
# Risk Assessment and Mitigation Phase Cross-Functional Factor

# (SCG-CFF-2)

# Energy System Resilience

**May 17, 2021**

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# CROSS-FUNCTIONAL FACTOR: ENERGY SYSTEM RESILIENCE

## I. INTRODUCTION

This Energy Resilience Cross-Functional Factor (CFF) Chapter describes how Energy Resilience activities impact the risks described in SoCalGas's other Risk Assessment Mitigation Phase (RAMP) Chapters.

SoCalGas is presenting CFF information in this RAMP Report to provide the Commission and parties additional information regarding the risks and mitigations described in its RAMP Chapters. CFFs are not in and of themselves RAMP risks. Rather, CFFs are drivers, triggers, activities, or programs that may impact multiple RAMP risks. CFFs are also generally foundational in nature. Therefore, SoCalGas's CFF presentation differs from that of its RAMP risk chapters (*e.g.*, no risk spend efficiency calculations or alternatives are provided).

As described below, Energy Resilience spans multiple lines of business and helps to mitigate several RAMP risks in this Report. The following risk chapters are affected by Energy Resilience: Incident Related to the High/Medium Pressure System, Incident Related to the Storage System and Excavation Damage. For example, the increased knowledge gained from vulnerability assessments or geological hazard identification influence projects and programs instituted to reduce incident risks to the gas system.

## II. OVERVIEW

### A. The Increasing Need for Energy Resilience

Californians deserve a reliable and affordable supply of energy that is clean, safe, and resilient. While it is impossible to predict what the energy ecosystem will look like over the next two decades, SoCalGas knows it must be safe, reliable, and resilient. Californians will need an increasingly integrated and decarbonized portfolio of energy sources and tools that are affordable, scalable, and can meet critical peak periods of energy demand. California's future and quality of life depend on it.

SoCalGas also knows its customers and the California economy cannot afford to wait for others to secure this future. SoCalGas is intent on leading the transition to resilient decarbonized energy. Innovation and rapid development of new technologies will be critical to achieve success. As the first gas utility in America to install advanced meters, a pioneer in the development of renewable natural gas, and a leader in hydrogen innovations, SoCalGas has

surpassed mandated emissions reduction targets,[1] and continues to incorporate technological advancements into its operations. Through collaboration and partnership, California can lead the transition to affordable and resilient clean energy solutions at scale and serve as a global beacon for energy innovation.

The purpose of this Chapter is to address a critical category of challenges that are not risk events themselves, but rather, transcend multiple risk categories by influencing the likelihood and/or consequence of other identified risks. In this Chapter, SoCalGas describes how its commitment to securing a resilient energy future for California traverses multiple RAMP risk categories and underpins its next GRC. SoCalGas's spending on projects and activities that lead to a decarbonized grid goes hand-in-hand with furthering energy resilience in California's clean energy future.

### B. What is Energy Resilience?

**Resilience** is defined as a system's ability to prevent, withstand, adapt to, and quickly recover from a high-impact, low likelihood event. In contrast, **reliability** refers to a system's ability to maintain energy delivery under standard operating conditions, including normal fluctuations in demand and supply.[2] A resilient energy system is vital to every critical function and sector of the U.S. economy and to the communities that depend upon its services.[3]

SoCalGas envisions a resilient, clean energy future founded upon an integrated energy system with decarbonized molecules and electrons working together to drive down emissions and safely and reliably meet all Californians' energy needs. To achieve this future state, continued investments in maintaining the resilience and performance of California's gas system infrastructure *as it decarbonizes* is essential.

### C. Energy as Foundational to Modern Life

Today, more than ever, Californians are increasingly dependent on energy to fuel their lives. As recently explained by the Commission, electricity and natural gas are essential services

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[1] As part of the Senate Bill (SB) 1371 Leak Abatement program, SoCalGas has made significant advancements in surveying, recording and repair that have reduced methane emissions across SoCalGas's service territory.

[2] American Gas Foundation, *Building a Resilient Energy Future: How the Gas System Contributes to US Energy System Resilience* (January 2021) at 9, *available at https://gasfoundation.org/2021/01/13/building-a-resilient-energy-future/*.

[3] *Id*. at 9.

that are necessary to maintain a healthy living standard and to meaningfully participate in society:

> Electricity and natural gas are essential services, and consumers necessarily must purchase them to maintain a healthy living standard and meaningfully participate in society. Unlike other products or services, which customers are able to forego if prices rise too high, essential utility services will continue to be consumed regardless of price. This means that for low-income households, increases in utility bills will crowd out other purchases rather than affect energy usage behavior.[4]

Energy powers our homes, recharges our telephones and computers, and fuels our vehicles. Without a reliable source of energy, we would be unable to engage in the most basic of day-to-day activities, such as communicating with others outside our home, powering up appliances, cooking food, and taking warm showers. Without a reliable source of energy to fuel cellular telephones, enable Wi-Fi connections, and power up computers, many Californians would be unable to work.

Because energy is increasingly foundational to modern life, Californians' need for a resilient energy system that is capable of withstanding low-likelihood, high impact events is also increasing.

### D. Climate Change is Increasing the Need for Energy Resilience

Global climate change is driving an increased need for energy resilience in California in two distinct, yet interrelated ways. First, global climate change is driving an increased need for energy resilience due to the increasing frequency and intensity of extreme weather events. As recognized by the Commission in its Climate Change Rulemaking, "California utilities are already experiencing impacts from climate change such as increased temperatures, an increased number of wildfires, sea level rise, and severe drought."[5] Second, climate change is driving an increased need for energy resilience in California due to the actions California is taking as a global leader to address climate change through decarbonization of the energy system. As the transformation of California's energy system accelerates, interdependence of the gas and electric

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[4] CPUC, *Utility Costs and Affordability of the Grid of the Future: An Evaluation of Electric Costs, Rates, and Equity Issues Pursuant to P.U. Code Section 913.1* (Feb. 2021) (Affordability Whitepaper) at 86.

[5] Order Instituting Rulemaking to Consider Strategies and Guidance for Climate Change Adaptation (Rulemaking (R.) 18-04-019) (Climate Change Adaptation OIR), at 11.

systems increases. Therefore, the more the State's grid system relies upon intermittent electric resources, the more long-duration, dispatchable capacity is needed. Gas is currently the primary means to complement renewable energy and to maintain a reliable, resilient, and affordable electric grid, as well as to provide long-duration storage.

The Commission has initiated a rulemaking to consider strategies to integrate climate change adaptation matters into relevant Commission proceedings, determining that "robust climate adaptation planning in a time of worsening climate impacts is a prudent next step to ensure the safety and reliability of all investor-owned public utilities."[6] The Commission has identified the first steps toward electric and gas sector climate resilience – examining all the climate change-related vulnerabilities of the system, and then envisioning all the potential remedies to those vulnerabilities.[7] SoCalGas has been studying climate change issues, potential impacts, and adaptation for several years and has undertaken considerable efforts to confront the risks posed by such impacts. This Chapter includes SoCalGas's assessment of the gas system's ability to weather the safety and reliability-related threats posed by global climate change and plan to enable the deployment of solutions to address those vulnerabilities.

Table 1 below summarizes the top climate change related hazards and potential consequences to the SoCalGas gas system.

**Table 1: Hazard, Events, and Potential Consequences**

| Hazard | Events | Potential Consequences |
|---|---|---|
| Increased Frequency and Severity of Storm Events | Storm surge (El Niño events), flooding, high winds, and heavy snow. | 1. Increased frequency of emergency response from Gas Emergency Centers (GECs) and SoCalGas crews.<br>2. Levee erosion or failure necessitating asset repair, replacement, or relocation to low-lying above- and below- ground gas assets.<br>3. Exposure of underground pipelines. |

[6] *Id.* at 1.

[7] *Id.* at 14.

| Hazard | Events | Potential Consequences |
|---|---|---|
| Change in Precipitation Patterns and Droughts | Subsidence, landslides, mudslides, weakened soil structure, drought-induced vegetation loss. | 1. Horizontal subsidence causes compressive stresses resulting in buckling of gas pipelines.[8]<br>2. Exposure of underground pipelines.<br>3. Reduced access to pipeline rights-of-way.<br>4. Diminished effectiveness of cathodic protection system, which can lead to increased corrosion.<br>5. Damage to pipelines in bridges or spans due to mudslides. |
| Sea Level Rise | Erosion, coastal inundation, and flooding potential. | 1. Levee erosion or failure necessitating asset repair, replacement, or relocation to low-lying above- and below-ground gas assets.<br>2. Exposure of underground pipelines. |
| Change in Temperature Extremes | Increased gas demand for electric generation to meet demand on more cooling days and/or for air conditioning (HVAC) demand. Increased ambient temperatures. | 1. Increased cycling of compressor station and maintenance schedules along with additional design requirements for compressor stations to support the increased cycling.<br>2. Damage to pipelines in bridges or spans due to thermal expansion. |

[8] SoCalGas is not aware of research indicating that the climate change threats noted would result in horizontal subsidence; however, oil extraction and water extraction can potentially cause subsidence.

SoCalGas's adaptation, assessment, and commitment to meet the challenges posed by climate change, discussed below, align with the Commission's guidance to the State's electric and gas utilities to incorporate climate change adaptation in utility planning to maintain safe, reliable, and affordable energy services in the future's more difficult operating environment.

### E. SoCalGas's Commitment to Securing a Resilient Energy Future

SoCalGas is committed to meeting the energy resilience challenges posed by Californians' increased reliance on energy and by global climate change. The resilience of the gas system is well-noted. As reliance on renewable fuels increases, so will energy interdependence, and this resilience will be critical for maintaining the energy system overall. In addition, a diverse fuel supply will further support system resilience. While maintaining this resilience, SoCalGas commits to driving rapid innovation and the deployment of new clean energy solutions. SoCalGas further commits to maintaining the affordability of its gas service to support the State's economy and preserve Californians' quality of life while moving toward this energy future.

#### 1. Resilience of the Gas System

The resilience of California's gas system is well-recognized. In 2018, SoCalGas actively participated in a study commissioned by the CEC to assess the potential impacts of climate hazards on the gas grid.[9] The CEC found "gas assets and services are likely to experience limited impacts from climate hazards. Widespread disruptions are not expected due to limited projected exposure to climate hazards and existing physical protections that limit potential impacts."[10] SoCalGas's gas grid and services are inherently resilient to natural and man-made disasters, because most of SoCalGas's infrastructure is belowground and less vulnerable to climate hazards than aboveground infrastructure.[11] Additionally, "operational flexibility is

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[9] *See* California Energy Commission Report CCCA4-CEC-2018-009, Potential Climate Change Impacts and Adaptation Actions For Gas Assets In The San Diego Gas and Electric Company Service Area (August 2018), at 1.

[10] *See* California Energy Commission Report CCCA4-CEC-2018-009, Potential Climate Change Impacts and Adaptation Actions For Gas Assets In The San Diego Gas and Electric Company Service Area (August 2018), at 61.

[11] "Case Studies of Natural Gas Sector Resilience Following Four Climate-Related Disasters in 2017," ICF, 2018, at 79. *Available at https://www.socalgas.com/1443742022576/SoCalGas-Case-Studies.pdf.*

designed into the gas system within a set of system standards that ensure the system's safety and security."[12]

The inherent resiliency of the gas delivery system lends itself to diverse energy solutions and technologies and addresses customer and public safety concerns during constrained energy supply periods, such as during emergencies—including those caused by climate change—and/or extreme weather. For example, SoCalGas's compression stations are capable of continuing to operate during power outages, as these stations can self-start or black-start (restoring power without relying on the external electric power transmission) the energy generated onsite to power the compressors.

The characteristics of SoCalGas's system, including significant storage capacity, underground location of assets, and dispatchability, enable and complement the use of intermittent renewables by providing reliability and resilience. This resilient gas system can enable the State's transition to an integrated energy system of the future with decarbonized molecules and electrons working together to lower emissions and safely and reliably meet Californians' energy needs.

### 2. Energy Interdependence Increases the Need for Energy Resilience

As the transformation of California's energy system accelerates, interdependence of the gas and electric systems increases. Therefore, the more the State's electric energy grid relies upon intermittent electric resources, the more long-duration, dispatchable capacity is needed. Gas is currently the primary means to complement renewable energy and to maintain an affordable, reliable, and resilient electric grid, as well as to provide long-duration storage. Existing gas infrastructure will continue to play a critical role in maintaining an integrated energy system, providing the flexibility for intermittent renewable resources to be seamlessly added to the grid without interruption. For example, the Summer of 2020 brought severe climate-related heat waves and wildfires that significantly impacted California's demand for and supply of generation.[13] All of SoCalGas's storage assets were employed to fill the gap between

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[12] American Gas Foundation, *Building a Resilient Energy Future: How the Gas System Contributes to US Energy System Resilience*, January 2021, at 3, *available at* *https://gasfoundation.org/2021/01/13/building-a-resilient-energy-future/*.

[13] California Independent System Operator. *Final Report the Root Cause Analysis: Mid-August 2020 Extreme Heat Wave* (Jan. 13, 2021), at 21, *available at* *http://www.caiso.com/Documents/Final-Root-Cause-Analysis-Mid-August-2020-Extreme-Heat-Wave.pdf*.

abnormally high electric demand, driven by increased cooling loads, and low renewable energy generation, due to smoke from wildfires.[14] SoCalGas's gas system helped avert a crisis within a crisis, providing an essential solution to intermittency, storability and dispatchability challenges.

The recent climatic events also demonstrate the need for a resilient gas system to support a solar/wind-based energy system. The power outages experienced in August and September of 2020 illustrate the critical need for the long-duration storage provided by California's gas system to bridge the gap between energy demand and reliable supply. A recent report by the California Independent System Operator (CAISO) found that "[i]n transitioning to a reliable, clean, and affordable resource mix, resource planning targets have not kept pace to ensure sufficient resources that can be relied upon to meet demand in the early evening hours. This made balancing demand and supply more challenging during the extreme heat wave."[15]

Recent power outages similarly highlight the fundamental difference between renewable energy, which is variable and only available during a limited timeframe, and firm capacity, which is available on-demand. In contrast to intermittent energy resources, the gas grid provides a reliable source of dispatchable, on-demand energy, allowing for the generation of electricity to meet peak energy demand. It also plays a critical role in managing the daily and seasonal ramping needs of the electric grid, which are expected to increase in magnitude and frequency given California's greater reliance on intermittent renewables (*i.e.*, solar and wind). These ramping services, coupled with the State's gas grid, have proven invaluable in responding to the rapid fluctuations of an increasingly volatile energy system.

In short, continued investments in maintaining the gas system's performance and resilience are essential to achieve State climate goals and support the State's increasing reliance on renewable electric generation.

### 3. Energy Resilience through Diversification of Fuel Supply

Due to climate change, extreme weather events are increasing in intensity and frequency. Thus, a critical capability of the gas grid is its resilience to operate during electric system

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[14] U.S. Energy Information Administration, *Today in Energy: Smoke from California wildfires decreases solar generation in CAISO* (Sept. 30, 2020), *available at* *https://www.eia.gov/todayinenergy/detail.php?id=45336*.

[15] California Independent System Operator. *Final Report the Root Cause Analysis: Mid-August 2020 Extreme Heat Wave* (Jan.13, 2021), at 4, *available at* *http://www.caiso.com/Documents/Final-Root-Cause-Analysis-Mid-August-2020-Extreme-Heat-Wave.pdf*.

disruptions caused by extreme weather events. SoCalGas will continue to enable California to provide a clean, safe, reliable, and resilient supply of energy in the face of increasing climate change challenges.

SoCalGas's long-term storage infrastructure plays an essential role in preserving this energy system reliability and resilience. Without long-term storage, a catastrophic climatic event could potentially have a significant effect on the safety and wellbeing of Southern Californians. For instance, an event similar in gravity to that of the 2014 Polar Vortex in the Northeast United States[16] or the 2021 Texas Storm Uri[17] could foreseeably cause a curtailment in the importation of gas supply statewide. Such curtailments could put both electric and gas customers at risk,[18] which could in turn lead to significant injuries and/or loss of life (as experienced in Texas during the 2021 Storm Uri). For example, it has been reported that 111 people died as a result of Texas Storm Uri.[19] Such potentially devastating impacts to Californians are mitigated by the characteristics of the existing gas system, which is comprised of both pipelines and storage facilities.

A 2018 Western Interconnection Gas – Electric Interface Study[20] undertook a quantitative analysis of the probability of such an incident and found that there is an estimated 12 percent probability of a disruption in gas supply over a ten-year period due to a freeze. The study further indicated, "[t]he various freeze-off scenarios result in conditions in which the

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[16] *See* North American Electric Reliability Corporation, *Polar Vortex Review (*September 2014), *available at* *https://www.nerc.com/pa/rrm/January%202014%20Polar%20Vortex%20Review/Polar_Vortex_Review_29_Sept_2014_Final.pdf*.

[17] *See* ERCOT Letter to the Members of the Texas Senate and the Texas House of Representatives (March 4, 2021), *available at* *http://www.ercot.com/content/wcm/lists/226521/ERCOT_Letter_Re_Feb_2021_Generator_Outages.pdf*.

[18] *See* Wood Mackenzie Public Report, *Western Interconnection Gas-Electric Interface Study (*June 2018), at 15, *available at* *https://www.wecc.org/Reliability/Western%20Interconnection%20Gas-Electric%20Interface%20Study%20Public%20Report.pdf*.

[19] Shawn Mulcahy, "At least 111 people died in Texas during winter storm, most from hypothermia," THE TEXAS TRIBUNE (March 25, 2021), *available at https://www.texastribune.org/2021/03/25/texas-deaths-winter-storm/#:~:text=At%20least%20111%20people%20died,winter%20storm%20%7C%20The%20Texas%20Tribune*.

[20] *See* Wood Mackenzie Public Report, *supra*, at 15.

electricity system is stretched to its limits and may face reliability challenges."[21] These recent experiences in the Northeast and Texas demonstrate customers could face a serious safety risk should similar conditions occur in California because of climate change. SoCalGas's storage facilities currently mitigate these risks, which are also mitigated by technologies such as microgrids and fuel cells. Today, the most critical function of the gas grid infrastructure (pipeline and storage) is its resilience and continued operation during climate induced energy supply disruptions. Thus, SoCalGas is committed to continuing to ensure a safe, reliable, resilient, and increasingly renewable gas grid for its customers.

The benefits of a diverse supply of energy are realized not just at the system level, but also at the customer level. For example, residents of a home fueled solely by electricity may be forced to endure the inability to cook food and the loss of hot water during an electric shut-off or other unplanned outage. In contrast, residents fueled by both gas and electricity may maintain the ability to heat their homes, cook and take hot showers during an electrical power outage.[22] SoCalGas remains mindful of the critical role gas plays in maintaining the quality of life for Californians and is committed to maintaining the resiliency of the gas system for its customers.

**4. Transition to Clean Fuels to Further Enhance Energy Resilience**

SoCalGas is studying how the resilient gas transmission and delivery system can be leveraged to transport low to zero-carbon gases, such as hydrogen and Renewable Natural Gas (RNG), as California moves to decarbonize the energy system. Hydrogen has the potential to provide emissions-free sustainable energy in a variety of end uses, such as fuel cell electric vehicles, stationary power, heat for buildings, backup power, industrial heat and feedstock, and distributed as well as central station generation.[23] Further, hydrogen is one of few feasible carbon-neutral solutions for hard to abate industries (*e.g.*, shipping, aviation, heavy-duty long-

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21 *Id*.

22 This benefit was recently evident during the Texas Storm Uri, where two in five residential customers were able to consistently heat their homes with gas despite the electric outages. Steffy, Loren, "Despite Losing Power for Days, Texans Will Pay Higher Power Bills—Perhaps for Decades to Come," TEXAS MONTHLY (March 4, 2021).

23 M.W. Melaina et al., National Renewable Energy Laboratory, Blending Hydrogen into Natural Gas Pipeline Networks: A Review of Key Issues (March 2013), *available at* https://www.nrel.gov/docs/fy13osti/51995.pdf.

haul transportation, iron and steel production, chemical, and manufacturing processes that require high-temperature industrial heat such as aluminum, glass and cement.[24]

Abroad, hydrogen is being blended into the gas grid at low levels[25] with no or minimal changes to the pipeline system or end use equipment. Over time, it may be possible to retrofit the gas grid to transport higher levels of hydrogen to support energy resilience while helping to achieve the goal of carbon neutrality. Hydrogen blended into natural gas is most compatible with newly installed, plastic infrastructure that is isolated from legacy materials. The natural gas network in California is interconnected, and consequently, the system is limited by its assets that have the lowest tolerance for blended hydrogen. SoCalGas and SDG&E proposed demonstrations of hydrogen blending in lieu of a preliminary hydrogen injection standard in Application (A.20-11-004).[26] Blending of hydrogen into the existing gas system will provide a significant boost towards achieving gas pipeline decarbonization in California. Furthermore, blending, where feasible, could be a lower cost option of transporting hydrogen than developing new hydrogen transmission and distribution infrastructure. With technological progress and sufficiently large, sustained, and localized demand, gas pipelines can be one of the most cost-effective long-term choices for hydrogen delivery. Achieving commercialization and cost reductions for the deployment of low and zero-carbon hydrogen at scale would help decarbonize many sectors (including industry, thermal power plants, and the transportation sector, including light-, medium- and heavy-duty vehicles, goods movement, and air travel) and accelerate progress towards the State's climate, clean air, and clean energy goals.

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[24] Kobad Bhavnagri, Bloomberg NEF, Hydrogen Economy Outlook (2020), available at *https://data.bloomberglp.com/professional/sites/24/BNEF-Hydrogen-Economy-Outlook-Key-Messages30-Mar-2020*.

[25] The GHRYD project in France blended up to 20% hydrogen into the gas network serving a new residential community around 200 homes without any modifications to the gas system or customer appliances. Blending demonstration projects in other countries produced similar results. Engie, "The GRHYD demonstration project," *available at* *https://www.engie.com/en/businesses/gas/hydrogen/power-to-gas/the-grhyd-demonstration-project*.

[26] *See* Application (A.) 20-11-004. SoCalGas and SDG&E also proposed a Hydrogen Blending Demonstration Program in this application. The first project will blend hydrogen into an isolated section of primarily polyethylene (PE) plastic distribution system in SoCalGas's service territory. The initial hydrogen blend level is planned at one percent and may increase to as much as twenty percent. SoCalGas expects to choose the location of the initial project in 2021.

SoCalGas has also partnered with the National Fuel Cell Research Center (NFCRC) at the University of California, Irvine (UCI) to launch the first U.S. Power-to-Gas (P2G) project -- an electrolyzer powered by the on-campus solar electric system that feeds its renewable hydrogen to the campus power plant. This research showed that P2G technology can increase the use of renewable energy and should be an important component in meeting California's clean energy and greenhouse gas reduction goals.[27] Delivering zero-emissions energy via the gas grid can help the State transition to a zero-emissions energy future. Furthermore, the research lays the groundwork for leveraging the existing gas grid for the storage and transmission of renewable energy.

Along these lines, SoCalGas sponsored Assembly Bill (AB) 3163 (Chapter 358, Statutes of 2020) which expands the definition of biomethane to include gas from cellulosic waste like dead trees and agricultural material.[28] The expansion of this definition will help prevent cellulosic organic waste from being sent to landfills or openly burned, which releases massive amounts of GHG emissions. The California State Senate Committee on Energy, Utilities and Communications found that biomass conversion cuts GHG emissions by 98 percent compared to open burning or wildfire.[29] This legislation will help to convert organic waste into pipeline quality biomethane to be used as a source of clean and renewable energy. This new law is expected to increase supplies of RNG and help turn the State's organic waste problem into a cost-effective renewable energy solution. In fact, SoCalGas is committed to replacing 20 percent of the gas delivered to core customers with RNG by 2030. The RNG could then be used for heating, hot water, and cooking in commercial buildings, and for stoves, clothes dryers, water heaters, fireplaces, and heating in residential homes.

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[27] *See* PRNewswire, "SoCalGas and University of California Irvine Demonstrate Power-to-Gas Technology Can Dramatically Increase the Use of Renewable Energy," (Mar. 30, 2017) (noting that preliminary research showed that UCI could increase its use of renewable energy ten-fold, up to 35 percent with power-to-gas strategy), *available at https://www.prnewswire.com/news-releases/socalgas-and-university-of-california-irvine-demonstrate-power-to-gas-technology-can-dramatically-increase-the-use-of-renewable-energy-300432101.html*.

[28] *See* California State Legislature Assembly Bill No. 3163, *available at http://leginfo.legislature.ca.gov/faces/billTextClient.xhtml?bill_id=201920200AB3163*.

[29] *See* California State Senate Committee on Energy, Utilities and Communications Bill Analysis, (July 31, 2020), *available at http://leginfo.legislature.ca.gov/faces/billAnalysisClient.xhtml?bill_id=201920200AB3163#*.

Furthermore, the California Air Resource Board (CARB) has called for the use of RNG to not only reduce the usage of fossil gas, but to serve as a resilient source of renewable fuel for vehicles and electricity generation.[30] This is further specified in the "Low Carbon Energy"[31] and "Transportation"[32] sections of CARB's 2017 Climate Change Scoping Plan that specifically lay out the pathway for RNG usage in the residential, commercial, and industrial sectors as well as in the transportation and electricity sectors.

Further, the existing body of knowledge indicates that fuel reduction (*i.e.*, removing this biomass) is effective and can be used strategically to reduce risks in key areas. The gas grid could participate and support fuel biomass reduction efforts. A recent report by Lawrence Livermore National Laboratory found that converting waste biomass to fuels and storing carbon dioxide ($CO_2$) holds the greatest potential for negative emissions (approximately -84 $MtCO_2$ annually) because biomass is readily available across California.[33] About 56 million tons per year of waste biomass is available from trash, agricultural waste, sewage and manure, logging and fire prevention activities.[34] Another opportunity for RNG production is through livestock manure, which emitted about 12 $MTCO_2e$ in 2018.[35] Because agriculture and dairies comprise a large part of the California economy, waste biomass presents an abundant source of resilient decarbonized energy.[36]

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[30] *See* California Air Resource Board 2017 Climate Change Scoping Plan, *available at* *https://ww2.arb.ca.gov/sites/default/files/classic//cc/scopingplan/scoping_plan_2017.pdf*.

[31] *Id.* at 69.

[32] *Id.* at 91.

[33] Lawrence Livermore National Laboratory, *Getting to Neutral: Options for Negative Carbon Emissions in California* (Jan. 2020), *available at* *https://www-gs.llnl.gov/content/assets/docs/energy/Getting_to_Neutral.pdf*.

[34] *Id.* at 4.

[35] *See* California Air Resource Board, *Greenhouse Gas Emission Inventory – Query Tool for years 2000 to 2018,* at year 2018 for livestock manure, *available at* *https://www.arb.ca.gov/app/ghg/2000_2018/ghg_sector.php*.

[36] Per SB 1383 (Chapter 395, Statutes of 2016), beginning January 1, 2022 local governments must procure minimum levels of recovered organic products that include (1) compost; (2) mulch; and/or (3) renewable energy (transportation fuel, heat, and electricity) from anerobic digestion and electricity from biomass conversion. *See* California Department of Resources Recycling and Recovery SB 1383 Final Regulations Text, *available at* *https://www2.calrecycle.ca.gov/Docs/Web/118371*.

### 5. Microgrid and Fuel Cell Energy Resilience Programs

To help communities plan and prepare for risks from climate change, SoCalGas is also developing new energy resilience projects for its customers to be deployed across its service territory to spur energy resilience investments by its customers. Specifically, SoCalGas is exploring opportunities presented by microgrid and fuel cell technologies. A microgrid is "an interconnected system of loads and energy resources, including, but not limited to, distributed energy resources, energy storage, demand response tools, or other management, forecasting, and analytical tools, appropriately sized to meet customer needs, within a clearly defined electrical boundary that can act as a single, controllable entity, and can connect to, disconnect from, or run in parallel with, larger portions of the electrical grid, or can be managed and isolated to withstand larger disturbances and maintain electrical supply to connected critical infrastructure."[37] An important function of a microgrid is to operate during power outages that may be caused by climatic hazards. Thus, microgrids are mitigation tools communities can implement to adapt to climate change. To fulfill this function, a microgrid must be supported by a reliable fuel transportation system and source, which can be used in stationary fuel cells, fuel cell electric vehicles, as well as clean combined heat and power applications and microturbines.

A fuel cell can use the chemical energy of hydrogen (or another fuel) to cleanly and efficiently produce electricity.[38] Fuel cells provide an essential power supply when it is most needed and can generate electricity from gas or biogas, in addition to hydrogen. These fuel sources not only provide flexible and reliable generation but can also provide energy storage. Hydrogen, for instance, can be stored and later used to generate power when needed. Fuel cells enable businesses, residents, and local governments to invest in adequate preparation for the worst-case scenarios of climate change. Additionally, combined heat and power technologies provide reliable energy in the form of electricity and heat. Diversification of power sources throughout a community helps ensure that residents receive dependable energy and feel safer in the event of climatic hazards and risks. Moreover, when deployed by essential service providers, such as fire stations, hospitals, and schools, these critical service providers secure their ability to remain operational during extreme hazardous events.

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[37] SB 1339.

[38] *See* United States Department of Energy Fuel Cells Program site at *https://www.energy.gov/eere/fuelcells/fuel-cells*.

### 6. Affordability

Californians deserve an affordable supply of energy to fuel their lives and maintain their standard of living. As acknowledged by the Commission in the Climate Change Rulemaking, electricity and natural gas are essential services that Californians must purchase to maintain a healthy living standard and meaningfully participate in society. Unlike other products or services, consumers do not have the option to forego the use of energy—they must pay for these essential utility services regardless of price. A February 2021 report prepared by the Energy Institute at Haas, UC Berkeley, states that California's electric utility rates are among the highest in the country.[39] In contrast, SoCalGas's residential bills are among the lowest in the nation.[40] This remains one of the top reasons gas customers report high levels of satisfaction with their gas service year after year,[41] and is a source of great pride among the employees of SoCalGas who work safely and efficiently to maintain this affordability for customers. SoCalGas is ever mindful of the imperative to provide an affordable supply of energy to Californians.

Three climate-related events outside California illustrate how SoCalGas's gas system currently preserves affordability of California's electric system during extreme weather events. In 2014, the Midwest and Northeast United States experienced a polar vortex that led to curtailment of gas supplies for electric generation and other related shortages. This impacted the price for a megawatt hour of electricity, which increased from $160 per MWh to $1,800 per MWh.[42] In 2011,[43] and again in February 2021, a curtailment of gas supply occurred in Texas due to cold weather events.[44] Regulators are examining the Texas energy market after natural

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[39] Borenstein, *et al.*, Designing Electricity Rates for an Equitable Energy Transition, Energy Institute at Haas WP 314 (Feb. 2021), *available at https://haas.berkeley.edu/wp-content/uploads/WP314.pdf*.

[40] A.17-10-007/-008 cons., June 18, 2018 Rebuttal Testimony of Sharim Chaudhury at ISC-4.

[41] *See, e.g.,* Ernst & Young, *Fuels of the future — what is powering the US energy transition?* (2019), at 5, *available at https://assets.ey.com/content/dam/ey-sites/ey-com/en_us/topics/power-and-utilities/ey-fuels-of-the-future-v21.pdf*.

[42] *See* North American Electric Reliability Corporation, *supra*.

[43] *See* Federal Energy Regulatory Commissions and North American Electric Reliability Corporation Report on *Outages and Curtailments During the Southwest Cold Weather Event of February 1-5, 2011: Causes and Recommendations* (August 2011), *available at https://www.ferc.gov/sites/default/files/2020-04/08-16-11-report.pdf*.

[44] *See* ERCOT Letter, *supra*.

gas prices soared 10,000 percent following Texas Storm Uri.[45] During Storm Uri, SoCalGas utilized its Aliso Canyon, Honor Rancho, La Goleta, and Playa Del Rey storage fields to supply sufficient gas to its customers, including to the electrical grid, without relying on Texas imports. This ability to operate SoCalGas's storage facilities "on-demand" enabled SoCalGas to proactively respond to climatic events and contributed to the stabilization of energy prices for Californians.

Moreover, affordability is critical to achieving the long-term objective to combat global climate change. As recently acknowledged by the Commission in its affordability whitepaper, *Utility Costs and Affordability of the Grid of the Future: An Evaluation of Electric Costs, Rates, and Equity Issues Pursuant to P.U. Code Section 913.1*, "[i]f handled incorrectly, California's policy goals could result in rate and bill increases that would make other policy goals more difficult to achieve and could result in overall energy bills becoming unaffordable for some Californians."[46] SoCalGas aspires to lead the industry in climate change adaptation to serve as a catalyst for a global transition to clean energy. If this transition to a decarbonized energy system is demonstrated to be financially feasible, SoCalGas believes other states and nations will follow California's lead. If, on the other hand, this transition proves to be unduly costly, few are likely to follow.

Mindful of the fact that natural gas is essential to the health, wellbeing, and quality of life of Californians, and the critical role its gas system plays in maintaining reliability, resilience and affordability of energy in California, SoCalGas is committed to maintaining energy affordability as California decarbonizes its energy system to adapt to global climate change.

## III. 2020 PROGRAMS

Energy resilience projects and programs initiated by SoCalGas in 2020 are discussed below. While this is not an exhaustive list of all such activities, the programs and projects summarized below illustrate SoCalGas's broad efforts and commitment to secure energy resilience for California while simultaneously continuing to decarbonize the energy system.

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[45] Matt Egan, "Regulators examine Texas energy market after natural gas prices soared 10,000%," CNN BUSINESS (Feb. 23, 2021), *available at https://www.cnn.com/2021/02/23/investing/texas-natural-gas-investigation-cftc/index.html*.

[46] Affordability Whitepaper at 3.

From 2016 through 2020, SoCalGas's Gas Engineering Department developed gas infrastructure resiliency and vulnerability reports with the help of external experts to provide guidance to internal operations and engineering design of long-term strategies for climate change adaptation. These reports are being used to support cities and counties subject to Senate Bill (SB) 379,[47] which requires updates to municipalities' safety elements to address climate adaptation and resilience. Beginning in 2021, SoCalGas undertook a system-wide climate change vulnerability assessment to assess all SoCalGas assets, operations, and services to understand what current and future climate hazards pose threats. The assessment examines three future time horizons and identifies vulnerabilities considering a multitude of climate hazards, including, but not limited to, extreme temperatures, extreme precipitation, sea level rise, and wildfire. The assessment will inform enhancements and investments to the gas grid. This assessment is being conducted pursuant to the Climate Change Adaptation OIR issued by the Commission on April 26, 2018,[48] and will be iterated on four-year cycles.

The hazards of climate change potentially impact every community within SoCalGas's service territory. SoCalGas is committed to promoting equity relative to climate adaptation of the Company's infrastructure, operations, and service in impacted communities. Of particular concern are communities faced with high socioeconomic burdens and high exposure to one or more adverse climate hazards. These disproportionately-impacted communities, designated in the Climate Change Adaptation OIR, will require specific attention and extra resources to adapt to climate change. SoCalGas's Community Engagement Plan will help identify and prioritize utility climate adaptation investments in these designated communities. The Community Engagement Plan will serve as a guiding document, outlining how SoCalGas will engage with these impacted communities and implement best practices for outreach to local jurisdictions and other non-governmental organizations. This plan will be iterated on four-year cycles.

SoCalGas's Gas Engineering organization continues to improve upon existing evaluation tools for the analysis and assessment of Geological Hazards to provide recommendations related to geological, civil, and structural engineering designs impacted by weather- and climate-driven events. For example, these climate driven events include areas impacted by wildfire and

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47 *See* California State Legislature Senate Bill No. 379.

48 *See* CPUC's Climate Adaptation OIR, R.18-04-019 (September 3, 2020).

potential landslides triggered by heavy rain events. In addition, Gas Engineering will continue identifying locations of the gas infrastructure where it would be beneficial to install strain gauges to monitor pipelines that could potentially be exposed to excessive stresses from land movement as new information is assessed from the geological hazard and satellite monitoring programs. SoCalGas will continue its efforts to identify projects and areas where pipelines may be prone to slope instability and erosion.

SoCalGas is committed to decarbonizing its fleet of vehicles, equipment, and related infrastructure to help reduce greenhouse gas emissions. As an example, SoCalGas has already converted over 30% of its fleet to renewable compressed natural gas vehicles (RCNGV) and has built a network of internal-facing fueling infrastructure nodes. As new zero-emission vehicles and equipment come to market, SoCalGas plans to accelerate transitioning its fleet to support SoCalGas's Aspire 2045 Climate Commitment ("Climate Commitment").[49] The Climate Commitment identifies goals to replace 50% of the SoCalGas Fleet with less carbon intense vehicles by 2025 and 100% zero-emissions vehicles and equipment by 2035. SoCalGas plans to diversify its fleet further by investing in Battery Electric Vehicles (BEV), and/or Fuel Cell Electric Vehicles (FCEV), and related infrastructure to advance SoCalGas's climate goal.

SoCalGas is committed to decarbonizing its facilities by completing numerous energy efficiency and power generation projects to help reduce greenhouse gas emissions. For example, SoCalGas has already installed oxide fuel cells to generate electricity at two of its most prominent sites—Monterey Park and Pico Rivera. As more energy-efficient equipment and technology comes to market, SoCalGas plans to accelerate greening its facilities to support the advancement of its Climate Commitment, which identifies a goal to achieve net-zero energy for 100% of SoCalGas's buildings by 2035. As discussed above, SoCalGas is committed to evaluating technology and research in microgrids, fuel cells, renewable natural gas, and hydrogen that will maintain energy resilience while enabling the decarbonization of the energy system. Based on prior research, SoCalGas committed to replacing 20 percent of its conventional gas supply with RNG by 2030. Although these activities are primarily focused on hydrogen and reflect investments related to the Hydrogen Blending Application, in the future this

[49] *https://www.socalgas.com/sites/default/files/2021-03/SoCalGas_Climate_Commitment.pdf*.

work may include additional projects to support other clean energy innovation and advance technology-based solutions.

## IV. 2022-2024 PROGRAMS

The activities listed above are expected to continue during the TY 2024 GRC as ongoing projects that are part of SoCalGas's long-term energy resilience efforts. Many of the activities are cyclical in nature and may require reevaluation each year to identify and implement new mitigations as weather conditions change. Certain evaluation processes are being expanded to include other related conditions such as post-wildfire analyses. Notable expansions to the above activities and new activities are discussed below.

To achieve the Climate Commitment, SoCalGas is exploring options to accelerate its energy efficiency and power generation strategies. SoCalGas has initiated alternative energy planning and feasibility studies to optimize its facility operations and implement a variety of climate change and clean energy projects that could maximize opportunities on identified high-priority areas, including renewable energy generation, energy efficiency, and technology. Several options that SoCalGas is considering for meeting its sustainability goals at its facilities include:

- Construction of a facility powered by on-site renewable energy, including wind, solar, automated controls, fuel cell, and battery storage, to minimize reliance on conventional power;
- Implementation of energy efficiency audits and identification of conservation goals for each facility type (headquarters, branch payment office, etc.); and
- Identification of opportunities for future facility integration with smart devices.

The initial assessments and potential upcoming work are an essential component of SoCalGas's commitment to identifying and promoting innovative climate solutions that conserve energy and reduce carbon footprints. SoCalGas is currently evaluating the potential costs of implementing its sustainability strategy and will provide these costs in a future GRC (or other) application where recovery is sought, as applicable. SoCalGas remains committed to maintaining energy affordability for its customers and is actively pursuing partnerships, grants, and other opportunities to fund sustainability initiatives.

SoCalGas is also working on several low carbon programs and projects in line with its energy resilience efforts, which are further described below. These low carbon projects are in various stages of advancement.

The Customer Energy Resiliency Program focuses on providing power resilience and reliability solutions to customers located in Tier 2 or Tier 3 High Fire Threat Districts during unplanned outages or when electric utilities de-energize powerlines during Public Safety Power Shutoff (PSPS) events to mitigate the risk of wildfires. The program will target two customer segments: 1) vulnerable residential customers with critical energy resilience needs; and 2) critical facilities (*e.g.*, fire stations, police stations, city halls, etc.). For residential customers, SoCalGas is proposing a long duration fuel cell plus battery storage solution with islanding capabilities. For critical facilities, SoCalGas will develop customized solutions that may include and are not limited to fuel cells, battery storage, solar photovoltaic, and combined heat and power technologies. SoCalGas anticipates incorporating hydrogen into this program in the future.

The Hydrogen Integrated Program aims to develop a network of hydrogen refueling stations to support SoCalGas's zero emissions fleet. The program will include expanding the functionality of its existing network of NGV stations to provide hydrogen refueling services and a compact pipeline network connecting those refueling stations with local small-scale production facilities.

In addition, SoCalGas is exploring the feasibility of constructing a long-haul pipeline to deliver hydrogen at large-scale to the Los Angeles basin. SoCalGas is also assessing the feasibility of constructing a long-haul $CO_2$ pipeline to transport $CO_2$ at large scale from the Los Angeles basin to areas of permanent sequestration.