NYSEG · RG&E
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Climate Change Vulnerability Study and Resilience Plan

Working Group Meeting 3

July 12, 2023

Welcome & Introductions

Project Context

Vulnerability Assessment Summary of Findings

Climate Change Resilience Plan Overview and Strategies

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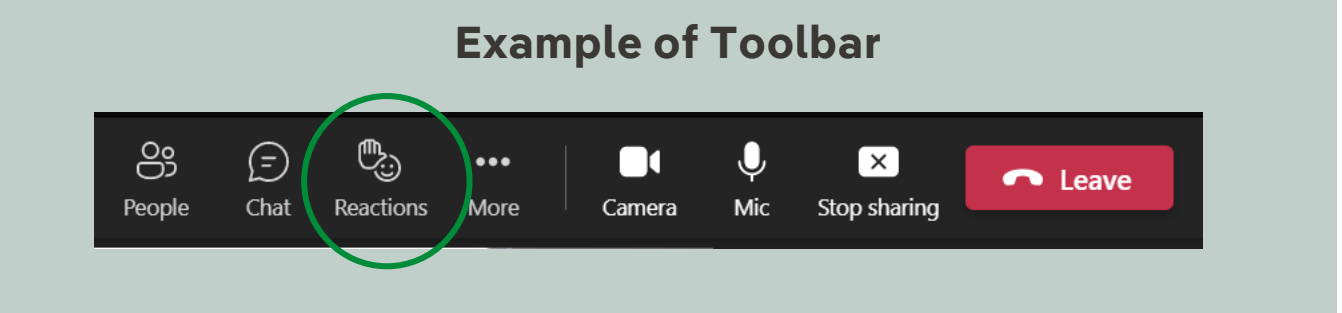
Welcome & Introductions

- Please use the ***raise hand function*** at any point during the presentation to ask a question or add it to the chat.
- The meeting will be recorded
- The presentation was provided to everyone in advance of today's working group session.
- If you have technical difficulties or need assistance with the Microsoft Teams please message jeffrey.meek@icf.com



Team

- **Project Lead:** Ed Roedel, Principal Engineer – Strategic Planning
- **Stakeholder Engagement:** Dave Gridley, Director – Government & Community Relations
- **Regulatory Lead:** Lori Cole, Manager – Regulatory & Tariffs

- **Study Support:** ICF
  - Judsen Bruzgul – Project Lead
  - Jeffrey Meek – Stakeholder Lead

Registered Working Group Participants

Name	Organization or Affiliation
Avni Pravin	AGREE
Ziang Zhang	Binghamton University
Erika Pierce	Westchester County Board of Legislators
Aimee Dailey	Broome County Planning
Beth Lucas	Broome County Planning
Owlen Huxley	C&S Companies
Brian Eden	Campaign for Renewable Energy
Barry Carr	Clean Communities of CNY
Abigail McHugh-Grifa	Climate Solutions Accelerator of the Genesee-Finger Lakes Region
Kristen Van Hooreweghe	Climate Solutions Accelerator of the Genesee-Finger Lakes Region
Molly Ryan	Clinton County IDA
Kelly Donoghue	Clinton County Office of Emergency Services
Eric Day	Clinton County Office of Emergency Services
Patrice Perry	Columbia County Planning Department
Guillermo Metz	Cornell Cooperative Extension Tompkins County
Karim Beers	Cornell Cooperative Extension Tompkins County
Robert Corpora	Cortland County
Michael Mager	Couch White, LLP for Multiple Intervenors
Rick Mancini	Customized Energy Solutions
Bonnie Lawrence	Erie County Department of Environment and Planning
Romy M Fain, PhD	Heat Inverse
Michael Jagielski	Koffman Southern Tier Incubator
Andrew Brodell	Livingston County OEM
Will Gall	Livingston County OEM
Amanda Kaier	Mohawk Valley Economic Development District, Inc
Clement Chung	Monroe County Department of Environmental Services
Aferdita Bardhi	NYS Department of Public Service
Biola Daniel	NYS Department of Public Service
Bridget Frymire	NYS Department of Public Service
Eric Moore	NYS Department of Public Service
Greg Crawford	NYS Department of Public Service
Michael Richard	NYS Department of Public Service

Name	Organization or Affiliation
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Nicole Sallese	NYS Department of Public Service
Bob Mack	NYSERDA
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Carol Chock	Rayepayer and Community Intervenors
Judy McKinney Cherry	Schuyler County Partnership for Economic Development
Kerri Green	Schuyler County Partnership for Economic Development
Jeffrey Eisenhauer	Siemens
Jack Wheeler	Steuben County
Heather Brown	Sullivan County
Jennifer de Souza	The Raymond Corporation
Mike Straight	Tier Energy Network
Jeff Smith	Tier Energy Network, Rotary
Hailley Delisle	Tompkins County
Peter Bardaglio	Tompkins County Climate Protection Initiative
Katie Borgella	Tompkins County Dept of Planning and Sustainability
Fion MacCrea	Town of Alfred
Jason Keding	Town of Boston
Dr. Mitch Tucker	Town of Boston
Brendan Ryan	Town of Brighton
Evert Garcia	Town of Brighton
Jerry Vernold	Town of Hancock
Pat Wartinger	Town of Henrietta Sustainability Committee
C.J. Randall	Town of Ithaca
Nick Goldsmith	Town of Ithaca
Katherine Daniels	Town of North Salem
Norma J Burris	Town of Orange
Josheph Wilson	Village of Dryden
James Basile	Village of Fair Haven
Dave McDowell	Village of Sodus Point
Thomas Lyon	Wayne County Economic Development & Planning
Ryan Dwyer	Westchester County
Brian Meyers	Wyoming County

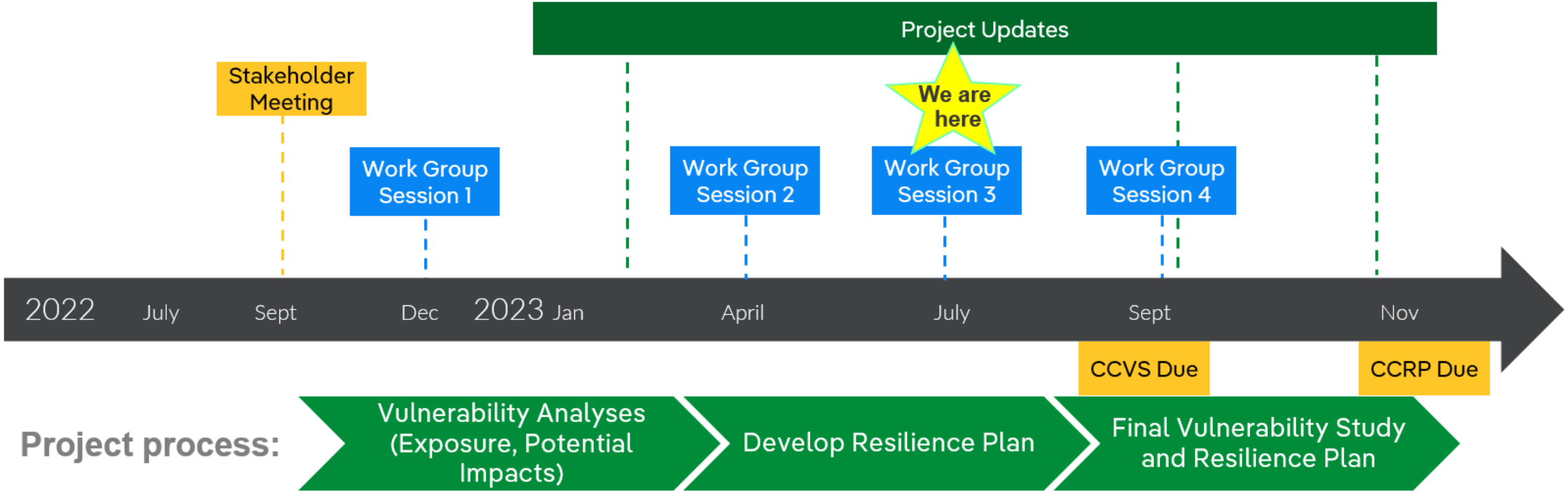
Reminder: Working Group Overview

- Provide a platform for open and constructive discussion of key issues affecting NYSEG and RG&E's climate resilience planning.
  - Gather input and insights from external stakeholders and subject matter experts on strengths and gaps
  - Learn about parallel efforts and connection points
- This is the third Working Group meeting, added at the request of stakeholders, to provide insight on the CCRP.
- The fourth and final meeting will be scheduled in early fall of 2023.

Reminder: Efforts to Date

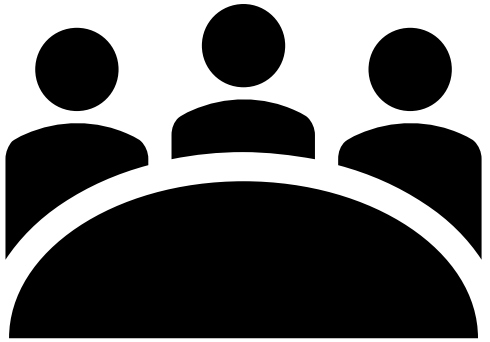
Previous WG Session Topics:

- Climate science summary & sample asset exposure findings
- Process for determining physical impacts of climate change on infrastructure
- Analysis of exposure, sensitivity, and consequence



Today's Focus

- Update on the study progress since the last WG meeting.
- Provide information on the climate vulnerability assessment findings.
- Review the overview for the Climate Change Vulnerability Study (CCVS) and Climate Change Resilience Plan (CCRP).
- Discuss potential strategies for increasing resilience to further protect customers.
- Discuss study details and process, and share next steps.



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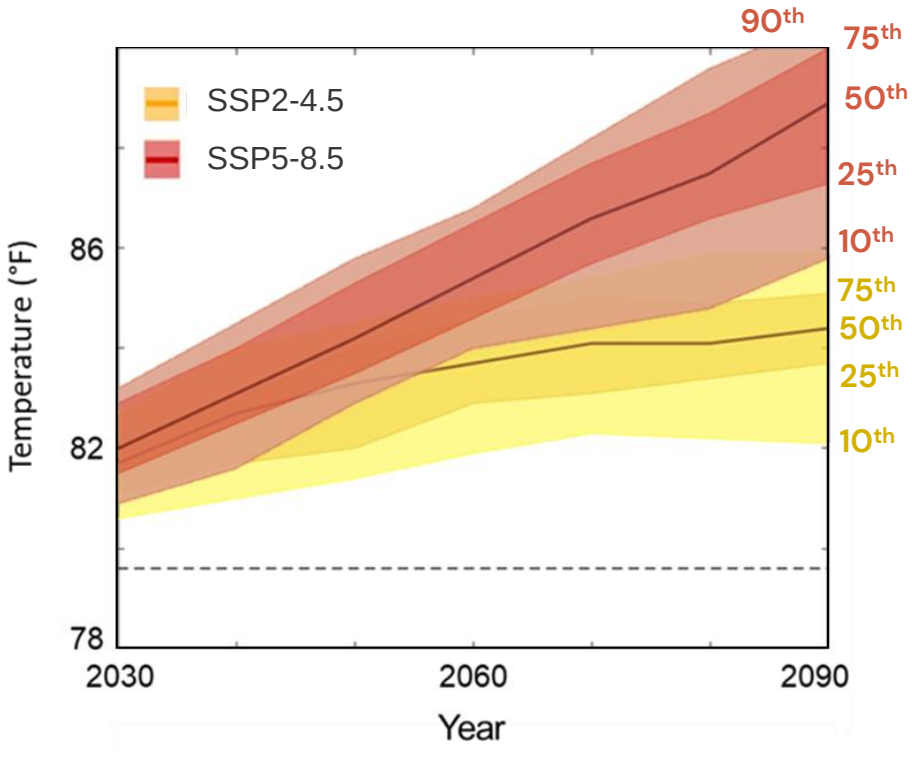
Overview of PSC Order

- March 2022, PSC law became effective (Case 22-E-0222) to NY electric utilities
- Conduct a **Climate Change Vulnerability Study (Study)** and develop a **Climate Change Resilience Plan (Plan)**
- The Study must include an evaluation of the electric grid's vulnerability to climate-driven risks
- The Plan must address the findings of the Study for the next ten- and twenty-year periods
- Engage and collaborate with stakeholders
- The Study and Plan must be filed in the fall of 2023, with updates at least every five years

Reminder: Climate Pathways

- **Climate change projections:** we considered a range of possible scenarios in terms of emissions scenarios and their effect on the climate of New York State.
- Future global emissions of greenhouse gases will determine which pathway the global climate takes.
- We used three combinations pathways and simulation percentiles to represent plausible lower bound, planning level, and upper bound of climate model projections:
  - **SSP2-4.5 50th percentile** as lower bound
  - **SSP5-8.5 50th percentile** as planning level
  - **SSP5-8.5 90th percentile** as a high-end "stress test"
- **Planning Level:** A conservative selection aimed to identify resilience measures that will enable NYSEG and RG&E to identify which climate change risks may interfere with the ability to serve our customers.



Background: Ongoing Climate Change Efforts

Mitigation

Actions to decrease GHG emissions

Below are some examples of what Avangrid is doing regarding environmental sustainability goals with targets to achieve these by 2030.

- Scope 1 and 2 GHG carbon neutral by 2030
- 100% sustainable light-duty fleet vehicles
- 100% renewable electricity use in corporate buildings
- Avangrid Renewables – 16.9 GW of emission free installed generation capacity
- Enabling 1,050 MWh of energy storage development
- Enabling the installation of 15,000 EV chargers

Adaptation

Actions to increase resilience to climate change

This will be the focus of today's meeting. The goal is to increase the reliability and safety for customers. We will discuss potential resilience strategies in more detail.

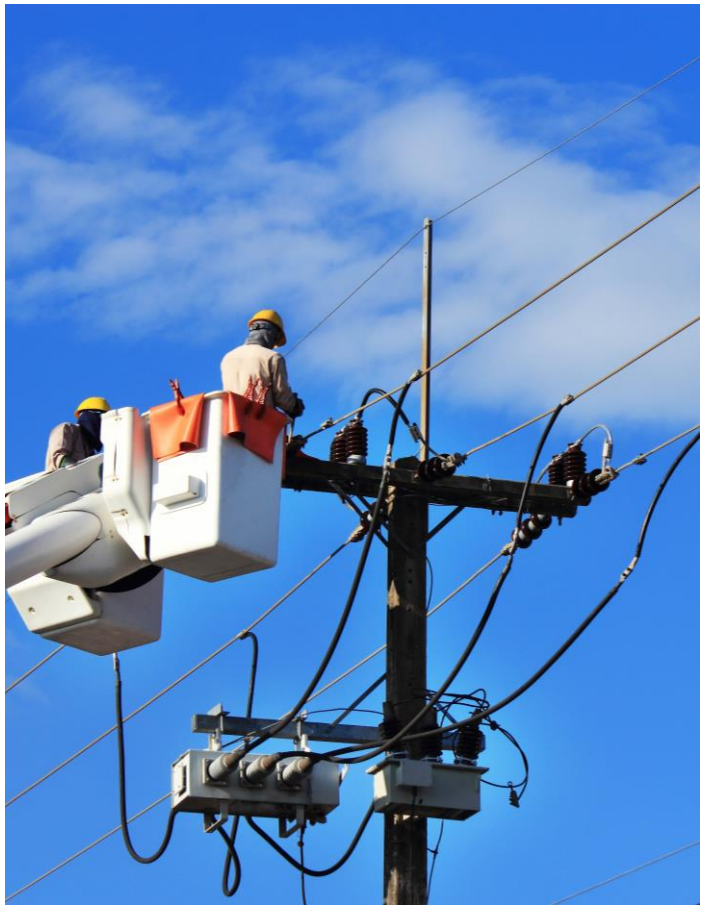
Examples of resilience strategies are:

- Infrastructure hardening
- Undergrounding lines
- Building new storm barriers
- Changes to design standards

Today's Focus

Check-in: Climate Pathways

Are there any questions on what Climate Pathways are, or NYSEG/RG&E's selected pathway for Resilience?



Overview of Equity Considerations

New York State defines DACs “based on geographic, public health, environmental hazard, and socioeconomic criteria, which shall include but are not limited to:

1. Areas burdened by cumulative environmental pollution and other hazards that can lead to negative public health effects;

2. Areas with concentrations of people that are of low income, high unemployment, high rent burden, low levels of home ownership, low levels of educational attainment, or members of groups that have historically experienced discrimination on the basis of race or ethnicity; and

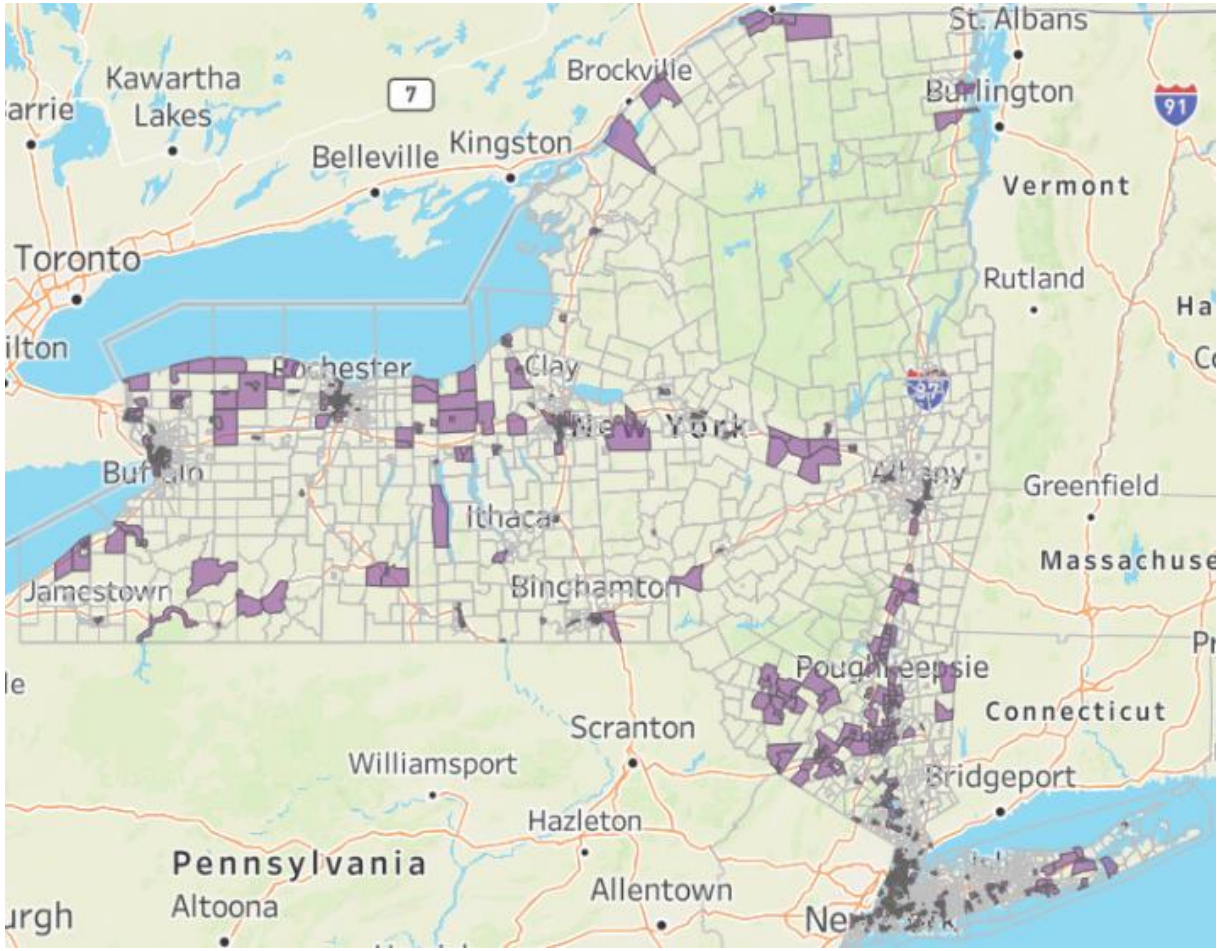
3. Areas vulnerable to the impacts of climate change such as flooding, storm surges, and urban heat island effects.“

Source: Disadvantaged-Communities-Frequently-Asked-Questions.pdf

Overview of Equity Considerations

Within the context of the Resilience Plan, we are:

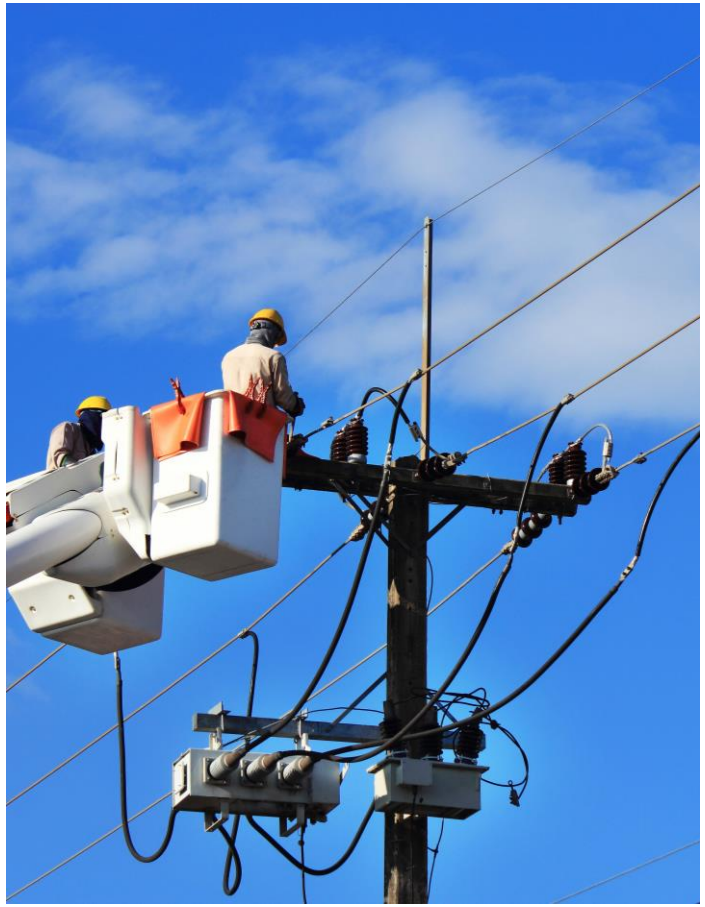
- Analyzing locations where DACs and vulnerable infrastructure overlap
- Considering how energy reliability may be increased in these communities
- Identifying opportunities to increase infrastructure resilience that benefits these communities



Map of Disadvantaged Communities in New York State (New York State Climate Justice Working Group, 2023).

Check-in: Project Overview and Equity Considerations

What are your reactions to this approach?



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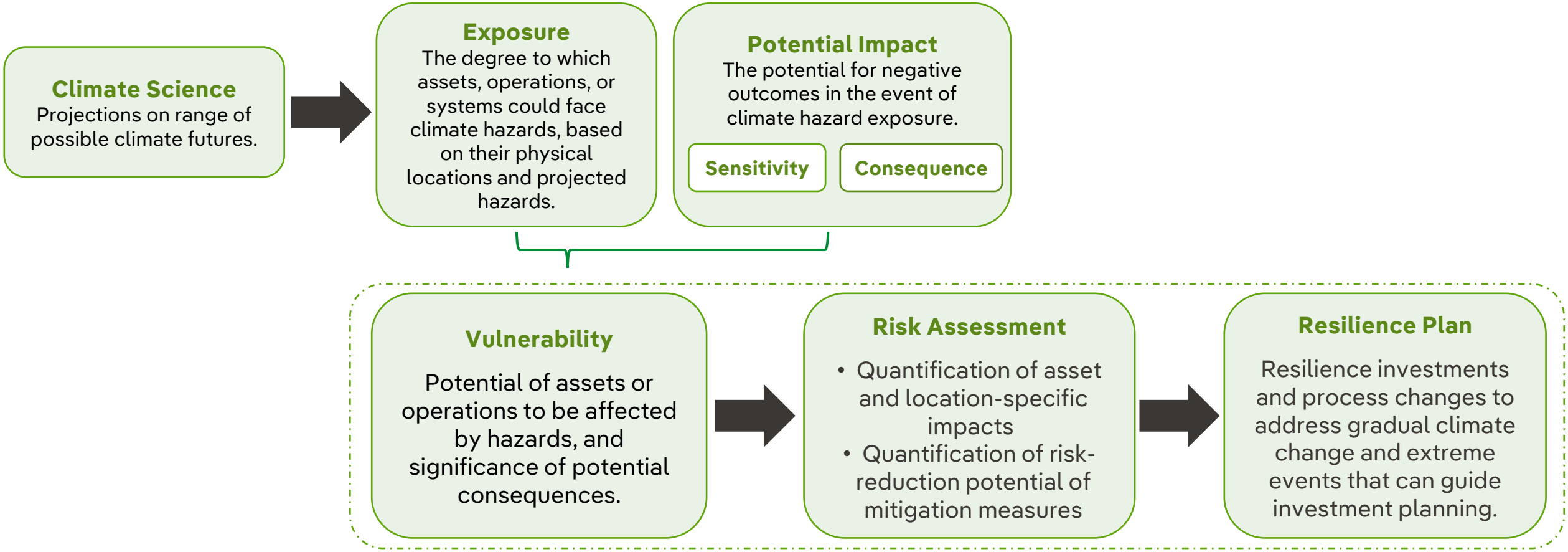
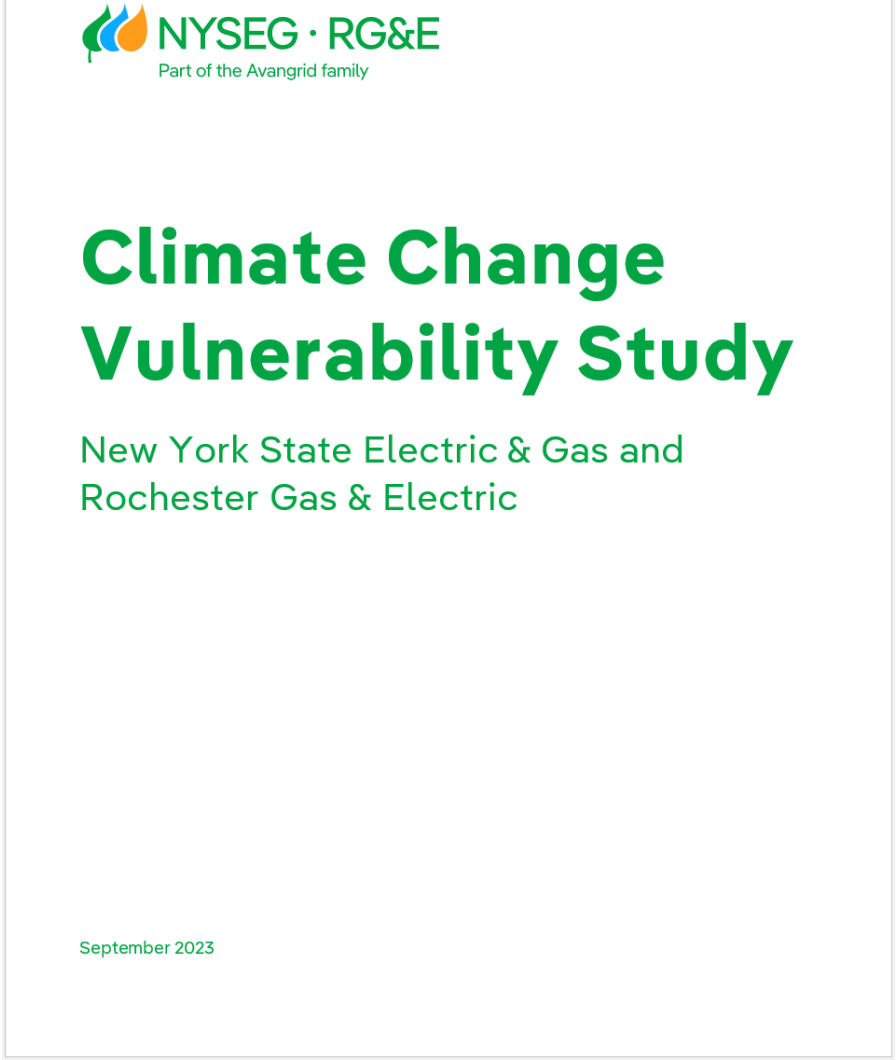
Project Process Diagram



Today's Focus

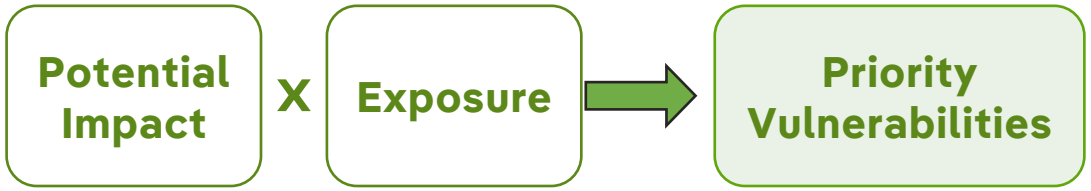
Vulnerability Study Highlights

- **Climate Change Vulnerability Assessment**
  - Climate Science Projections
  - Identified Vulnerabilities
- **Potential Resilience Measures**
  - Strengthen
  - Anticipate and Absorb
  - Respond and Recover
  - Advance and Adapt



Vulnerabilities

The potential of assets, operations or customers to be affected by projected hazards, and the significance of the potential consequences.



Climate hazards included in the study:

Asset families and components included in the study:

Transmission Line
Line structures
Conductors (Overhead/Underground)
Open-air current carrying components

Distribution Line
Structures
Conductors (Overhead/Underground)
Open-air current carrying components
Transformers (Pad mount / Overhead)
Regulators
Capacitors
Surge arrestors

Substations
Substation transformers
Substation regulators
Circuit breakers
Protection & control devices
Instrument Transformers (CT's and PT's)
Control room/Control house
Substation reactors
Support structures

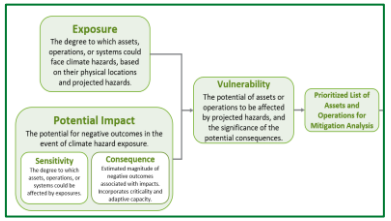
Summary of Key Findings

Priority vulnerabilities are those that represent the most significant risk to NYSEG and RG&E's electrical assets, and the ability to serve our customers reliably.

- **Substation – High :** Study Team determined that vulnerability to flooding and extreme heat was found to be high for circuit breakers, regulators and transformers. For example, extreme heat in excess of design parameters presents equipment failure risk.
- **Transmission & Distribution – High:** Vulnerability to wind, and combined wind and ice events was found to be high. Extreme winds can exceed design parameters and increase risk of failure.
- **Transmission & Distribution - Medium:** Vulnerability to extreme temperature for transmission & distribution power delivery components. Extreme heat in excess of design parameters can cause equipment failure.

Substations	High	High	High	Low	High
Transmission	Med.	High	Med.	Low	High
Distribution	Med.	High	Med.	Low	High

Vulnerability Assessment → Risk Assessment and Resilience Plan



Vulnerability Assessment

Quantification of Identified Risks for Specific Assets and Locations

Identification of Risk Mitigation Measures

Quantification of Risk Mitigation Potential

Ability of Measures to Reduce Likelihood of Damage & Asset Specific Consequence of Identified Risks Defined per order as Customer Outages and Cost of Restoration

Quantification of Risk Mitigation Costs

Identification of Cost-Effectiveness

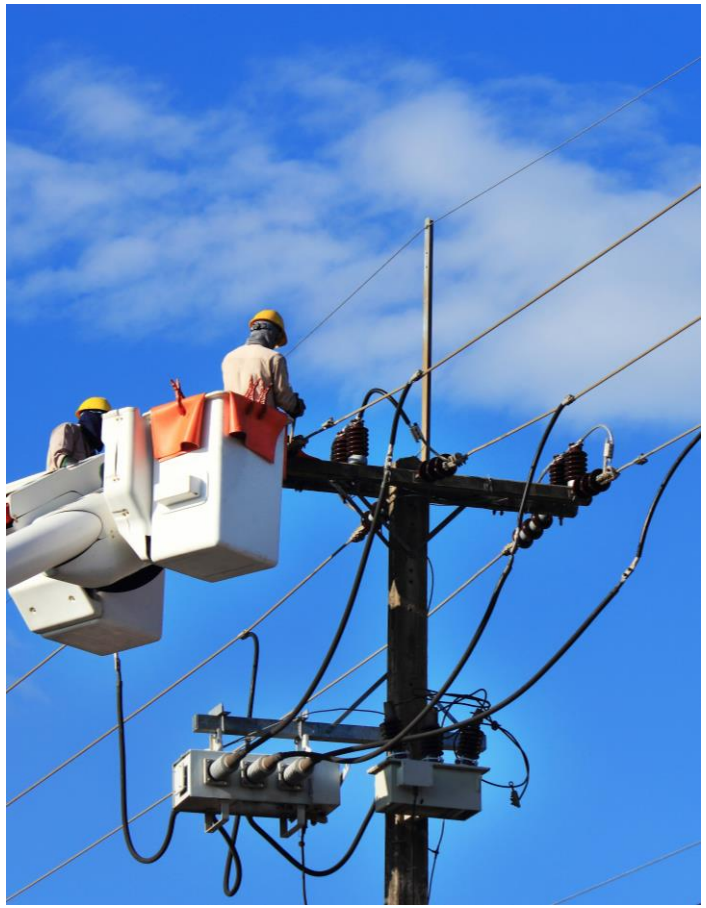
Identification of Optimal Portfolio of Resilience Measures

Takeaway: Specific assets and locations are identified through the risk assessment process. The resilience plan identifies specific measures to yield a more resilient electric grid for customers by reducing outages and restoration time after major climate-related events.

Check-in: Vulnerability Assessment Findings

Key takeaways from the vulnerability assessment findings?

Any questions?



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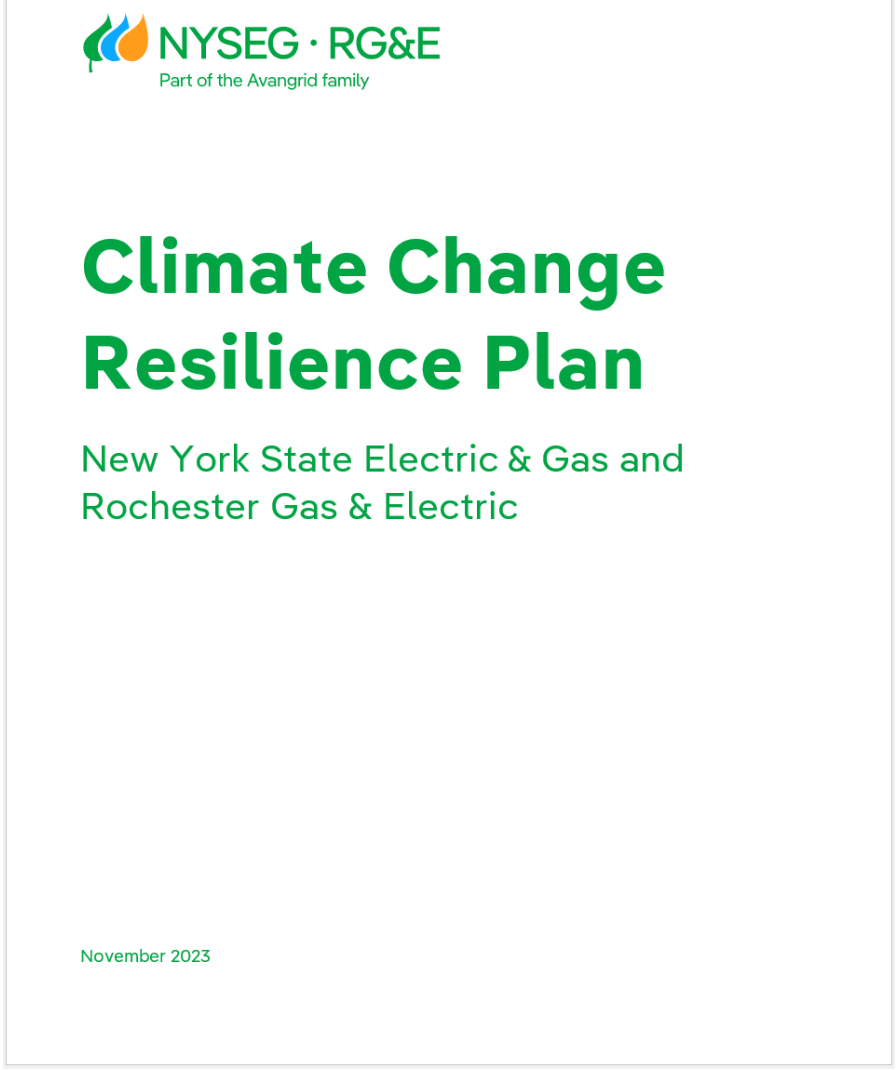
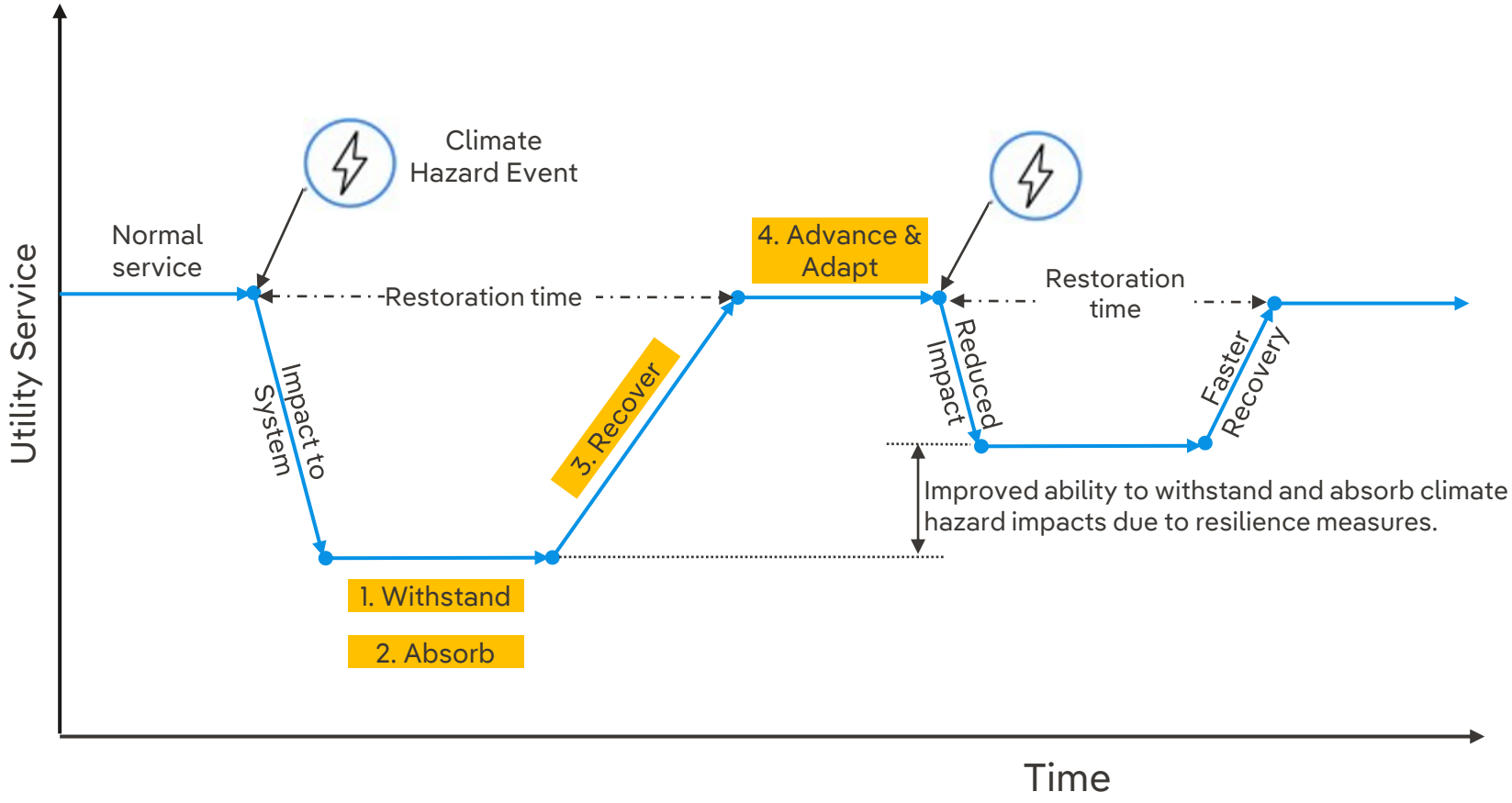
Resilience Plan Highlights

- **Summary of potential consequences and adaptation measures from the CCVS**
- **Multi-pronged Resilience Strategy and Approach**
  - Incorporating Resilience into Existing Planning, Design, and Operations Practices
  - Investing in Resilience Projects and Programs
  - Exploring a variety of strategies through a 4-dimension resilience framework
- **Investment Plan and considerations of equity**
  - Summary of projects and programs for 5-year,10-year, and 20-year periods



Resilience Plan Framework

Pursue a multi-pronged resilience strategy with four dimensions: Withstand, absorb, recover, and advance and adapt.



1. Strengthen assets and operations to **withstand** the adverse impacts of a climate hazard event.

2. Increase the system's ability to **anticipate** when a climate hazard event may occur and **absorb** its effects.

3. Bolster the system's ability to quickly **respond and recover** in the aftermath of a climate hazard event.

4. Advance and adapt the system to address a continuously changing threat landscape and perpetually improve resilience.

Potential Solutions – Strengthen & Withstand

Examples of physical measures:

- Distribution pole replacement programs to withstand higher wind and wind + ice loads
- Targeted undergrounding of conductors, prioritizing regions with higher wind projections, historically impacted by windstorms, and that maximizes benefits to customers

Source: https://thermtest.com/a-deeper-look-into-underground-cable-systems-and-the-effects-of-soil-thermal-conductivity-on-energy-transfer

Examples of process improvements:

- Update design standards for transformers to have higher ambient and equipment temperature ratings

Potential Solutions – Anticipate & Absorb

Examples of physical measures:

- Adding Circuit Ties and automated switching to distribution circuits
- Install SCADA switches and distribution reclosers that allow faster identification of fault

Examples of process improvements:

- Training personnel on the activation of additional resilience measures when applicable

Source: https://www.sandc.com/globalassets/sac-electric/documents/public---documents/sales-manual-library---external-view/general-publication-461-g366.pdf?dt=638247018381498790

Potential Solutions – Respond & Recover

Examples of physical measures:

- Review stocks of spare assets and parts to avoid supply chain lead times in replacing damaged or destroyed assets
- Review stocks of portable assets that provide power supply redundancy (substations, generators, etc.)

Source: https://www.southernstatesllc.com/applications/mobile-substations

Examples of process improvements:

- Expand the operating capacity and training of emergency response teams, including to climate change-driven low probability but high impact events like concurrent extreme storms or combined climate hazards

Potential Solutions – Advance & Adapt

Examples of process improvements:

- Periodically reevaluating climate risk scenarios as new data become available
- Integrating climate change risk into capital planning and risk management tools
- Integrating climate considerations across operating procedures including load forecasting, asset management, vegetation management, capacity planning, reliability planning, and emergency response

Project Prioritization

Identify specific assets and locations with “High” risk scores

Identify potential resilience measures specific to each asset or location

Develop a Business Case Justification score for each resilience measure

Rank projects and programs based on the Business Case Justification score

Location Prioritization Example – Asset Risk Score

A risk score will be quantified to determine which assets should be prioritized for resilience measures. The example below is for the asset+hazard combination of substations and flooding. The values presented below are an example and not actual risk scoring of a substation.

Asset	Event Severity (score / 10)	Consequence (score / 10)	Risk (score / 100)
Substation 1	4	5	20
Substation 2	7	10	70
Substation 3	10	6	60

Priorities

Event Severity is the event likelihood multiplied by the projected inundation depth.

Consequence is based on Customer Minutes Interrupted (CMI) and Estimated Cost of Restoration.

Risk Score is the multiplication of the event severity and the consequence.

Resilience Measure Benefit Scoring Example

A multicriteria analysis can be implemented to identify the measures that provide the highest benefits to customers. Below is an example of benefits being captured through it. The values below are an example and not an actual evaluation of a resilience measure.

Resilience Measure	Resilience	Reliability Increase	Equity	Safety Increase	Cost	Total Score /100
Measure 1	7	7	9	10	8	80
Measure 2	9	4	9	8	5	68
Measure 3	8	8	10	9	7	78

Resilience includes benefits to the community such as avoided business losses or impact to critical facilities.

Reliability include customer interruption costs and the quantified benefit of increased reliability

Equity evaluates the level benefits the project or program may bring to a disadvantaged community

Safety captures increased safety to all public and NYSEG/RG&E personnel

Cost captures both the impact rate of the resilience measure and the avoided restoration costs

Total score is the sum of each benefit scaled to 100.

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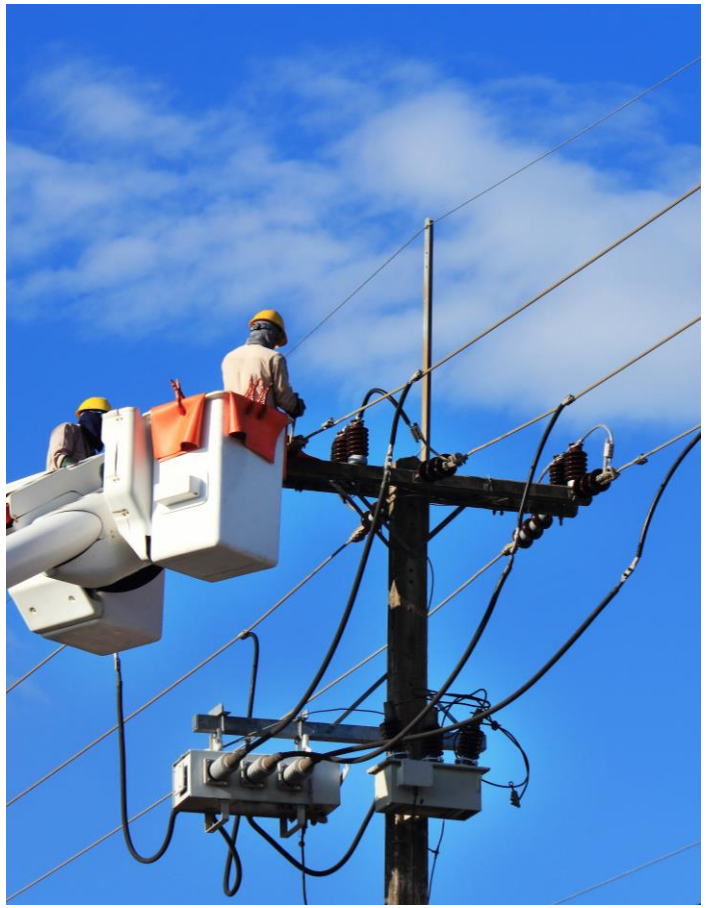
Any questions about the CCRP overview or potential strategies?

Anything you'd like to learn more about at the next WG meeting?



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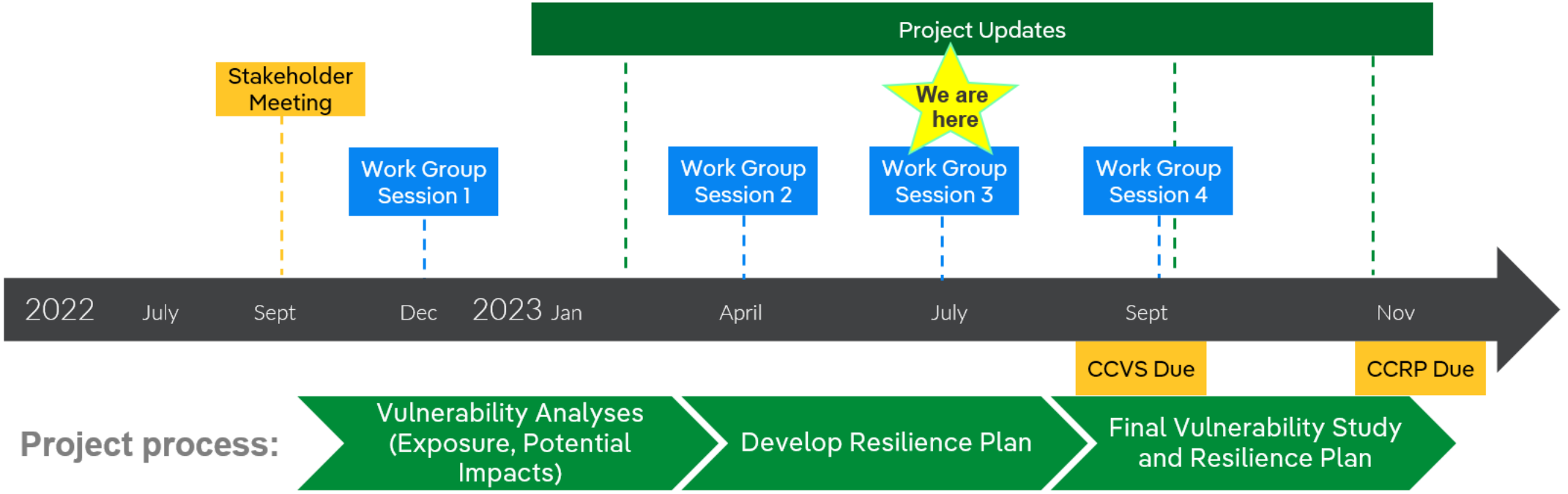
Continued Stakeholder Engagement Opportunities

- Next Working Group meeting will be in early Fall of 2023 to further discuss the risk assessment and provide an update on the Resilience Plan
- Continue building towards the climate vulnerability study filing (September 2023) and resilience plan filing (November 2023)
- Parties are welcome to join the Working Group at any time

Stakeholder Engagement Timeline

Key takeaway from today?



Thank You!

Please send any follow up questions or comments to:
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