

Southern California Edison's Climate Adaptation Vulnerability Assessment (CAVA)

January 25, 2024

Grid Resilience Planning Training for NARUC and NASEO

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Climate Adaptation – Regulatory Framework for CA's IOUs

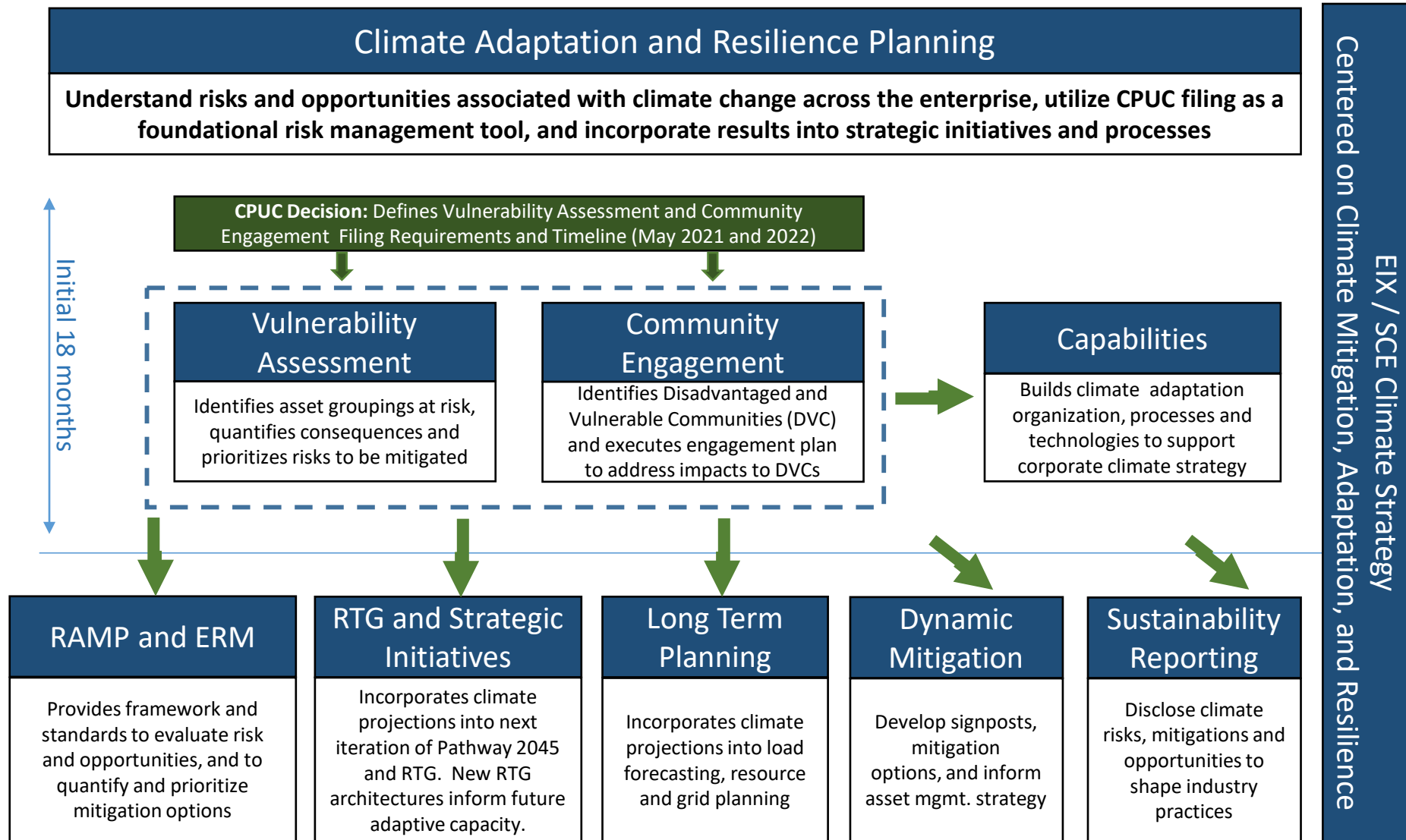
Vulnerability Assessment

- IOUs must identify actual or expected climatic impacts to **assets, operations, services, and communities**
- Climate scenarios to assess vulnerability must adhere to projections from the most recent **California Statewide Climate Change Assessment**, specifically the “business as usual” **RCP 8.5 projections**
- Climate variables in scope: **Temperature, Sea-level Rise, Wildfire, Precipitation** & Cascading Impacts
- Primarily assess mitigation needs for **20-30 years in the future, as well as 10-20 and 30-50 years out**
- Frequency: Every four years, with first one due April 22 of 2022

Disadvantaged and Vulnerable Communities (DVCs)

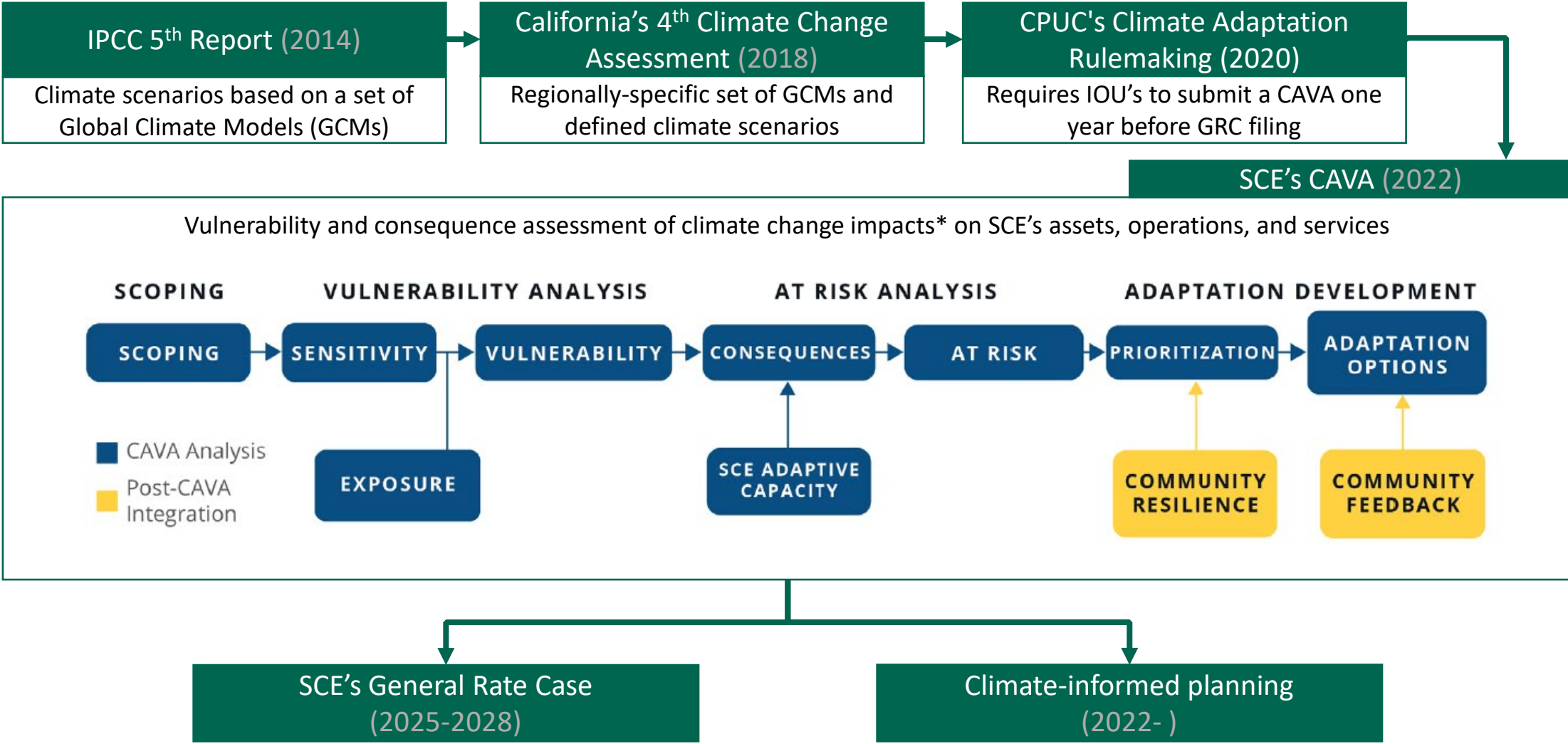
- IOUs required to identify and collaborate with DVCs around climate adaptation
- Must file and implement a **Community Engagement Plan (CEP)** informed by community input
- Consult DVCs during the Vulnerability Assessment (VA) process to **ensure equity in adaptive capacity**

SCE's Climate Adaptation and Resilience Planning Scope



The Vulnerability Assessment work was foundational for identifying major risks and developing internal capacity to inform future efforts

SCE's Climate Adaptation Vulnerability Assessment (CAVA)



*Temperature, sea level rise, precipitation and flooding, wildfire, and cascading events

CAVA 2050 exposure results and findings



Adapting for Tomorrow: Powering a Resilient Future

Key Findings Demand Urgent Action:

- The cost to invest in climate adaptation now is far less than the cost of inaction — both for the economy and public health and safety.
- As society decarbonizes in a changing climate, we need modernized planning for the grid to power communities in an uncertain future.
- Given the interdependencies of critical infrastructure, it takes all of us working together to confront the climate crisis.

AVERAGE TEMPERATURE **5°F** projected* increase relative to historical averages

- Existing infrastructure will become less efficient, resulting in reduced line capacity and higher transformer losses
- Useful life of assets will decrease

PRECIPITATION **40%** projected decline in snowpack and more variable year-to-year precipitation with more intense drought and fewer, more intense precipitation events

- Infrastructure will need to be designed to withstand more intense storm surges and flooding
- Hydroelectric generation could become less reliable if current drought continues or in the event of future prolonged droughts

SEA LEVEL RISE **2.6 feet** projected sea level rise relative to the year 2000

- Infrastructure and communities in some coastal areas will be at higher risk of flooding

EXTREME HEAT **7X** more likely, on average, to experience temperatures as hot as or hotter than historical 99th pctl. temp

- Worker safety standards will need to account for heat
- Peak load could increase significantly
- Equipment will not cool overnight during intense heat waves, reducing capacity and useful life of some equipment

WILDFIRE **23%** more land projected to burn in summer fuel-driven wildfires; wildfire season expected to be longer

- Conditions more conducive to wildfire ignition and spread
- Impacted service centers may not be able to operate or perform key functions during wildfires

*All projections assume an RCP 8.5 scenario

<https://www.edison.com/home/our-perspective/adapting-for-tomorrow.html>

Southern California Edison's Path to Climate Adaptation Investments

SCE's Climate Adaptation Vulnerability Assessment (CAVA)

Filed May 13, 2022

California's first CAVA

- Required by CPUC Decision 20-08-046.
- Envisioned by CPUC as an intermediate step to identify the risks of climate change and adaptation options.
- CPUC directed IOUs to seek approval of specific projects for climate adaptation in their General Rate Case (GRC) or other proceedings.



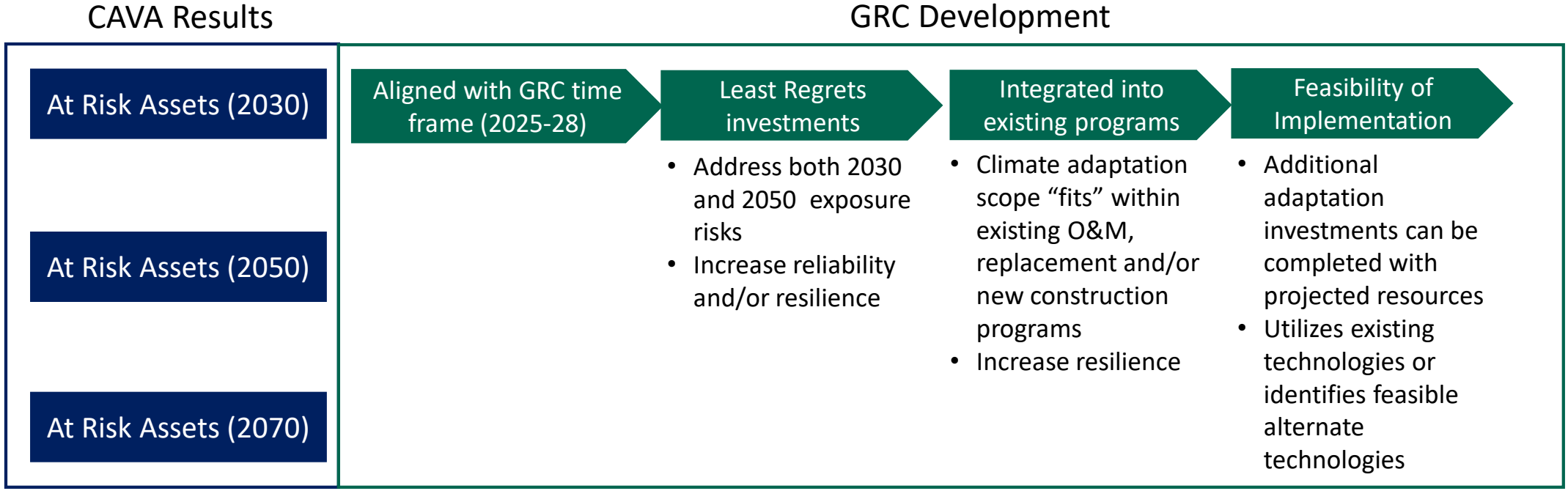
SCE's 2025-2028 General Rate Case (GRC)

Filed May 12, 2023

California's first GRC that includes climate adaptation requests

- Incorporates prioritized adaptations for risks identified in the previous CAVA filing across Generation, Transmission, and Distribution, as well as enabling initiatives across the enterprise to deepen its understanding of future physical climate risks.
- Proposed climate adaptation investments include >\$100M of capital investments across Generation and T&D, as well as O&M investments across the enterprise to support future climate adaptation assessments.

Translating CAVA Findings into GRC Investment Requests



Overview of proposed adaptations

Climate Variable	At Risk Assets	Adaptation Investments
<i>Transmission and Sub-transmission</i>		
Wildfire	Wood poles, sub-transmission conductors	Pole brushing for wood poles to reduce damage risk to poles and conductors
<i>Distribution</i>		
Wildfire	Distribution lines	Install new wires solutions (circuit tie lines) for increased operational flexibility
Flooding	Distribution lines	Install new wires solutions (circuit tie lines) for increased operational flexibility
	Pad-mounted equipment	Replace and/or upgrade with climate-resilient designs
Temperature	Substation transformers	Expand scope of substation transformer replacements in 2028, informed by climate change
	Distribution service transformers	Pilot program to proactively replace pad-mount transformers due to stress from extreme heat
<i>Generation</i>		
Wildfire	Hydro facility	Site specific vegetation studies leading to Generation, IT, and/or Distribution upgrades to increase wildfire resiliency
Flooding	Hydro facility	Stochastic Event Flood Modeling (SEFM) for all High Hazard dams to identify potential flooding risks
		Monitoring equipment installations informed by 2018 SEFM analysis results
Temperature	Natural gas peaker plant	Upgraded HVAC systems to reduce chance of forced outage during extreme heat events
Cascading events	Hydro facility	Debris Boom installations to protect against debris flow into dams

Next steps – Climate Informed Planning

Planning processes

- Climate-informed changes to:
 - Distribution System Planning
 - Transmission System Planning
 - Infrastructure Replacement
 - Other planning processes and programs
- New/upgraded systems and/or planning tools (to include climate variables and extend planning horizons)
- New IR programs for key distribution assets impacted by climate change

Design standards

- Reflect increased temperature impacts on loading and equipment sizing
 - Temperature-load relationship under revised 1-in-10 peak analysis
 - Equipment loading standards incorporate changing load factor estimates
- Reflect other climate variables in equipment designs
 - Fire, flood, debris flow resistance
- New equipment testing; new supplier classification

Climate Informed Planning Processes - Examples

- **Integrated Resource Planning (IRP)**
 - Future hourly temperature projections informing demand and supply sides of IRP planning
 - Demand
 - Incorporated temperature projections in HDDs and CDDs which impacted future heating/ cooling loads
 - Supply
 - Incorporated temperature projections in thermal, solar and battery storage outputs, reducing expected performance of these generation assets during high temperature hours
- **System Reliability Analysis**
 - Climate inform 20+ weather years being used in stochastic Loss of Load Expectation (LOLE) analyses with climate change “adder” to reflect earth warming conditions
- **Substation Transformer Replacement**
 - Developed climate-informed health index with 2030 temperature projections (number of days over 104F in 2030), resulting in three additional substation transformer replacements proposed in the 2025 GRC

Questions?

Energy for What's AheadSM

