

PG&E Climate Adaptation and Vulnerability Assessment

EXECUTIVE SUMMARY | **2024**



Our commitment: An energy system that is resilient to climate change

The impacts of climate change are already affecting the lives of Californians in significant ways and are projected to become more frequent and severe over time.

As extreme climate-driven events increase in frequency, PG&E is working today to stay years and decades ahead of California's changing climate conditions so that we can continue providing safe and reliable service for generations to come. Knowing what challenges may lie ahead means that PG&E can work today to prepare and can plan its investments to minimize costs and any impact on customer energy bills.

PG&E's 2024 Climate Adaptation and Vulnerability Assessment (CAVA)

analyzes how climate-driven natural hazards, such as rising average and extreme temperatures, extreme storms and flooding, sea level rise and wildfire, may impact the Company's ability to provide safe and reliable energy to the communities we serve.

This summary presents key findings from the report.

The full report is available at pge.com/climateresilience.



2024 Climate Adaptation and Vulnerability Assessment

This report provides a factual basis for understanding climate change risks to PG&E’s assets and operations to minimize any impact they may have on our system and service.

The findings of this report enable the integration of physical climate risk into PG&E decision-making in support of a more resilient and safe energy system.

This report is composed of two key elements:

1

Climate change and the communities we serve

As part of PG&E’s commitment to ensuring a clean and resilient energy system for all—in the face of climate-driven natural hazards—we gathered critical input from the communities we serve on how **climate change is impacting their lives and their energy-related needs**.

Community needs and preferences, especially for our most socially vulnerable customers, are a critical input as PG&E makes decisions about how to adapt the energy system on behalf of customers.



2

Vulnerability of PG&E infrastructure, assets, operations and services

This report informs PG&E’s urgent efforts to address the impacts of climate by **identifying potential climate change vulnerabilities of our assets and operations to projected future conditions in 2050**, as well as potential adaptation options that could be pursued to address these vulnerabilities.

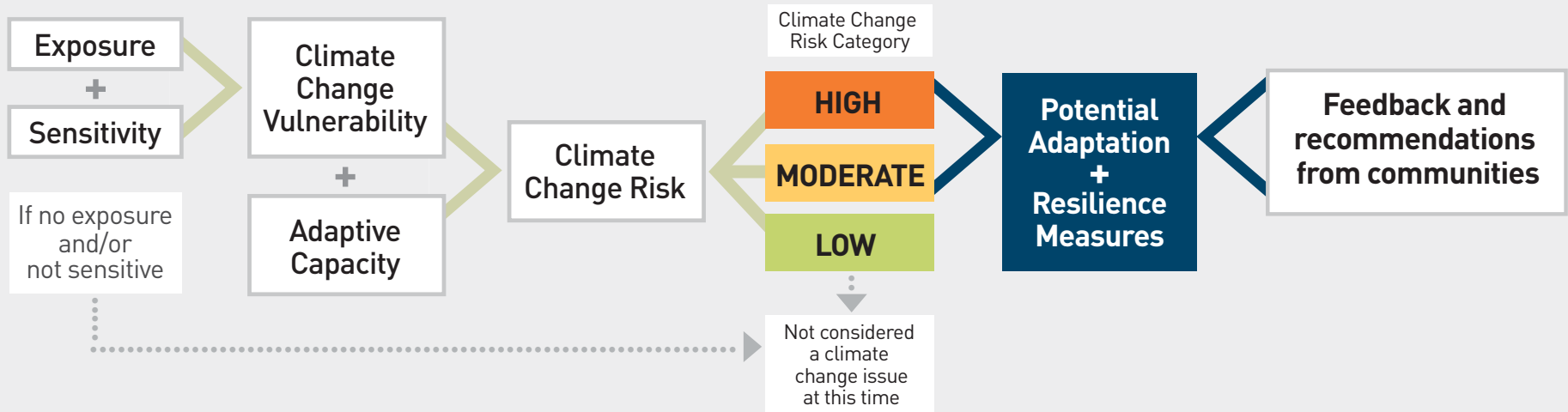
These adaptation options are not proposed investments but will be critical to inform future investment decision-making.



Methodology

This report examines the vulnerability of PG&E assets relative to future environmental conditions in 2050 based on the best available climate projections. The scope of the assessment includes all of PG&E's asset families and critical operations across the five regions of PG&E's service area. This analysis supports PG&E in prioritizing adaptive actions needed to build a climate-resilient energy system.

This is accomplished using the following methodology, which considers a wide range of climate variables and identifies specific metrics and thresholds of future conditions that are relevant to PG&E's assets and operations. The specific results of the vulnerability analysis for various assets and geographies are described in each section of the report.



Findings: Climate change risks

The table below is a high-level synthesis of climate change risk for PG&E's assets and infrastructure by asset family.

These results represent the vulnerability of PG&E's present-day energy system relative to conditions projected by 2050, in order to inform and prioritize adaptive actions.

Future Outlook: CAVA Results for 2050



	HIGH HEAT	HEAVY RAIN & FLOODING	SEA LEVEL RISE	WILDFIRE
ELECTRIC				
Transmission	High	High	High	High
Substation	High	High	High	High
Distribution	High	High	High	High
GAS				
Transmission	Low	Low	Low	Low
Distribution	Low	Low	Low	Low
Compression and Processing, Storage	Low	High	High	High
Measurement and Control Stations	Low	High	Low	High
LNG/CNG	Low	Low	Low	Low
POWER GENERATION				
Hydropower	Low	NON DAM (Low), DAM (High)	N/A	High
Natural Gas	Low	Low	Low	Low
Solar	Low	Low	N/A	Low
Nuclear	Low	Low	Low	Low
ENTERPRISEWIDE				
Critical facilities and IT	Low	Low	Low	Low

Color legend of climate change risk categories:

HIGH

Vulnerable assets. Current operational and planning processes likely not sufficient given future climate projections.

High-priority climate change issue.

MODERATE

Vulnerable assets. Opportunities exist to bolster current operational and planning processes to enable greater resiliency.

Recommend addressing issue.

LOW

Not considered a climate change issue at this time.

continued



Key findings

The findings in this report on the vulnerability of PG&E's existing energy system to projected conditions by 2050 will guide us **as we continue making strategic investments to strengthen our system to withstand changing environmental or climate-related risks on the road ahead**. While hazards are projected to become more frequent and severe over time, climate change is already impacting the energy system and the communities we serve.

The report finds that:



Projected increases in temperatures in excess of current planning and operational capabilities may result in insufficient capacity, reduced equipment life and asset failure and could diminish reliability of electric assets. This finding is particularly relevant as PG&E plans for the grid of the future to support electrification and the state's climate goals.



Changing precipitation patterns and resulting flooding may adversely impact **electric assets** such as substations and conductor support structures, as well as **gas assets** such as the McDonald Island Gas Storage facility and certain gas measurement and control stations. **Non-dam hydropower assets** may also be at heightened risk of damage.



The risk of wildfire from any source is projected to increase due to climate change, leading to higher risk of wildfire damage to many of PG&E's assets. PG&E's existing wildfire mitigation plan, though focused on eliminating wildfire ignited by electrical equipment, also **represents a significant existing investment in climate resilience**.

The impacts of climate change may also affect PG&E's **critical operations** and result in unsafe conditions for our field teams and coworkers whose services are critical to meeting the needs of our customers and communities.

We know there is a lot to do to address these impacts and **our commitment to building a clean, safe and resilient energy system for all**.

Climate change and the communities we serve

Delivering for our hometowns is at the heart of what we do at PG&E. Through the Resilient Together Initiative, PG&E partnered with community members to understand how climate hazards are impacting the energy-related resilience needs of those we serve.

Recommendations from the communities most vulnerable to climate change indicate opportunities to support community resilience during extreme heat, power outages, flooding and wildfire events.

In addition to these recommendations, affordability of energy services was a consistent community concern. PG&E recognizes the challenge of energy affordability and is committed to making energy bills more affordable.



Recommendations from communities to PG&E

PG&E provides this summary of community recommendations as we heard from our communities, and continues to evaluate which, if any, we can or will pursue.

- 1 Center equity** in all decision-making processes, investments and programs.
- 2 Expand weatherization programs** to provide highly subsidized or no-cost home improvements that make homes more resilient to a variety of climate hazards.
- 3 Provide distribution of free safety resources** that improve household resilience.
- 4 Provide direct reimbursements** for costs associated with power outages.
- 5 Maximize enrollment and longevity** of existing PG&E programs in Disadvantaged and Vulnerable Communities.
- 6 Provide financial support** for the development and sustained operation of community resilience centers.
- 7 Improve emergency notifications** and community education on hazards and resources.
- 8 Enable the expansion of distributed energy resources (DER)** to help minimize power outages in DVCs.
- 9 Expand urban greening** and forest management programs and investments.
- 10 Improve emergency evacuations** and transportation access to cooling centers.
- 11 Invest in and expand existing workforce** development programs.

Adaptation and resilience: PG&E's next steps

Though this report is focused on projected conditions in 2050, Californians are already living in an environment in which historically extreme climate-driven hazard events can and do happen. Many hazard events are likely to become more extreme and frequent over time. Additionally, energy system investments made today will be exposed to conditions in 2050 and beyond due to the multidecadal expected useful life of utility assets. **That's why we are acting now.**

PG&E is already doing a portion of the work to make the system climate-change resilient—for example, undergrounding 364 miles of powerlines at 10% lower cost than forecast and other system hardening—as part of our current 2023 General Rate Case (GRC), which covers the years from 2023-2026. Learnings from the CAVA will be integrated into future investment proposals. We are committed to continuing to make strategic investments for a safer and more resilient energy system at the lowest price for our customers.

Supported by the findings in this report, our next steps may include:

Evaluation of adaptation options for investment:

Adaptation options identified in this report will be considered in the context of PG&E's existing risk-based investment planning process. Climate resilience is one of multiple critical energy system priorities, including capacity, reliability, asset health and existing wildfire safety commitments, that require investment to meet California's needs.

These investments must be considered holistically to account for potential co-benefits as well as to support affordability by allocating precious customer dollars effectively.

PG&E has begun to integrate physical climate risk into its Risk Assessment and Mitigation Phase (RAMP) reports and will include a chapter dedicated to Climate Resilience in the 2027-2030 GRC filing.

continued



Adaptation and resilience: PG&E's next steps (continued)

Community and government partnership: Building climate resilience is a shared goal between PG&E and the communities we serve. This report provides a basis for engagement with local, state, federal and tribal partners—as well as the communities they represent—on shared climate vulnerabilities and potential opportunities for partnered adaptation.

Advancing key climate resilience capabilities for the energy system: Climate-hazard impacts experienced across the United States and globally in recent years have elevated the importance of climate resilience as an issue within the energy sector. PG&E continues to advance its own understanding of physical climate hazards and how to adapt to them as well as partner with industry stakeholders to share findings and participate in new research.

PG&E is a contributor and technical advisor to multiple California Energy Commission-funded climate research initiatives, provides expertise to the state via the Governor's Office of Planning and Research (OPR), Integrated Climate Adaptation and Resilience Program (ICARP) and Technical Advisory Council and also participates in the groundbreaking Electric Power Research Institute's (EPRI) Climate Resilience and Adaptation Initiative (READi). These collaborations are critical to establishing shared planning assumptions and effective adaptation strategies across the energy sector.

Continued commitment to mitigating extreme wildfire risk: Extreme wildfire risk is a critical hazard to mitigate for California's energy sector. PG&E's existing Wildfire Mitigation Program is an example of rapid adjustment, or adaptation, to climate-driven increases in wildfire risk. PG&E remains committed to reducing wildfire risk from its equipment via the measures outlined in the company's 2023–2025 Wildfire Mitigation Plan (WMP). PG&E's WMP includes the effort to underground 10,000 miles of powerlines in the highest wildfire threat areas, an adaptation that will likely improve system resilience to other climate-driven hazards.

Targeted improvements for future vulnerability assessments: Over the course of developing this report, PG&E identified a number of areas of potential improvement to be addressed in subsequent work. These include utilizing new energy-system relevant climate-hazard variables as they mature and become available, analyzing system-level impacts and conducting scenario-based power-flow analyses to map the impact of hazard conditions—including compounding and cascading events—to particular communities, and incorporating data about non-utility owned infrastructure that supports energy-system resilience (e.g., the condition of flood control infrastructure in the Sacramento Delta).

