December 20, 2024

Versant Climate Vulnerability Study:
Final Report Overview

Meeting Logistics

Please ensure you are muted unless you are called on

The meeting is being recorded

Please provide your name, title, and affiliation

Feel free to ask questions or comment during the presentation using the chat feature or the raise hand function

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Agenda

1. Welcome and Introductions
2. Project Background and Stakeholder Engagement Roadmap
3. Report Outline and Key Sections
4. Future Resilience Work
5. Questions and Feedback
6. Next Steps

Meeting Objectives

- Project status update
- Review key sections of the final report
- Receive feedback

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Project Background

- The Climate Vulnerability Study is part of Versant's broader grid and climate planning efforts
- It follows the 2023 Climate Change Resilience Plan, which was required by An Act Regulating Utility Accountability and Grid Planning for Maine's Clean Energy Future
- The Maine Public Utilities Commission review of utility climate plans is outlined in Docket No. 2023-00282

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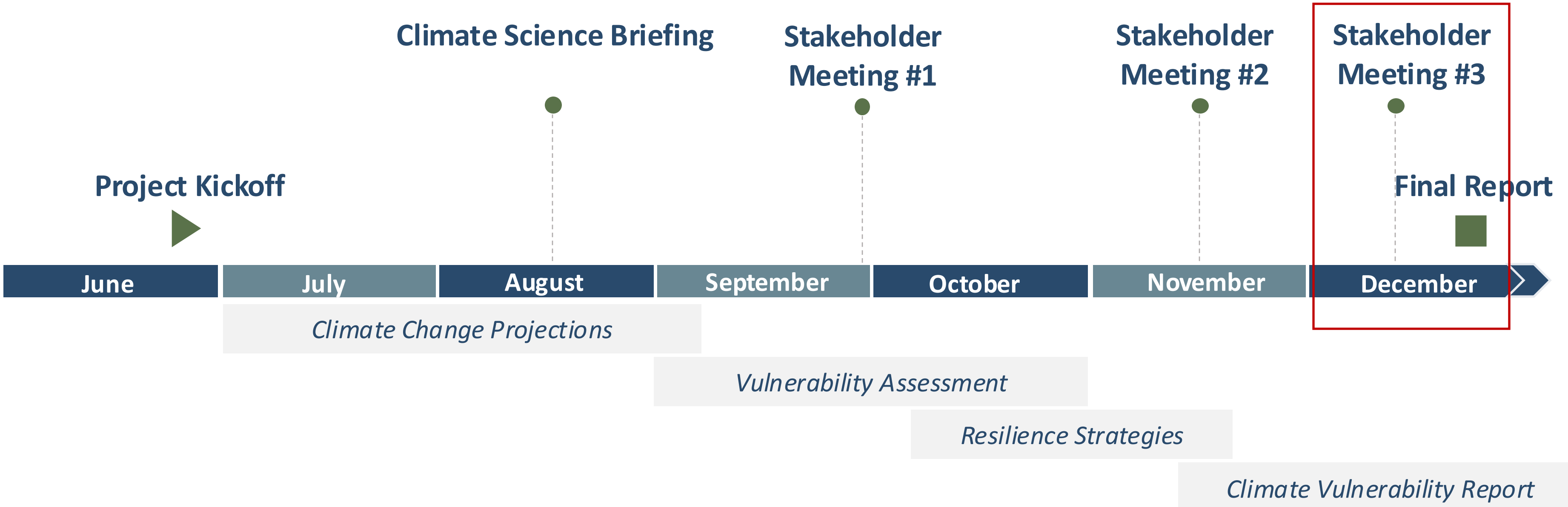
Versant's Climate Vulnerability Study and Stakeholder Engagement Roadmap



Recap of Stakeholder Meetings #1 & #2

- Reviewed **climate change projections** for a range of possible outcomes, including extreme heat, heavy precipitation, coastal flooding, wildfire, and winter weather.
- Reviewed **vulnerability assessment methodology** and **results** for extreme heat, winter weather, wildfire, and wind.
- Reviewed the **resilience framework**, potential resilience measures, and considerations for evaluating and prioritizing measures.

Overall Project Approach

Develop climate change projections for Versant's service territory.

→

Evaluate vulnerability of Versant's assets and operations to projected climate hazards. Identify high-priority vulnerabilities.

→

Develop resilience measures for high-priority vulnerabilities.

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Report Outline

Key report sections for review in this meeting:

- Climate Hazards
- Vulnerability Assessment
- Resilience Measures

Abbreviations and Definitions

Executive Summary

Introduction

- Climate Resilience in the Energy Sector
- Priority Hazards
- Assets Studied
- Study Limitations

Climate Hazards: Methodology, Future Projections and Exposure Results

- Climate Data
- Future Climate Projections and Exposure Results

Vulnerability Assessment

- Approach to Assessing Asset Vulnerability
- Results of Vulnerability Assessment
- Detailed Vulnerability Results
- Operational Vulnerabilities

Resilience Measures

- Resilience Framework
- Potential Resilience Measures
- Criteria for Prioritization
- Future Work

Next Steps and Conclusion

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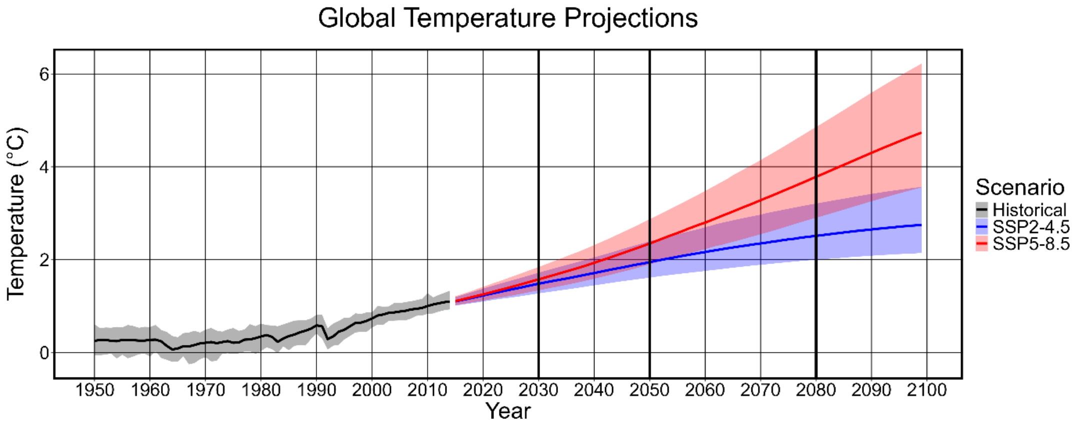
Climate Hazards: Methodology, Future Projections and Exposure Results

This section discusses the **methodology** and key findings from **future climate projections** and **exposure results**.



Extreme Heat	Winter Weather
Wildfire	Wind
Heavy Precipitation and Inland Flooding	Coastal Flooding

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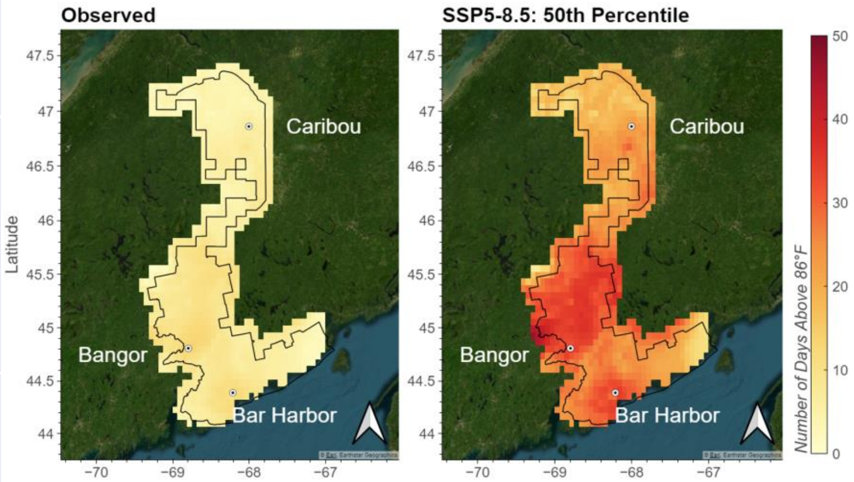
Climate Hazards: Methodology, Future Projections and Exposure Results

Extreme Heat

The frequency and intensity of extreme heat and heat waves are projected to increase across the service area, particularly in the southern and inland locations and in a high emissions scenario.

Selected Extreme Heat Projections		
Variable	**Intermediate Emissions** (SSP2-4.5: 50th Percentile)	**High Emissions** (SSP5-8.5: 50th Percentile)
2050 number of days per year above daily maximum temperature of 30°C (86°F) are projected to increase (relative to a baseline of 0.7 - 14.0 days across the service territory) by:	3.5 - 23.6 days	6.4 - 33.5 days
2050 number of heat waves per year with 2 or more consecutive days above daily maximum temperature of 86°F are projected to increase (relative to a baseline of 0.4 - 3.5 heatwaves across the service territory) by:	1.6 - 7.4 heatwaves	2.5 - 8.9 heatwaves



Observed and projected number of days with daily maximum temperature above 30°C (86°F)

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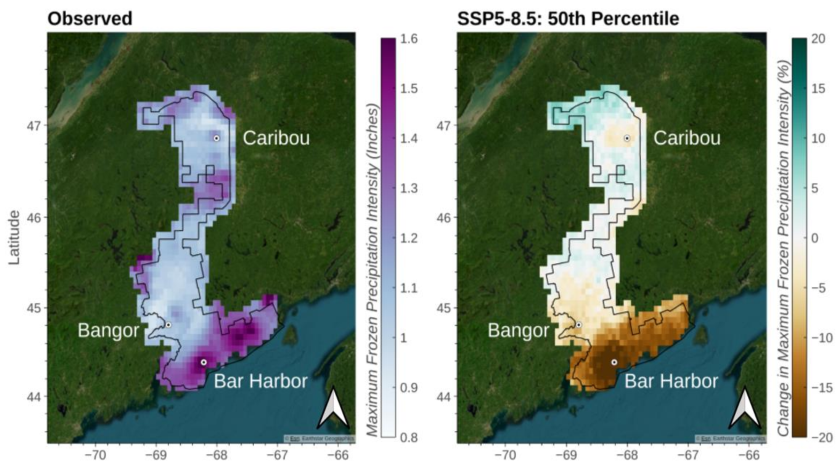
Climate Hazards: Methodology, Future Projections and Exposure Results

Winter Weather

Extreme precipitation and heavy snow intensity is expected to increase in inland areas, the likelihood of frozen precipitation and near-freezing precipitation is projected to decrease in the warmer coastal areas. Cold weather is projected to be less frequent across the service area in the future.

Selected Winter Weather Projections

Variable	**Intermediate Emissions** *(SSP2-4.5: 50th Percentile)*	**High Emissions** *(SSP5-8.5: 50th Percentile)*
2050 annual maximum 1-day frozen precipitation is projected to change (*relative to a baseline of 0.9 - 1.7 inches across the service territory*) by:	-14.4% to +11.5%	-23.6% to +9.6%
2050 annual maximum 1-day precipitation near freezing temperature are projected to change *(relative to a baseline of 0.5- 1.4 inches across the service territory) by:*	-10.3% to +21.8%	-21.8% to +23.6%



Observed and projected change in maximum frozen precipitation intensity (%) relative to observed values

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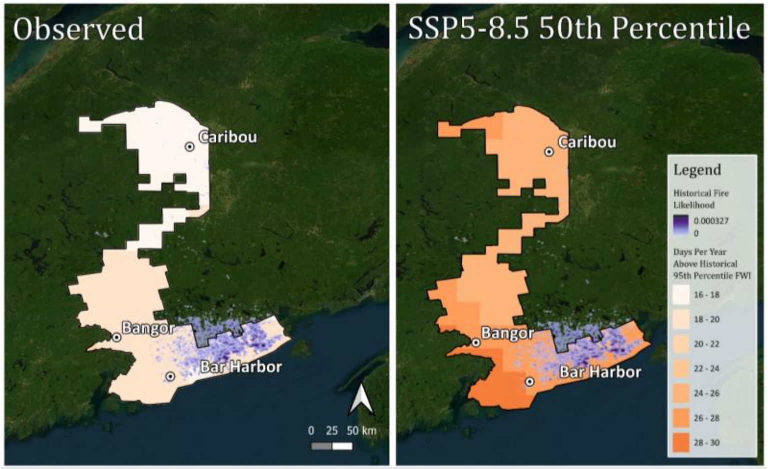
Climate Hazards: Methodology, Future Projections and Exposure Results

Wildfire

High fire danger days are projected to increase, potentially leading to increased fire activity and intensity in historically exposed areas. Historically, the southeastern portion of the service territory has experienced the highest wildfire likelihood.

Selected Winter Weather Projections		
Variable	**Intermediate Emissions** *(SSP2-4.5: 50th Percentile)*	**High Emissions** *(SSP5-8.5: 50th Percentile)*
2050 number of days per year above the historical 95th percentile FWI is projected to *increase* *(relative to a baseline of 16.9 - 20.7 days across the service territory)* by:	4.4- 6.4 Days	7.0 - 10.3 Days



Observed and projected number of days per year above historical 95th percentile fire weather index (FWI)

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Climate Hazards: Methodology, Future Projections and Exposure Results

High Winds

- Climate models have difficulty projecting changes to wind gusts due to the relatively small spatial and temporal scales at which they occur

- Growing body of research shows that climate change **will likely increase the frequency and intensity of most extreme wind events**. However, there is a high degree of uncertainty

- In particular, a study showed that the historical 1-in-700-year return period event of 115 mph (associated with Hurricane Sandy) could increase to 124 mph by midcentury. This demonstrates that **one of the most intense observations of wind speed in the Northeastern United States is projected to increase significantly by midcentury**.

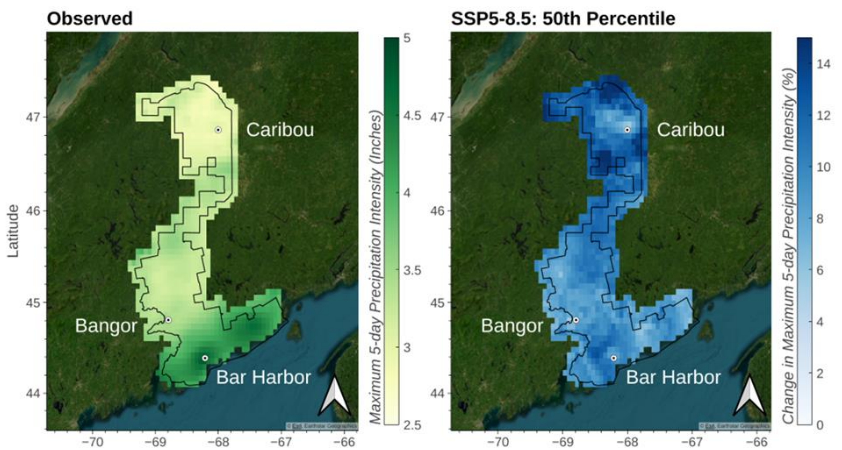
- There is scientific consensus that the **conditions that promote extreme winds and wind gusts could increase in the future**, but the magnitude of this increase comes with a high degree of uncertainty.

Climate Hazards: Methodology, Future Projections and Exposure Results

Heavy Precipitation and Inland Flooding

Extreme precipitation is projected to increase in intensity across most of the service territory, especially for inland locations and under a high emissions scenario. With rising precipitation rates, inland flooding is projected to increase across the service territory, particularly within and adjacent to the 100- and 500- year FEMA floodplains.

Selected Winter Weather Projections		
Variable	**Intermediate Emissions** *(SSP2-4.5: 50th Percentile)*	**High Emissions** *(SSP5-8.5: 50th Percentile)*
2050 annual maximum 5-day precipitation is projected to *increase* (*relative to a baseline of 2.8 - 4.8 inches*) by:	3.1% -17.1%	5.5% - 17.9%



Observed and projected change in maximum 5-day precipitation intensity (%) relative to observed

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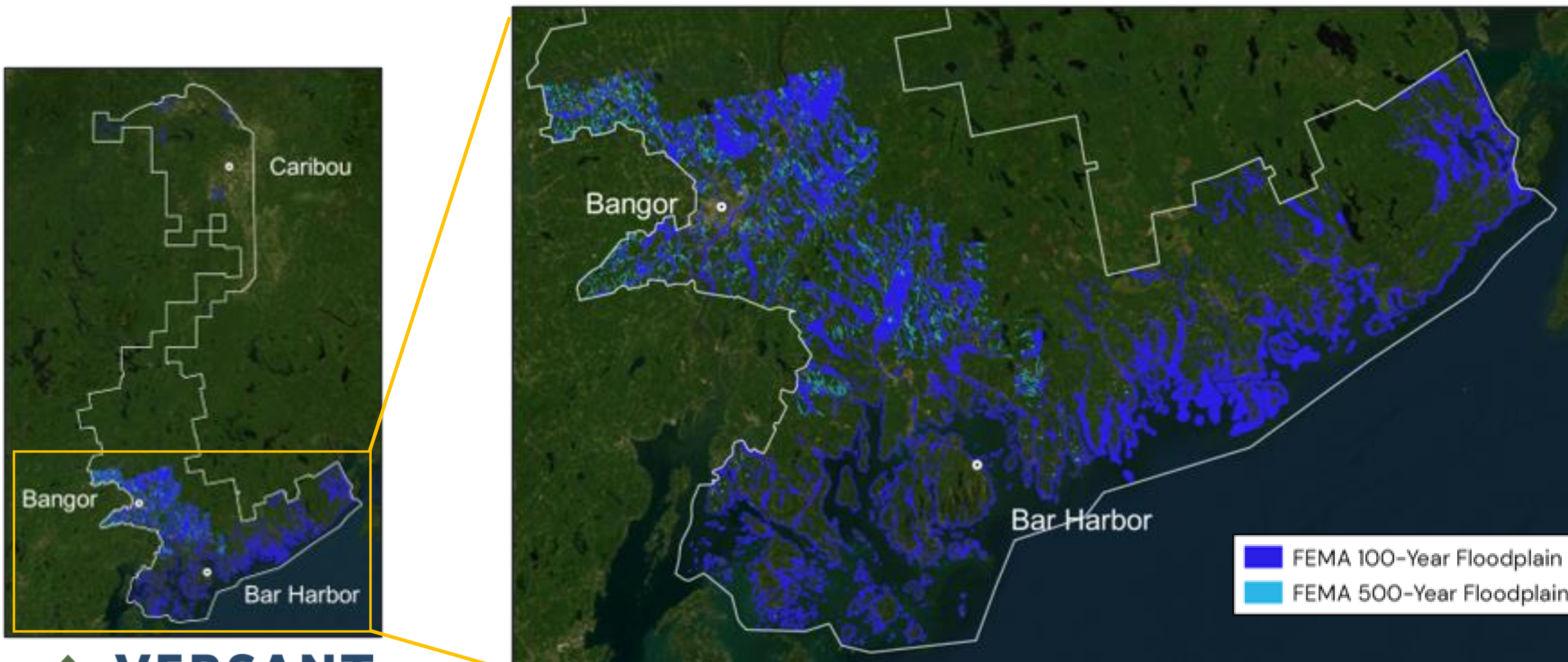
Climate Hazards: Methodology, Future Projections and Exposure Results

Coastal Flooding

Sea level rise is projected to increase permanent inundation and coastal flood exposure in some coastal portions of the service territory if adaptation measures are not put in place.



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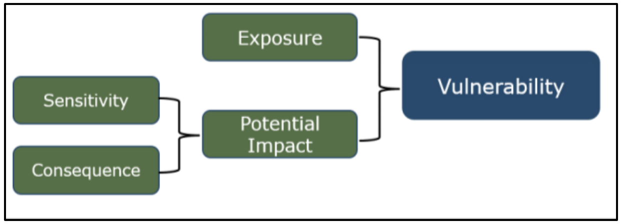
Climate Hazards: Methodology, Future Projections and Exposure Results

Extreme and Compound Climate Events

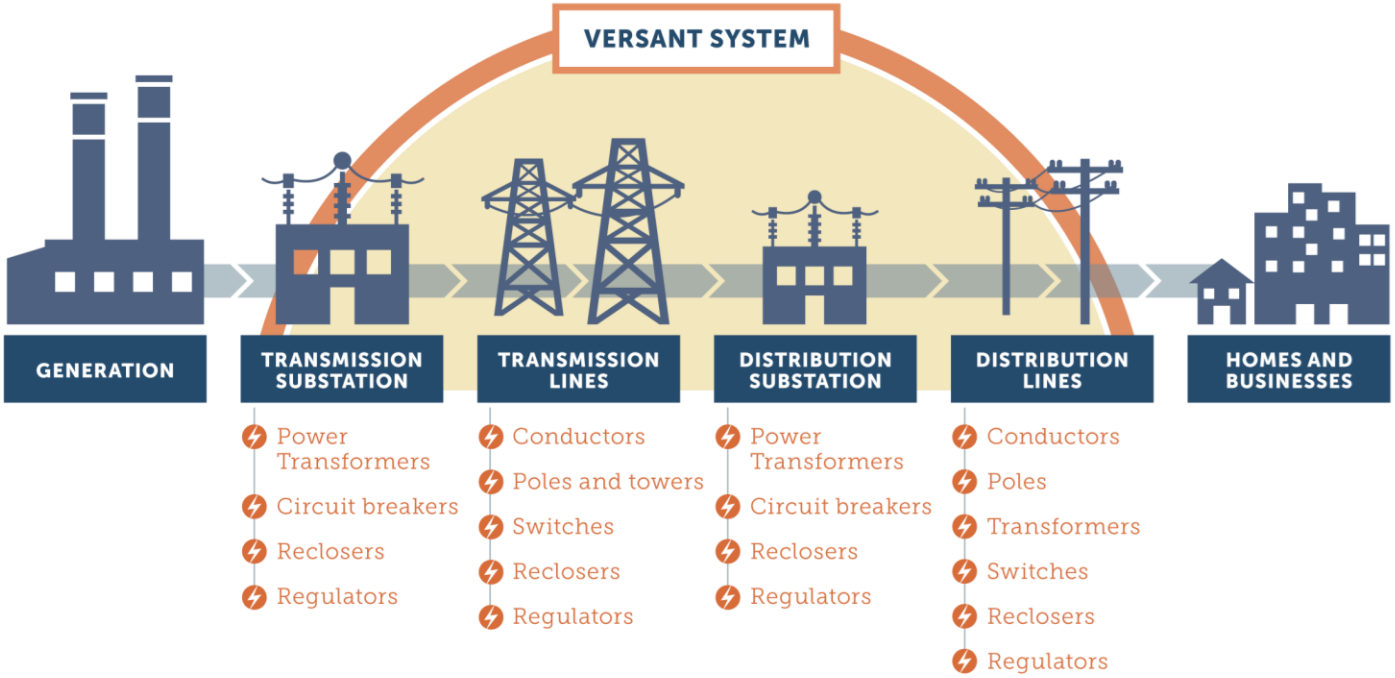
- A compound event is a weather or climate extreme in which two or more climate hazards occur simultaneously or in succession
- **Compound events will likely occur more frequently** as climate change increase the intensity and frequency of extreme events
    - **Heavy precipitation** saturates soil, weakens tree root systems, and increases the risk of **wind-driven** tree damage to assets.
    - **Heatwaves** can exacerbate **drought** through increased evaporation, raising **wildfire** risks that can damage assets and causing service interruptions.
    - **Coastal flooding** can be worsened by **rising sea levels**, **storm winds**, and **high tides**, leading to damaged assets and causing service interruptions.
    - **Rain-on-snow events** can increase **flooding** during **heavy precipitation** events due to runoff snowmelt, especially over frozen ground, damaging assets and causing service interruptions.

Vulnerability Assessment



This section discusses the **methodology** and key findings and trends from **asset-hazard** and **operational** vulnerabilities.

V2 will include Heavy Precipitation and Inland Flooding



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Vulnerability Assessment

Key Findings

Climate Hazard	Observed Vulnerability	Future Change in Vulnerability
Extreme Heat	Low	Significant **increase** in average and maximum temperatures, causing higher energy demand and lowered capacity.
Winter Weather	High	**Increase** in frozen precipitation in northern/inland areas and **decrease** in some southern/coastal areas.
Wildfire	Low	Moderate **increase** in weather conditions conducive to wildfire, which could damage assets.
High Winds	High	Possible significant **increase** in winds associated with events such as storms. High degree of uncertainty associated with wind projections.

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Vulnerability Assessment

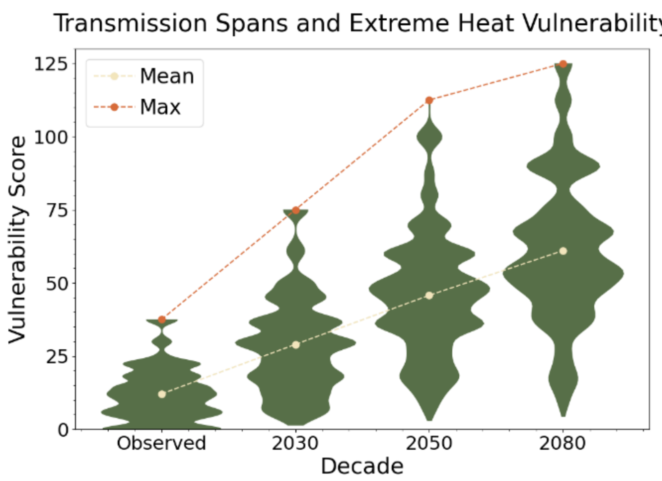
Extreme Heat

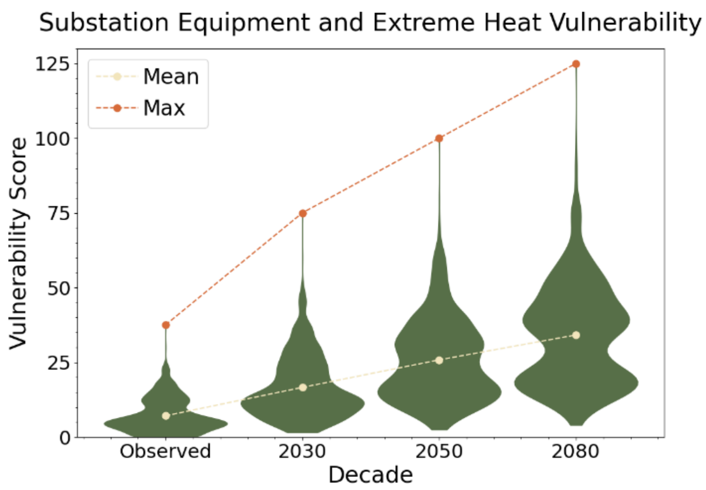
Assets assessed for extreme heat

- Transmission Spans
- Transmission Equipment
- Substation Equipment
- Substation Transformers

Projected vulnerabilities

- Increased line sag
- Reduced capacity
- Accelerated aging and failure, especially during high-demand
- Higher demand on grid





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Vulnerability Assessment

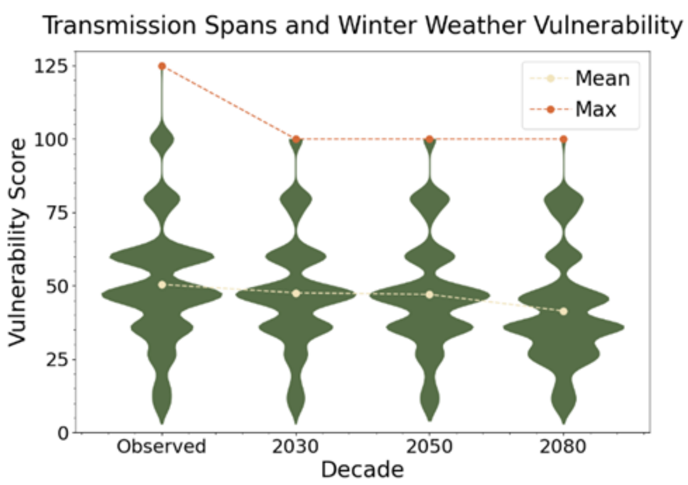
Winter Weather

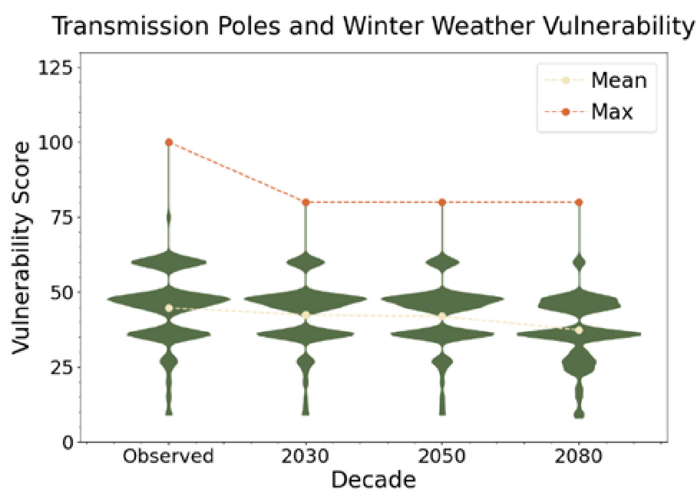
Assets assessed for winter weather

- Transmission Spans
- Transmission Poles
- Transmission Equipment
- Distribution Spans
- Distribution Poles
- Distribution Equipment
- Distribution Transformers

Projected vulnerabilities

- Ice loading and conductor failure
- Vegetation contact causing asset failure
- Mechanical component failure





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Vulnerability Assessment

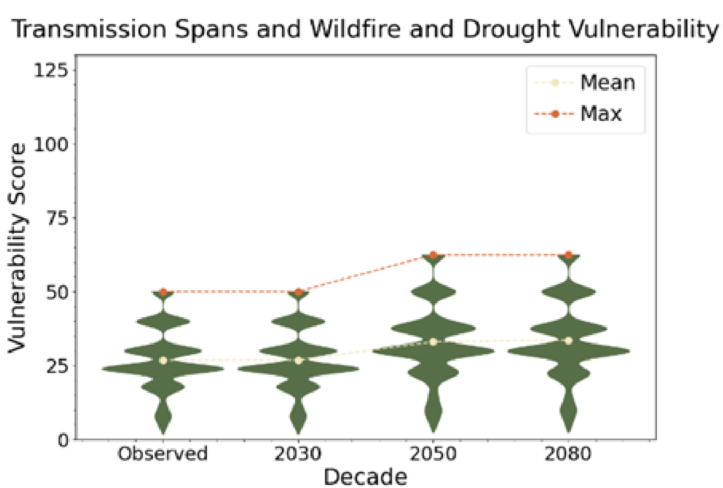
Wildfire

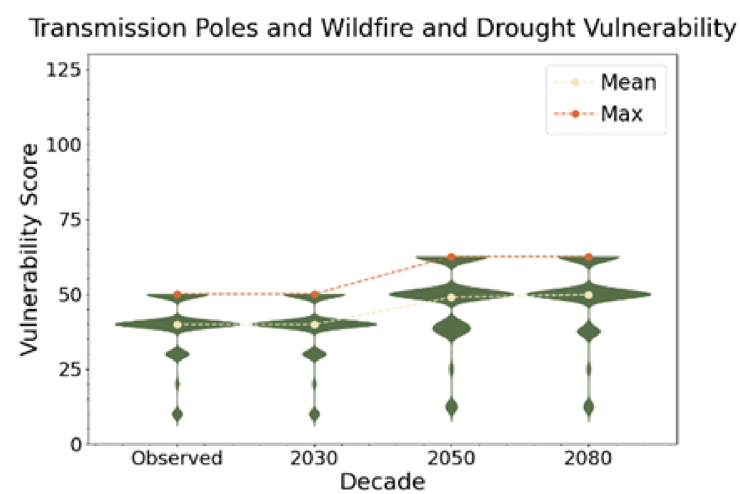
Assets assessed for wildfire

- Transmission Spans
- Transmission Poles
- Transmission Equipment

Projected vulnerabilities

- Flashovers
- Physical damage





Vulnerability Assessment

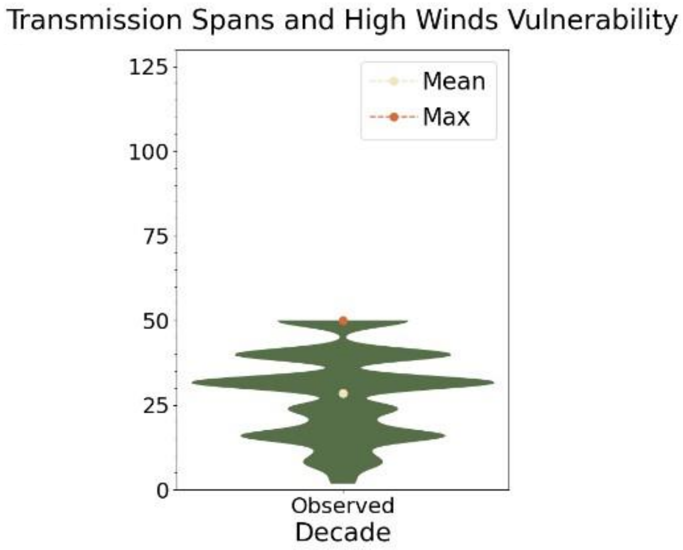
High Winds

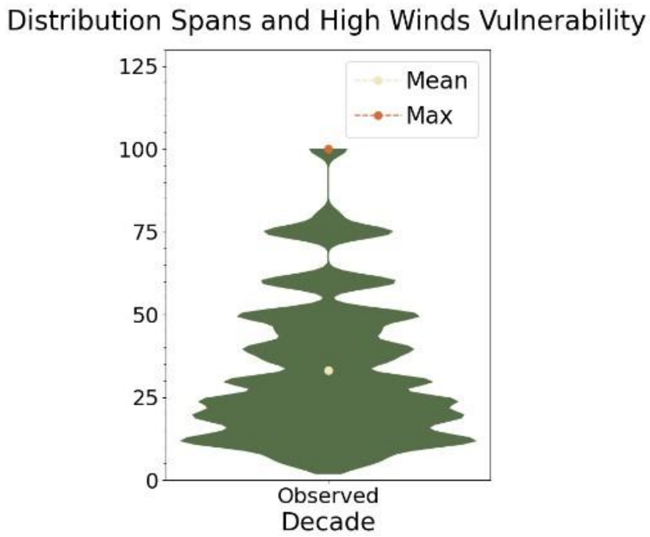
Assets assessed under high winds

- Transmission Spans
- Transmission Poles
- Distribution Spans
- Distribution Poles

Projected vulnerabilities

- Asset failure
- Vegetation contact causing asset failure
- Line detachment





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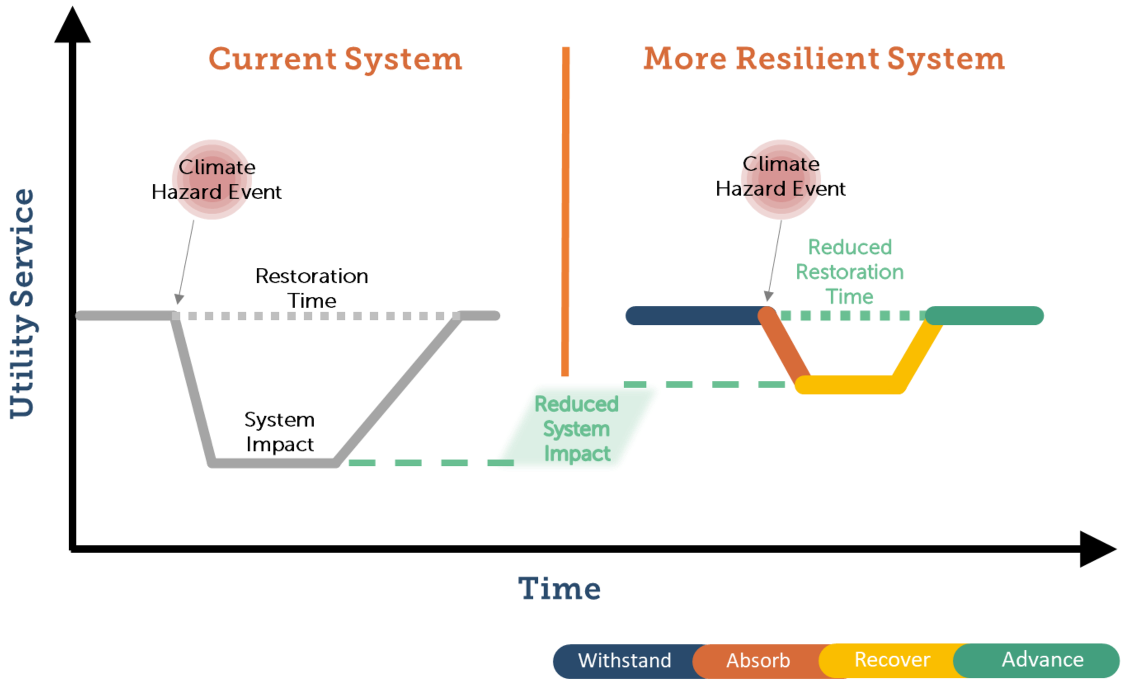
Operational Vulnerabilities

Departments	Key Takeaways and Impacts
Vegetation Management	Increased wind, winter weather, and extreme events can cause tree damage, contact with lines, and asset failure.
Environmental	Increased temperatures and heavy precipitation can increase risk of transformer spills and contamination.
Facilities	Increased wind, winter weather, and extreme events can cause damage to facilities, dangerous road conditions and affect site access, and delays in restocking equipment.
Asset Management / T&D Planning	Increased temperatures and extreme events can cause asset damage and decrease life span.
Communications, Legal & Regulatory Affairs	Increased frequency and intensity of all climate hazards can require more proactive public communication and policy and regulatory engagement.
Emergency Response	Increased wind, winter weather, and extreme events can cause more frequent activation of emergency response protocols, requiring more resource coordination.
System Operations	Increased extreme events can cause asset damage and increased temperatures can cause thermal equipment and increased grid stress.
Workplace Safety	Increased temperatures can cause heat-related risks to workers and increased storms can cause hazardous working conditions.

Resilience Measures Framework



- Presents a framework for building a more resilient system holistically – by enhancing diverse capabilities, such as withstanding, absorbing, recovering, and advancing.
- This ensures Versant's system is strengthened across multiple dimensions to address climate hazards cost-effectively and enhance long-term resilience.

Resilience Measures

The Report outlines a comprehensive suite of adaptation strategies to address the identified priority vulnerabilities, enhance resilience against specific hazards, and strengthen Versant's ability to withstand, absorb, recover from, and adapt to the impacts of the changing climate.

Example Resilience Measures	Hazard	Framework Dimension
Design standard updates / construction practices (e.g. stronger poles, targeted undergrounding)	Wildfire, Winter Weather, Wind	Withstand, Absorb
Increase spare inventory and establish robust supply chain agreements for critical assets	Wildfire, Winter Weather, Wind	Recover
Install covered conductors on targeted line segments	Wildfire, Winter Weather, Wind	Withstand
Expand transmission corridor widths to minimize vegetation contact	Winter Weather, Wind	Withstand
Install backup battery or microgrid solutions in selected areas	Winter Weather, Wind	Recover
Enhance situational awareness systems, such as fault indicators	Winter Weather	Absorb, Advance

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Future Resilience Work

- Resilience planning in 2025.
- Potential considerations for prioritizing resilience investments:
  - **Efficacy of Resilience Measures:** Degree to which the measures directly addresses and mitigates the identified vulnerabilities
  - **Synergies with Existing Programs:** Degree to which the measures aligns with existing programs to maximize impact and resources
  - **Cost and Funding Availability:** External funding opportunities and the total cost of high-cost measures
  - **Scalability and Timelines:** The immediacy of the risks and vulnerabilities that require mitigation

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Next Steps

- Final Climate Vulnerability Study report will be published in December (V2 to be released in January 2025).
- Continued stakeholder engagement as part of the IGP process.
- Incorporate results of the Climate Vulnerability Study into IGP.
- Update Climate Vulnerability Study every 3 years.

IGP Stakeholder Meetings

Penobscot County community meetings being scheduled for January 2025

Second IGP stakeholder meeting expected in early 2025

Thank You!

Please send any questions or additional feedback to gridandclimate@versantpower.com by December 31, 2024.