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DECARBONIZING THE GAS GRID AND REDUCING BUILDING EMISSIONS

SCAQMD 2022 AQMP: Residential and Commercial Buildings Working Group May 6, 2021

SoCalGas A Sempra Energy utility®

2018 GHG Emissions, California Air Resources Board

- » Buildings represent 25% of GHG emissions statewide
- » 10% is made of Natural Gas end-use and 15% of electricity end-use
- Attentiveness to emitting segments and jurisdiction will inform reduction strategies



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Decarbonizing Electrons and Molecules by 2045

Senate Bill (SB) 100

- » Renewables Portfolio Standard (RPS) 60% renewable by 2030
- » 100% Carbon Free Electricity by 2045



Image Source: Creative Commons.

SoCalGas' ASPIRE Commitment

» Net zero emissions in our operations and delivery of energy by 2045



Source: SoCalGas ASPIRE. https://www.socalgas.com/sites/default/files/2021-03/SoCalGas_Climate_Commitment.pdf

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Meeting California's Climate and Air Quality Goals

The gas grid supports the decarbonization of the electric grid through:

- » Flexibility
- » Storage
- » Reliability & Resiliency

Clean molecules are necessary to decarbonize and to facilitate electrification as demand and renewable capacity grow

Total Wind and Solar Curtailments by Month, 2014-2020



Source: SoCalGas ASPIRE. https://www.socalgas.com/sites/default/files/2021-03/SoCalGas_Climate_Commitment.pdf



Energy Efficiency and Demand Response Have Been Top Priority since 2008

The **Energy Action Plan** is a comprehensive strategy to meet the electricity and natural gas system needs in California

Top 3 priorities:

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- 1. Energy Efficiency and Demand Response
- 2. Renewable energy and distributed energy
- 3. Transmission and natural gas generation



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Advancing energy efficiency: ourney of success

46.3M

2020

55.0M

2019

51.8M

2018

~229M*

39.5M

2017

Therms saved since 2016

*consists of cumulative data from 2016 to 2020

36.2M

2016

These energy savings are equivalent to:



Enough to power 145,000+ homes for



Reduced greenhouse gases by 1,210,000+ metric tons

> **Reduced** emission 2,700,000 lbs of Nox 4,500 lbs of PM10

263,000 Cars removed from the road



SoCalGas' Customer Programs and Assistance Portfolio

- » Expanding work in disadvantaged communities through partnership
- » Energy efficiency services at >100K homes per year



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 Early retirement of old equipment through rebates and incentives



- Continuous addition of new EE technologies
 - Solar Thermal
 - Infrared BBQ Grill
 - Patio Heaters

Look out for No Burn Days

- » Joint Marketing and Outreach
- Messaging and Educating
 1.8 million customers on clean air actions



Make sure it's safe before you burn firewood

South Coast AQMD encourages you to check before you burn any firewood. When air quality reaches unhealthy levels, there may be a 24-hour ban on residential wood-burning fireplaces, stoves, or outdoor pits.

For more information, please use the QR code below to visit the website.



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Advancing New Technologies to Meet Clean Air Goals

SoCalGas' Research, Development & Deployment's Mission

- » Identify, test, and develop new products and technologies that:
 - Reduce GHG emissions
 - Maintain or improve safety and reliability
 - Increase the affordability of energy
- » Gas Heat Pump Water Heater uses natural gas to fuel the heating of water and achieve operating efficiencies greater than 100% through the capture of ambient heat







California GHPWH Field Demonstration Results





Source: GTI MATERIAL SHARED WITH PERMISSION

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- » Residential Gas Heat Pump Water Heater¹:
 - Energy Efficiency:
 - > 50% natural gas savings over standard gas water heaters
 - Emissions:
 - ~50% GHG emissions reduction
 - Ultra Low NO_x certification (Rule 1121-10 ng NO_x/J)
- » Gas Heat Pump Water Heating and Space Cooling in Restaurants²:
 - Energy Efficiency:
 - ~50% natural gas savings from hot water and ~15% electricity savings from 'free cooling'
 - Emissions:
 - ~50% GHG emissions reduction
 - Ultra Low NO_x certification (Rule 1146.2-14 ng NO_y/J)

¹ Glanville, P.et al. (2020) Integrated Gas-fired Heat Pump Water Heaters for Homes: Results of Field Demonstrations and System Modeling, ASHRAE Transactions; Vol. 126 325-332

²Glanville, P. Innovative Applications of Thermal Heat Pumps in Multifamily Buildings and Restaurants, Presented at the ACEEE 2020 Hot Water Forum.



Surface-Stabilized Burner: Ultralow NO_x Technology

- » Operating Principles:
 - This technology relies on porous media to absorb heat from the flame and then radiate it out to the process
- » Emissions Potential:
 - For natural gas, the surface stabilized burner can perform at 3-7 times below the most restrictive regulation for NO_x emissions
- » Applicability:
 - Residential & Commercial
 - Water & Space Heating
- » Catalytic-Assisted Burner

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Emissions Potential: Low single digit NOx values or even sub 1ppm



Experimental Results—Surface Stabilized Burner



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Diesel and gasoline generators on the rise amid Public Safety Power Shutoff (PSPS) events

- » Electric reliability is increasingly at risk by climate change and extreme weather events
 - In 2019, about 2,300 Public Safety Power Shutoff (PSPS) events occurred combined in PG&E, SCE and SDG&E service territories
 - The average outage duration within SCE service territory was ~30 hours
- » Use of diesel and gasoline generators on the rise
 - A recent survey by UC Berkeley found that 15 percent of people who experienced outages during recent PSPS events purchased a backup generator
 - In the last three years, more than 3,000 new diesel backup generators have been installed due to an increase in data centers and to heightened PSPS awareness in the region²
- » Adverse impacts to air quality and public health
 - CARB estimated that 8.3 tons of diesel particulate matter was emitted from diesel backup generators in October 2019, the equivalent of 30,000 heavy duty trucks driving on the road for one month
 - According to CARB, diesel particulate matter is responsible for about 70% of known cancer risk from toxic air contaminants
 ¹ Energy Institute at HAAS. Electricity Outages Lead to Substantial Backup Generator Purchases. Available at <u>https://energyathaas.wordpress.com/2020/05/26/electricity-outages-lead-to-substantial-backup</u>

generator-purchases/ ² California Energy Commission (2021). Workshop for Research into Clean Energy Alternatives to Diesel Backup Generator Systems on January 21, 2021. Available at https://www.energy.ca.gov/event/workshop/2021-01/workshop-discuss-research-clean-energy-alternatives-diesel-backup-generator



Technology Solution – Residential Fuel Cells

- » Fuel cells connected to the gas system can become a low or zero-carbon resiliency solution as fossil gas is displaced with renewable gas and green hydrogen
- » Many commercial and critical facility customers are currently using fuel cells to provide energy savings and long duration energy resiliency
- » Eleven countries across the globe have deployed residential fuel cells resulting in over 300,000 installations
- » Can provide residential customers with energy bill savings and long-duration energy resiliency (enabling customers to stay in their home during an extended grid outage)
- Can significantly reduce GHG and criteria pollutant emissions compared to diesel and gasoline backup generators

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Japan

ENE-FARM Program - nearly 300,000 units have been installed since 2009

Program Goal(s)

 Large scale implementation of this technology could help the country achieve CO2 reduction goals¹

- Install 5.3 million units by $2030^2\,$

¹ <u>http://pace-energy.eu/japan-a-success-story-in-deploying-fuel-cell-micro-cogeneration/</u>
 ² Japan's Strategic Energy Plan released in July 2018

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