

Orange & Rockland Climate Resilience Working Group

Public Service Law (PSL) § 66(29) – PSC Case 22-E-022

Kickoff Meeting

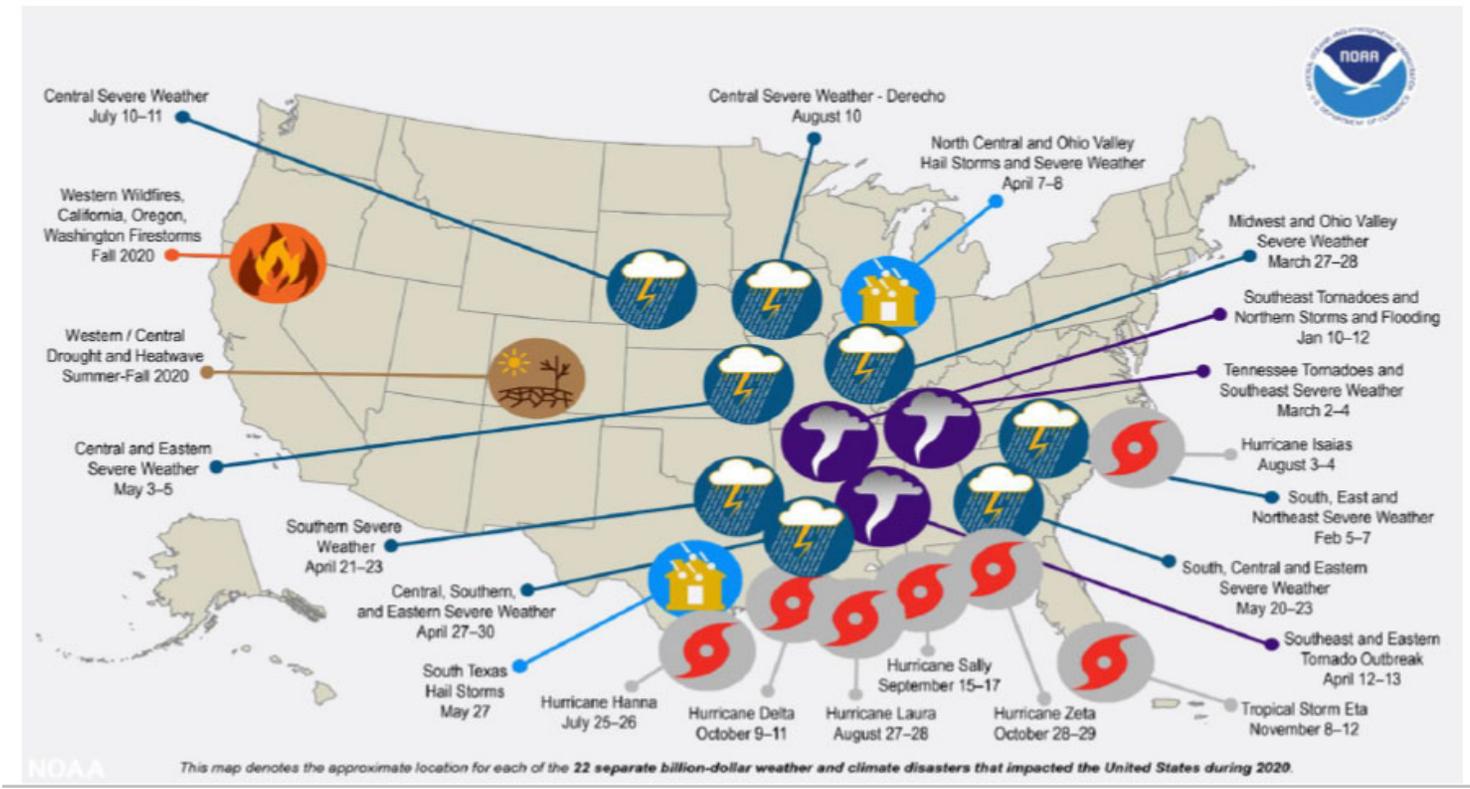
August 10, 2022

AGENDA

- Increase in Extreme Weather Events
- Paulin Law Legislation Discussion
- Climate Change Vulnerability Study (“CCVS”) – Describe the Study process
- Climate Change Resilience Plan (“CCRP”) – An output of the CCVS process
- Working Group Engagement Structure
- Timeline of Execution
- Stakeholder Input and Engagement
- Current Status & Next Steps

Increase in Extreme Weather Events

During the past five years, the U.S. faced intensifying weather conditions and resulting customer interruptions; 2020 was the hottest year on record, and the U.S. experienced multiple billion-dollar weather events.



Paulin Law Legislation

On March 22, 2022, New York State Public Service Law §66(29) went into effect. The Law is intended to facilitate electric utility planning and resilience measures to address anticipated future extreme weather.

- Orange & Rockland’s goal is to provide energy to our customers by leveraging our safe, reliable and resilient infrastructure.
 - Climate change is already altering patterns of energy demand and constraining some sources of energy supply, both by changing baseline averages and frequency and intensity of extreme events
 - Responses to climate-driven impacts will have to deal with an energy system that is becoming more reliant on renewables and distributed resources
- Electric companies to submit a **Climate Change Vulnerability Study (“CCVS”)** that will aim to identify climate change risk and incorporate it with our system design, planning and operations.
- Electric companies to submit a **Climate Change Resiliency Plan (“CCRP”)** that will identify projects that will need to be implemented in order to make our system more resilient to future extreme weather-related events.

Climate Change Vulnerability Study & Resilience Plan Process

Climate Change Vulnerability Study

- Evaluate Orange & Rockland's infrastructure, design specs, and procedures to understand vulnerability to climate-driven risks
- Include adaptation measures to address vulnerability
- Study will be performed with supporting climate data from NYSERDA and Columbia University
- Due: September 2023

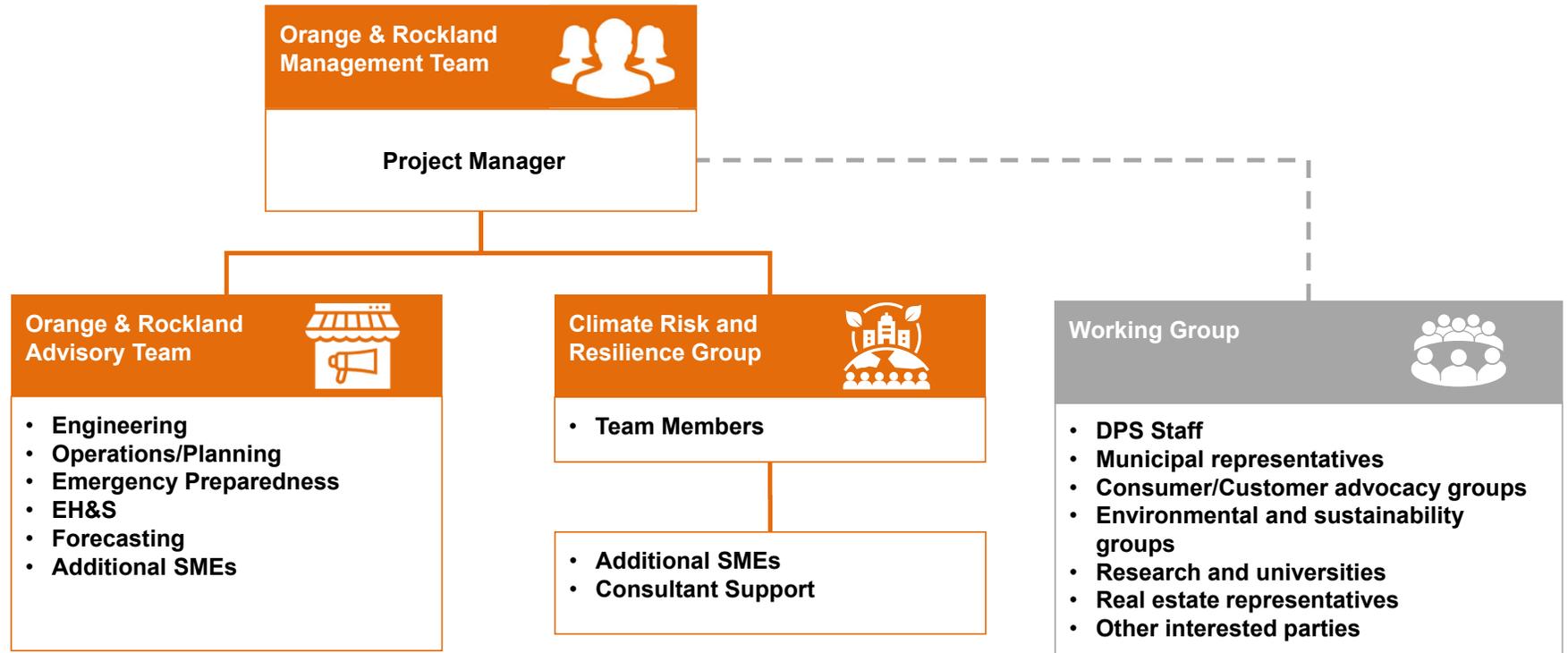
Climate Change Resilience Plan

- Propose hardening measures for the next 10 to 20 years
- Explain the systematic approach to achieve the objectives of mitigating the impacts of climate change to infrastructure, reducing restoration costs and outage times
- Detail how Orange & Rockland will incorporate climate change into planning, design, operations, and emergency response
- Detail how Orange & Rockland will manage climate change risk and resiliency, and minimize costs
- Due: November 2023

PSC Review & Approval

- Commission to hold a public hearing and approve or modify the plan within 11 months of submittal of CCRP

Engagement Structure with the Working Group



Orange & Rockland Climate Resilience Working Group

This is a list of the organizations, municipalities and elected officials in our service territory who are represented in the working group.

- New York State Department of Public Service
- Utility Intervention Unit
- Public Utility Law Project of New York, Inc.
- New York Power Authority
- Environmental Defense Fund
- Alliance for a Green Economy
- Aztech Geothermal
- New York Geothermal Energy Organization
- Local I.B.E.W. 503 Union
- New Yorkers for Cool Refrigerant Management
- Sustainable Warwick
- Bruce Levine
- Bob Wyman
- Ed Day – Rockland County Executive
- Steve Neuhaus – Orange County Executive
- George Hoehmann – Clarkstown Supervisor
- Dan Maloney –
Clarkstown Emergency Management Coordinator
- Mike Sweeton – Warwick Supervisor
- Bruce Tucker – Piermont Mayor
- Marshall Katz – Village of Wesley Hills Mayor
- Chris Kear – Rockland County Office of Emergency Management Director
- George Potanovic – Stony Point Action Committee for the Environment President
- Josh Potosek – Sullivan County Manager
- Stacey Vassallo – Lamont Doherty Senior Director of Development and Leadership Giving
- Sonia Cairo – Keep Rockland Beautiful Executive Director

Timeline of Execution

Timeline	2022						2023												
	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Establish Stakeholder Working Group	██████████																		
Receive and Validate Climate Data	██████████																		
Select Climate Change Pathway & Assess Risk					██████████														
Draft Climate Change Vulnerability Study (CCVS)							██████████												
Identify Adaptation Options and Prepare CCVS									██████████										
Develop Climate Change Resilience Plan (CCRP)												██████████							
Stakeholder Engagement		★				★				★				★					

★ Stakeholder Working Group Meeting

Stakeholder Input and Engagement

Robust Stakeholder engagement is an important element to the success of CCVS and CCRP

Orange & Rockland will schedule and conduct working group meetings a minimum of twice annually around key milestones and/or decision points to:

- Periodically communicate with the stakeholders of Orange & Rockland's Study and Plan efforts and progress
 - Share available climate science and anticipated weather conditions
 - Understand the physical impacts of climate change on Orange & Rockland's infrastructure and share potential adaptation solutions
- Stakeholders provide feedback to Orange & Rockland on CCVS and CCRP
 - Stakeholder input is essential to develop a robust CCRP that will maximize the benefits to O&Rs customers.

Current Status & Next Steps

- Working with Joint Utilities of New York to address regulatory inquiries and develop a common framework for C CVS and CCRP wherever possible
 - Joint Utilities of New York consists of the five utilities from New York State:
 - Orange & Rockland
 - Consolidated Edison
 - Central Hudson
 - National Grid
 - Avangrid
- Consultant will be brought on to assist Orange & Rockland with study and plan development
- Next Climate Change Resilience Working Group meeting in Q4 2022.



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Questions?

DRAFT for working group discussion purposes only.

INTERNAL

Orange & Rockland Climate Resilience Working Group

Public Service Law (PSL) § 66(29) – PSC Case 22-E-022

December 12, 2022

AGENDA

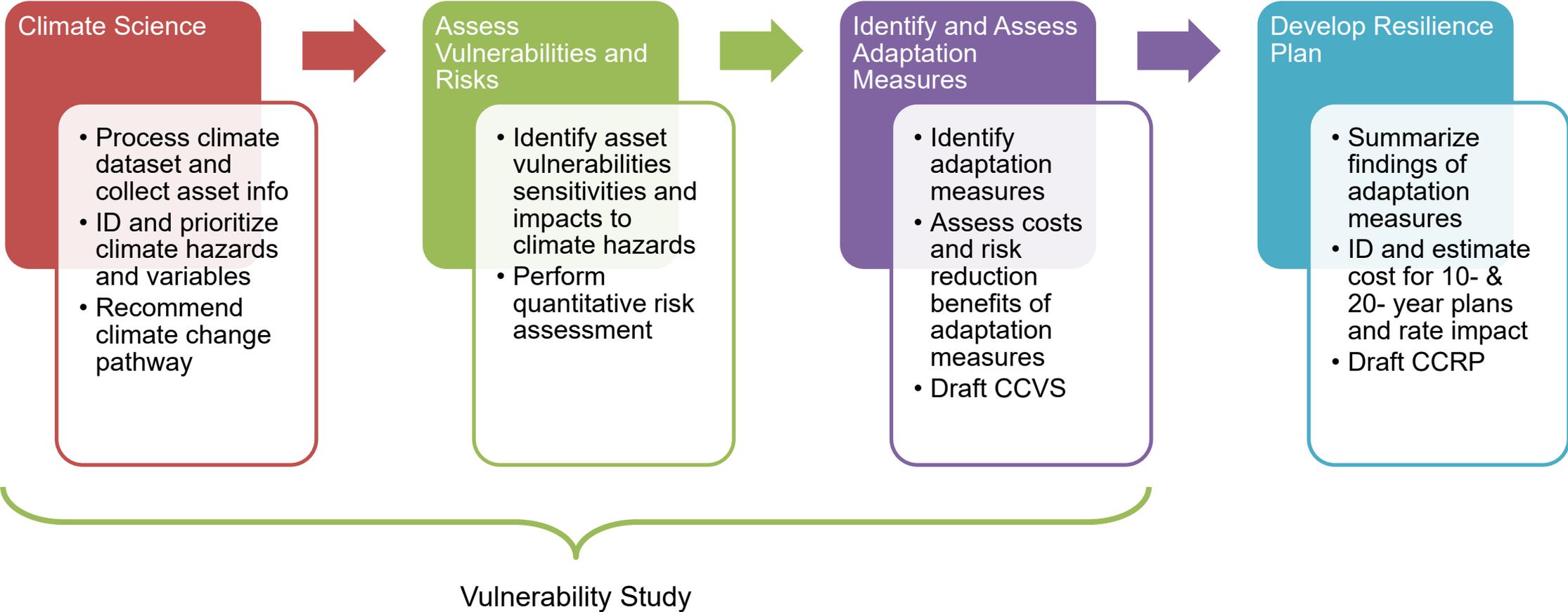
- Past Resiliency Investments
- Climate Change Vulnerability Study (“CCVS”) & Climate Change Resilience Plan (“CCRP”) Process
- Climate Model Data Analysis
- Vulnerability Discussion
- Next Steps

Past Grid Resiliency Projects

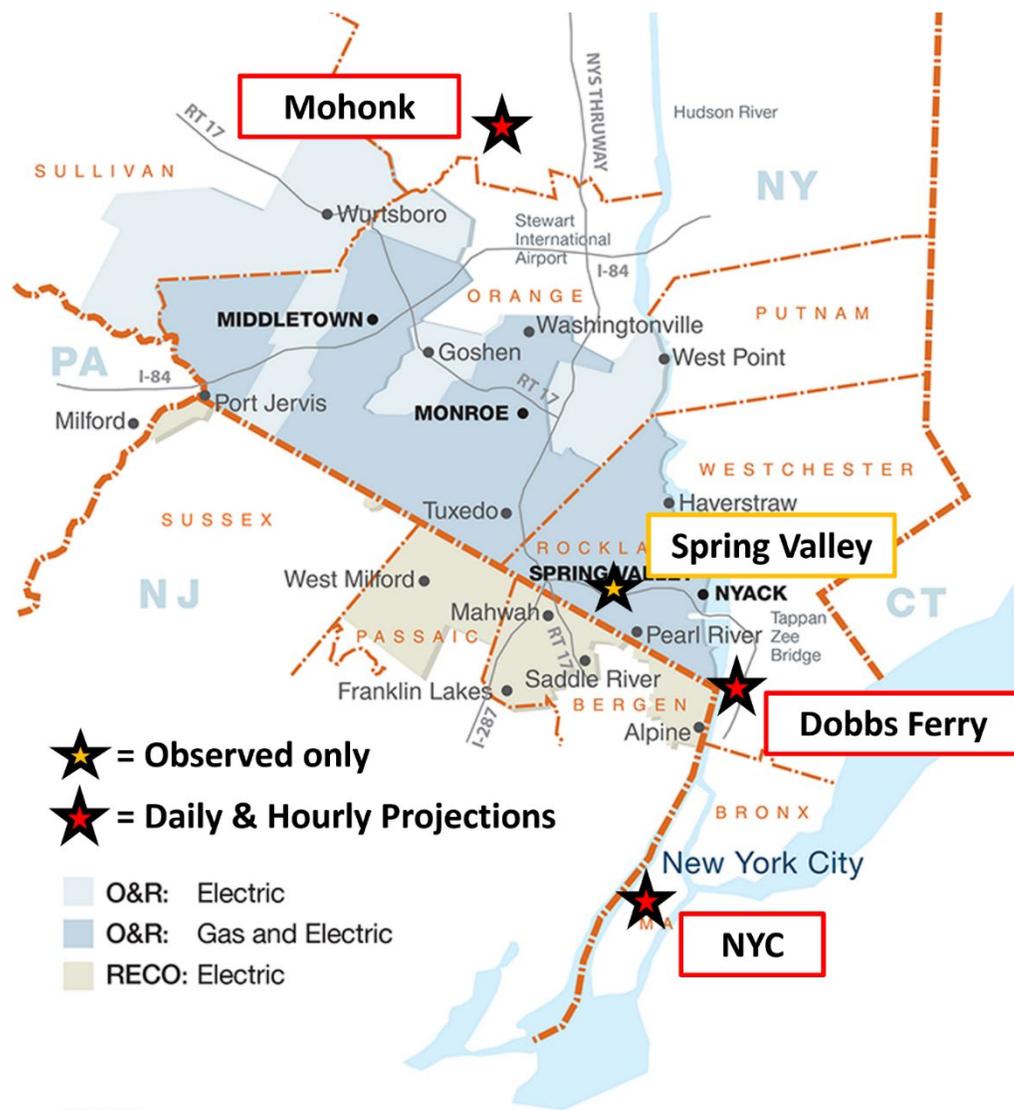
In the past decade since Superstorm Sandy, O&R has spent over \$140 million to fortify and improve the reliability of its electric systems through programs aimed at reducing the number, damage and duration of power outages caused by major storms.

- Our prior work to build a stronger, more resilient grid took many forms. Here are the top five:
 - Constructing additional electric circuits
 - Strategically implementing distribution automation
 - Burying overhead lines in more vulnerable locations
 - Enhancing overhead systems with stronger wire and poles
 - Expanding tree-trimming clearances at critical service locations.
- Together, projects like these have helped **improve O&R's restoration times by 30%**

Orange & Rockland C CVS & CCRP Process Flow



Weather Stations in Con Edison/O&R Service Area



- Current climate projection data provided by NYSERDA to utilities for purposes of developing climate vulnerability studies
- Several weather stations across Con Edison and O&R service territories:
 - The stations most relevant from Columbia dataset are Mohonk and Dobbs Ferry
 - Historical data shared by O&R's meteorological team to help characterize climate across O&R service territory:
 - Spring Valley weather station* data going back to 1995
 - 20 variables included in weather station data (e.g., temperature, humidity, wind speed)
 - Benchmarking against Columbia dataset

*Spring Valley weather station data used for peak electric load forecast

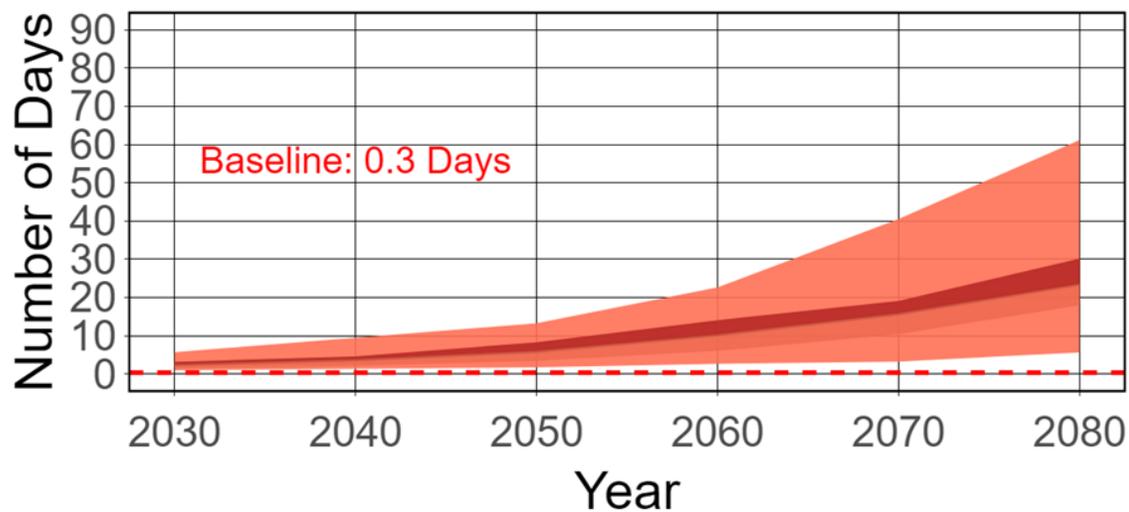
Comparison Table of CMIP6 to Historical Baseline – O&R data

Mohonk Weather Station Data

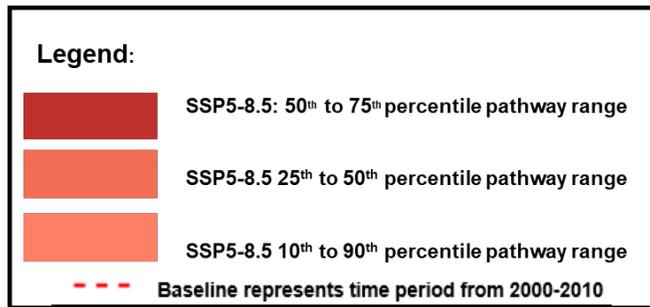
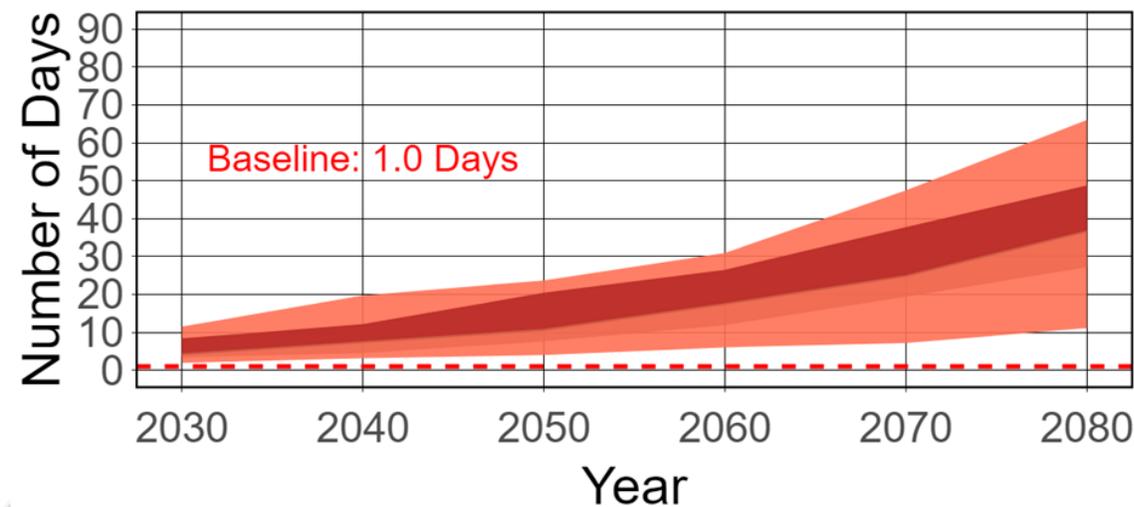
Climate Variables	Current 30-year historical average	2050 Sample Projection
Days per year over 95°F	1	13
Heat waves per year (3-days max temp over 90°F)	0.9	5
Days over 4 inches precipitation	0.1	0.4
Extreme weather events	3 hurricanes	Current climate science cannot quantify intensity or frequency of associated wind and rain deluge variables.

Days per year with ambient daily temperature >86°F

Mohonk SSP5-8.5 Projections:
Days per year with ambient daily temperature >86°F

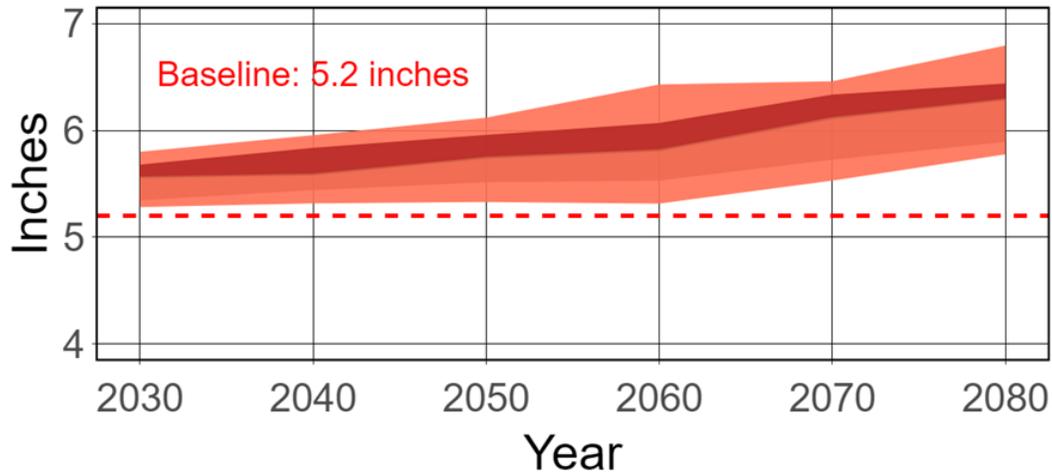


Dobbs Ferry SSP5-8.5 Projections:
Days per year with ambient daily temperature >86°F

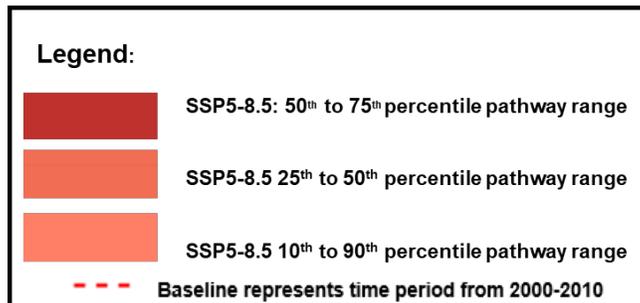
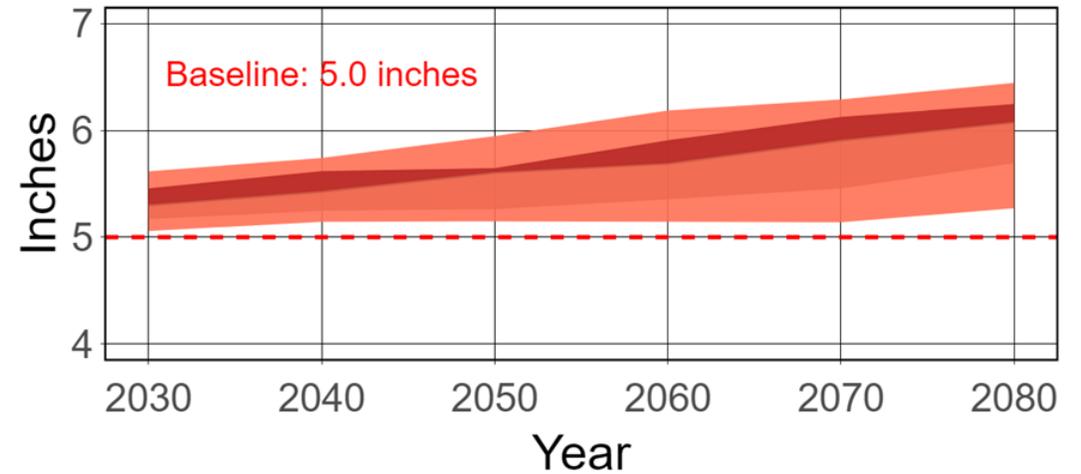


Maximum annual 5-day precipitation

Mohonk SSP5-8.5 Projections:
Maximum 5-day Precipitation (inches)



Dobbs Ferry SSP5-8.5 Projections:
Maximum 5-day Precipitation (inches)



Key Climate Variables & Asset Sensitivities

O&R will evaluate the following assets types in the vulnerability assessment as they relate to climate hazards: Transmission & Distribution (T&D) substations, overhead transmission, overhead & underground distribution, company facility locations

Hazard	Prioritized Variables	Purpose	Stakeholder Impact
Extreme Heat	<ol style="list-style-type: none"> Days per year with ambient and maximum daily temperatures above 86°F, 95°F, 104°F Number of heat waves per year with 3 or more consecutive days over 90°F Number of days per year with average daily temperature at or below 50°F Annual average daily minimum, mean and maximum temperature 	<ol style="list-style-type: none"> Potentially relevant to transmission overhead conductors and distribution overhead conductors wire ratings. Potentially relevant to substation transformers and equipment Potentially relevant to system planning. Potentially relevant to load forecasting. 	Grid restrictions, potential outages, and bill impacts
Average Temperature	<ol style="list-style-type: none"> Mean daily ambient summer temperature (6/1 – 8/31) 	Potentially relevant to asset ratings	Grid restrictions and bill impacts
Heat Index	<ol style="list-style-type: none"> Days with heat index exceeding 91°F, 95°F, 103°F, 115°F 	Potentially relevant for worker safety	Limited outdoor activity level during extreme heat
Extreme Cold	<ol style="list-style-type: none"> Number of days with minimum daily temperatures below 32°F Two consecutive days with daily average temperature ≤ 12°F each day Annual coldest daily temperature 	<ol style="list-style-type: none"> Potentially relevant to load forecasting and cold weather sensitive assets Potentially relevant to extreme cold weather procedure for emergency response and possible electrical disruption 	Grid operating restrictions and extreme cold weather procedures for emergency response
Heavy Precipitation	<ol style="list-style-type: none"> 1- and 5-day maximum precipitation Days per year with >0.75 and >2 inches of precipitation Annual average and daily rainfall 	Relevant to inland flooding	Flooding and outages from electrical equipment failure

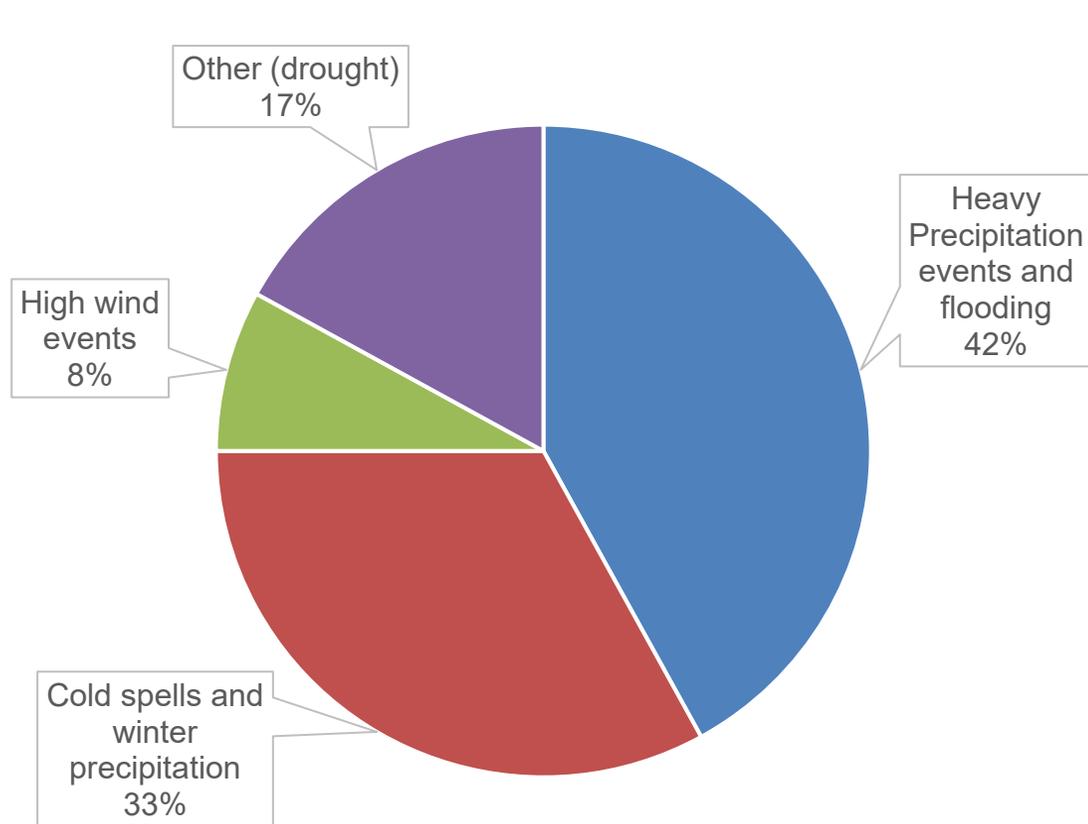
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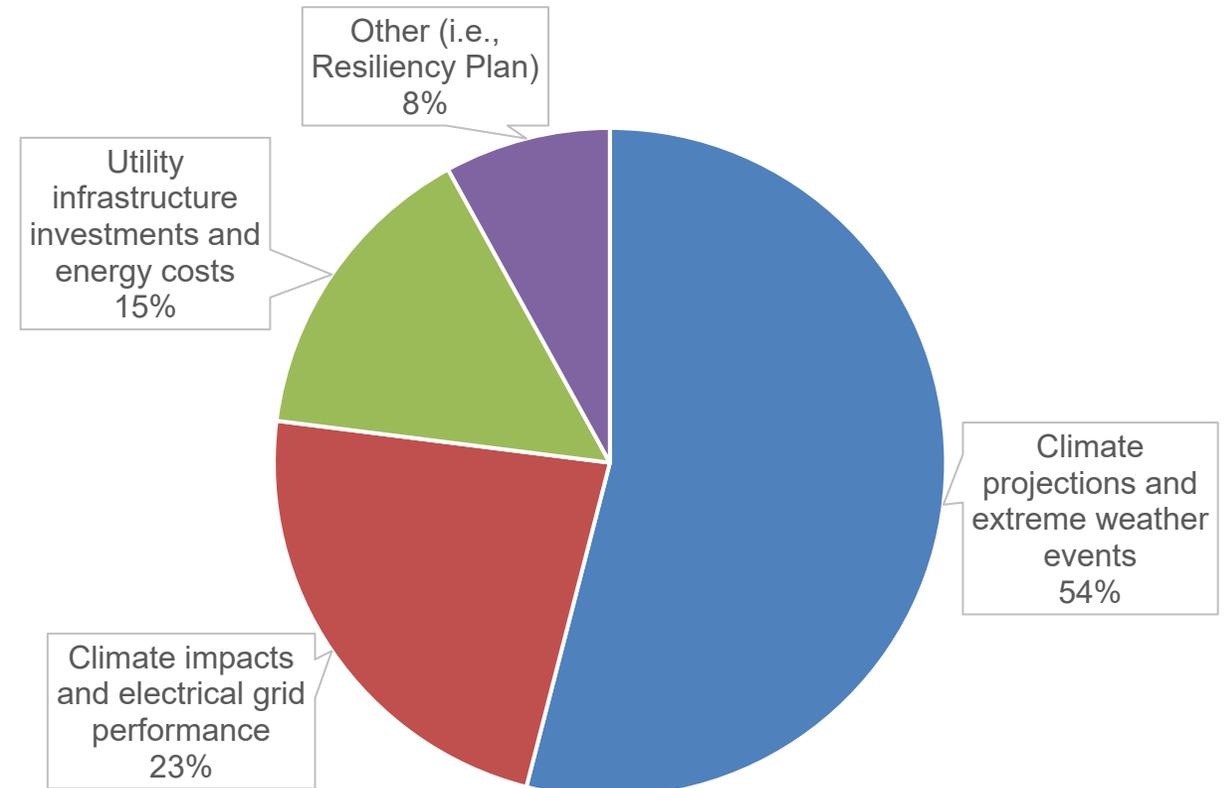
Hazard	Prioritized Variables	Purpose	Stakeholder Impact
Return Period Precipitation	1. 25-year, 24-hour precipitation event	Relevant to oil containment	Flooding, structural, and environmental impacts
Energy Demand	1. Cooling Degree Days 2. Heating Degree Days	Relevant to load demand	Grid restrictions and bill impacts
Temperature Variable (TV)	1. Days per summer with electric TV >85°F, >90°F 2. Annual maximum summer electric TV	Relevant to load demand	Grid restrictions and bill impacts
Coastal Flooding	1. Projected sea level rise ⁴ 2. Inundation extent and depth	Relevant to Hudson River assets	Flooding and outages from electrical equipment failure
Inland flooding	1. 100- and 500-year floodplain extent	Relevant to asset flooding	Flooding and outages from electrical equipment failure
Wind	1. Constraint on mean wind speed 2. Constraint on max wind gusts	Relevant to and overhead transmission and distribution lines and structures	Downed wires and power outages
Other extreme events	1. Hurricanes and tropical storms 2. Snow and ice 3. Lightning and thunderstorms 4. Drought	Relevant to multiple asset types	Combination of the above impacts from individual climate hazards

Survey Feedback

Weather events of greatest concern



Topics of interest to Climate Resilience Working Group



Open Discussion

- Suggested topics for Climate Resilience Working Group discussion:
 - Growth of Electric Vehicles and their purpose
 - Response to an extreme weather event
 - Grid resilience and clean energy growth
 - Other topics

Next Steps

- Establish our risk tolerance to climate change
- Evaluate asset vulnerabilities and sensitivities to climate change
- Next O&R Climate Resilience Working Group Meeting in Q1 2023



Orange & Rockland

**Questions or comments may be sent to
ResilientGrid@oru.com**

Reference

- O&R Storm Resilience Investments Since Superstorm Sandy: [O&R: \\$83M in More Electric System Undergrounding, Automation Since Sandy Results in a Stronger Power System, Fewer Outages and Faster Restoration Times \(oru.com\)](#)
- New York State Climate Impacts Assessment: [Results – New York State Climate Impacts Assessment \(nysclimateimpacts.org\)](#)

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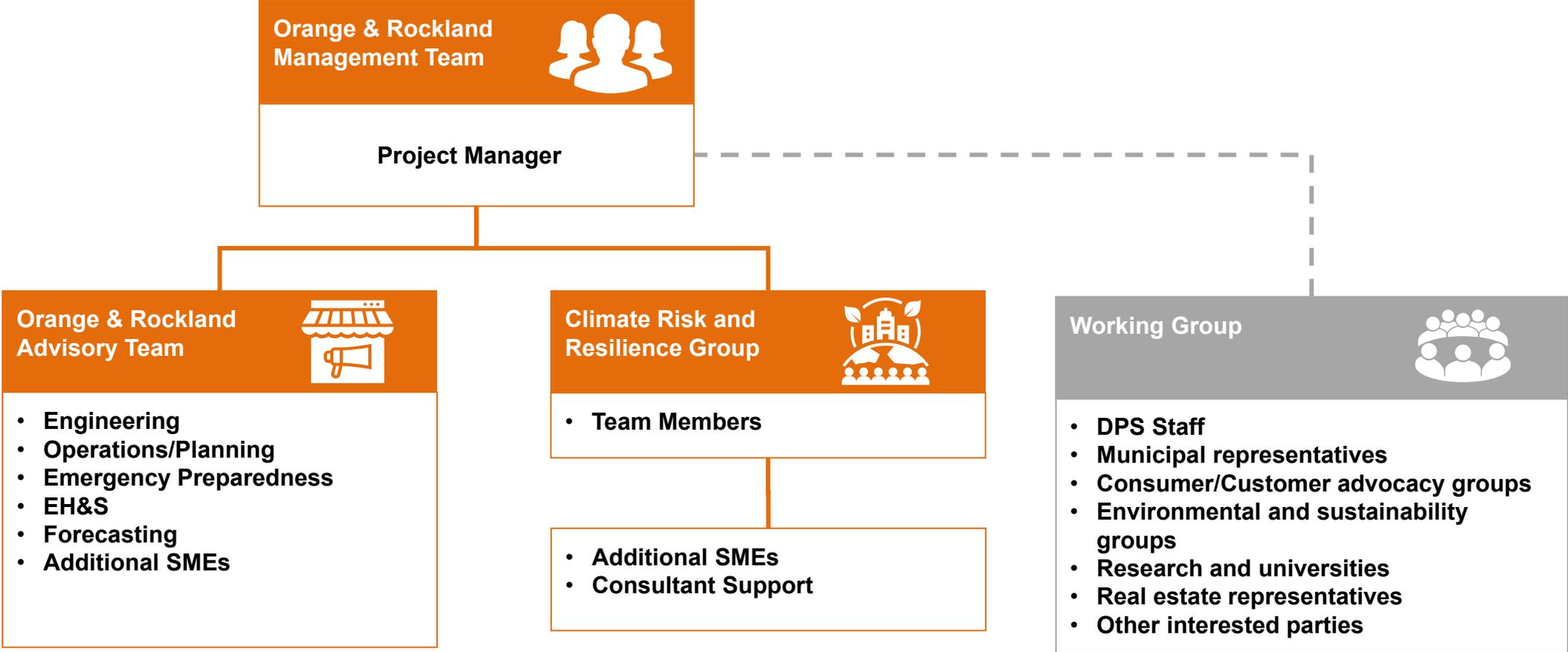
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Columbia Dataset Baseline Comparison (2000 - 2010)

Hazard	Spring Valley*	Mohonk	Dobbs Ferry
Days per year with Maximum Daily Temperature above 90°F	12.6	11	19
Maximum annual temperature (°F)	94.9	95.4	97.3
Days per year with average Relative Humidity over 95%	6.1	4.9	3.1
Average summer relative humidity	72.7	70.7	71.2
Average Annual Maximum Temperature Variable (TV)	83.7	83.3	83.5
Average Summer TV	72.9	72.2	73.6
Average Annual Total Heating Degree Days	5,266	5,388	4,620

Note: *Actual meteorological data at Spring Valley Operations Center

Engagement Structure with the Working Group



Timeline of Execution

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Establish Stakeholder Working Group	█																		
Receive and Validate Climate Data	█																		
Complete Risk Assessment of Assets					█														
Identify Adaptation Options and Prepare CCVS								█											
Develop Climate Change Resilience Plan (CCRP)								█											
Stakeholder Engagement		★				★			★			★			★				★

★ Stakeholder Working Group Meeting