



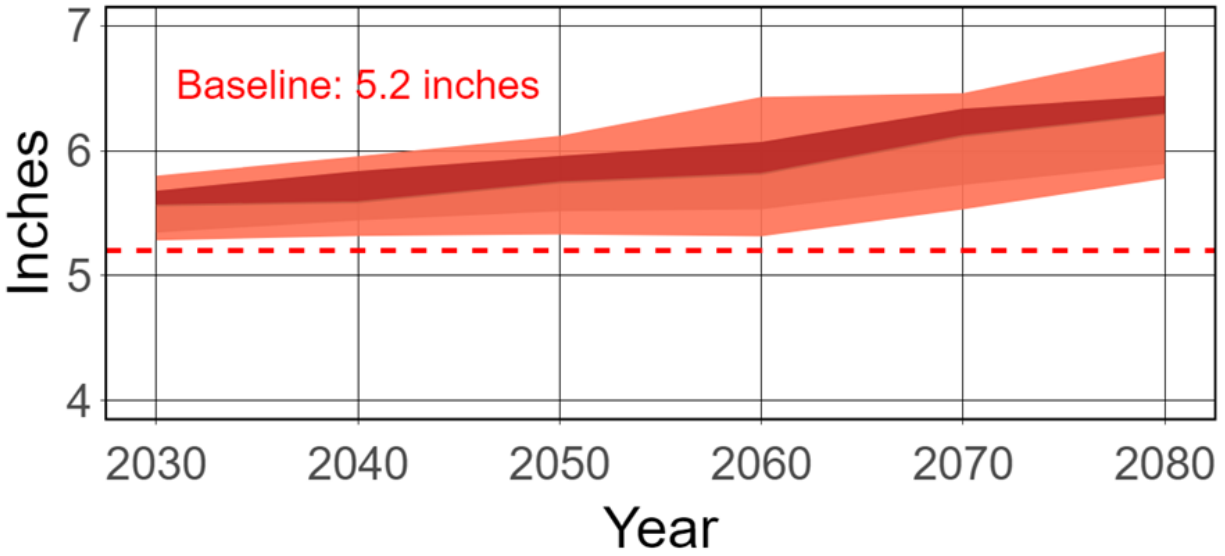
Mohonk SSP5-8.5 Projections:

Days per year with ambient daily temperature>86°F



Mohonk SSP5-8.5 Projections:

Maximum 5-day Precipitation (inches)



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