DECARBONIZING THE GAS GRID AND REDUCING BUILDING EMISSIONS

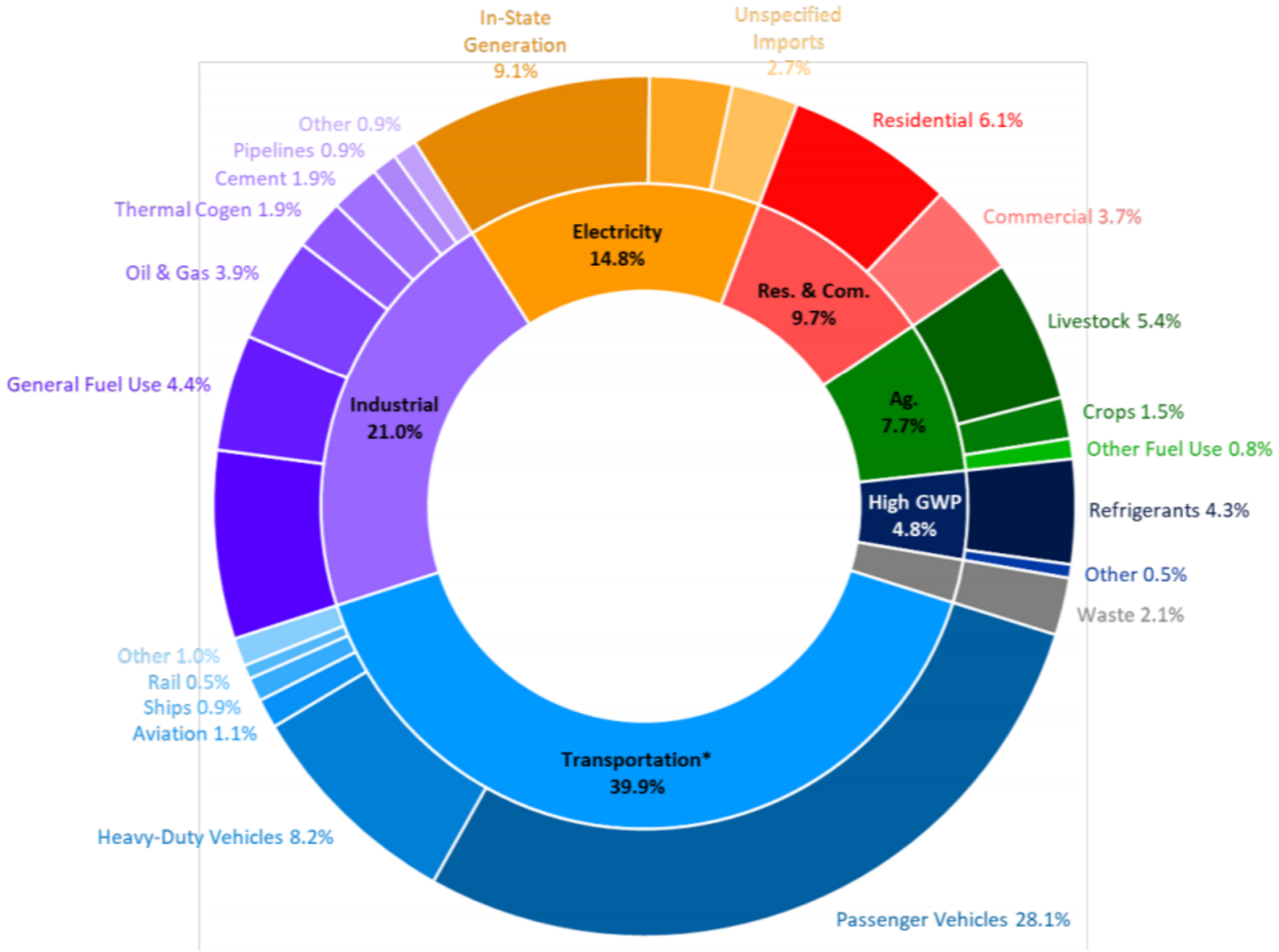
SCAQMD 2022 AQMP: Residential and Commercial Buildings Working Group

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



Source: https://ww3.arb.ca.gov/cc/inventory/pubs/reports/2000_2018/ghg_inventory_trends_00-18.pdf

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

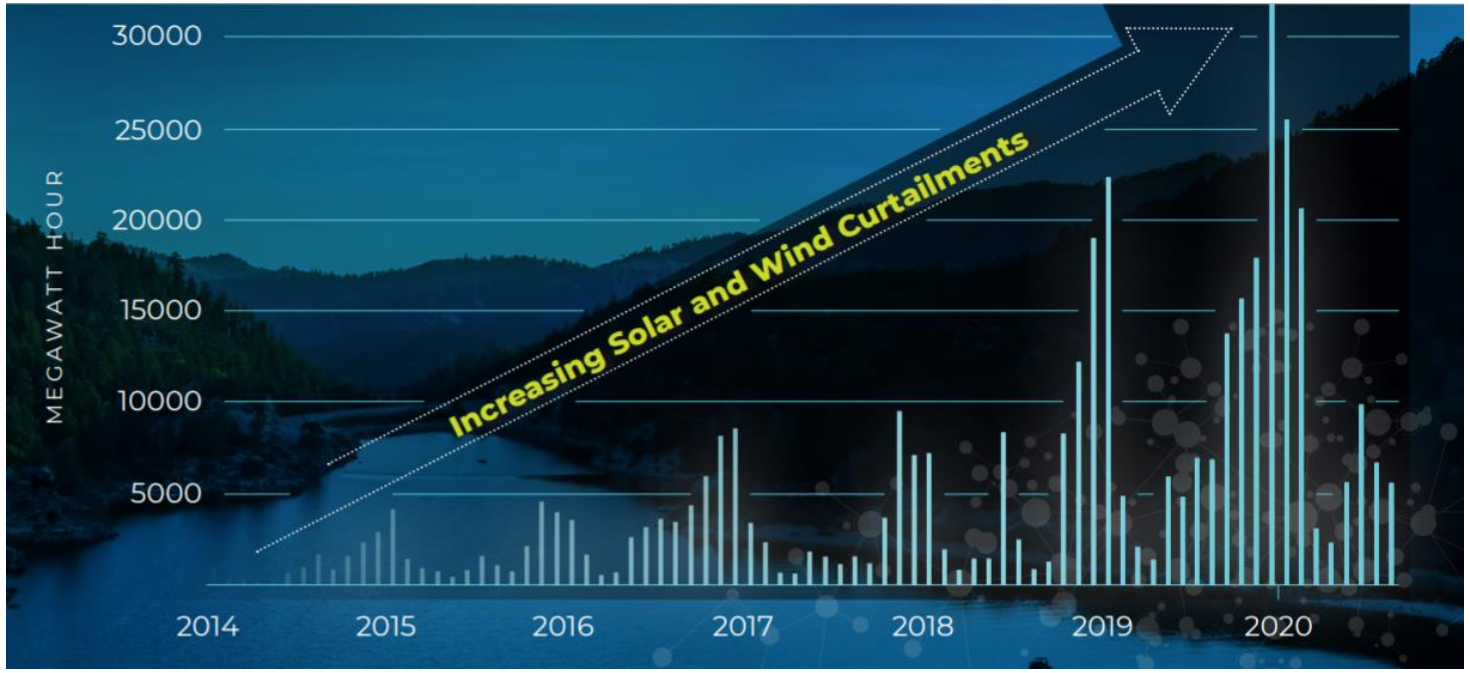
Meeting California's Climate and Air Quality Goals

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



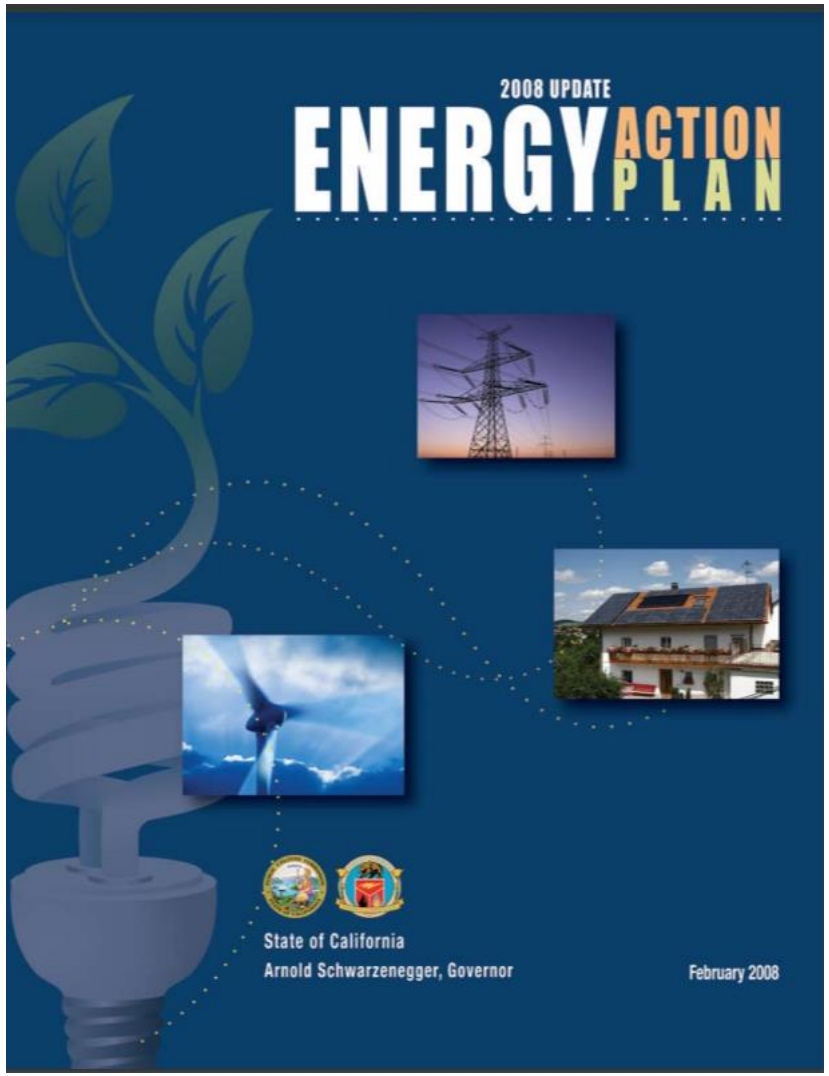
Source: SoCalGas ASPIRE. https://www.socalgas.com/sites/default/files/2021-03/SoCalGas_Climate_Commitment.pdf

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:

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

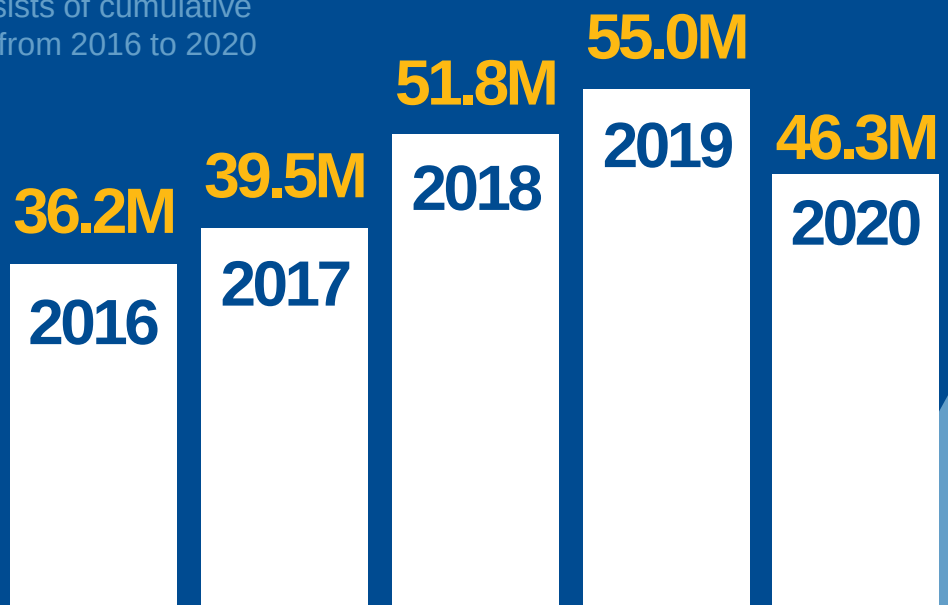


Advancing energy efficiency:
A journey of success

~229M*

Therms saved since 2016

*consists of cumulative data from 2016 to 2020



These energy savings are equivalent to:

Enough to power **145,000+** homes for one year

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
A Sempra Energy utility

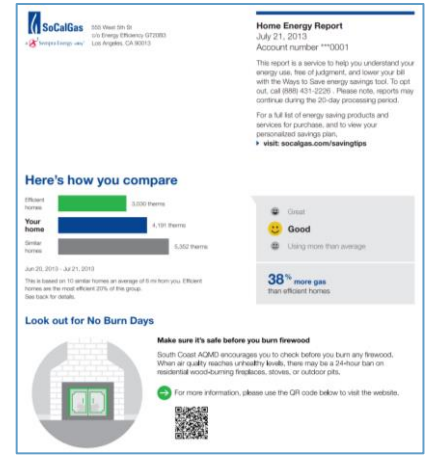
SoCalGas' Customer Programs and Assistance Portfolio

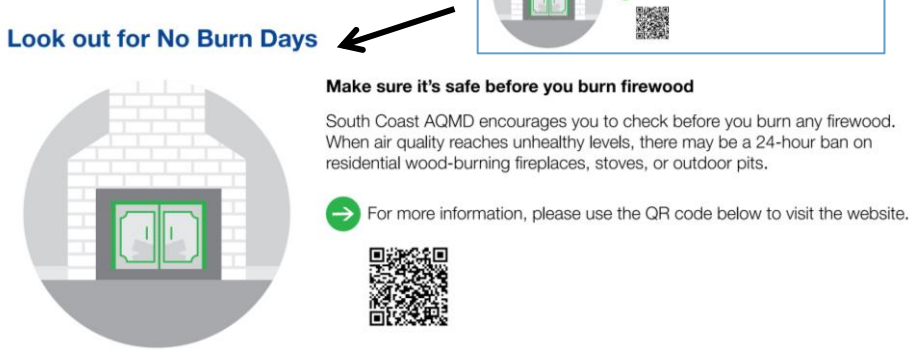
- Expanding work in disadvantaged communities through partnership
- Energy efficiency services at **>100K homes per year**

- Early retirement of old equipment through rebates and incentives

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

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





Advancing New Technologies to Meet Clean Air Goals

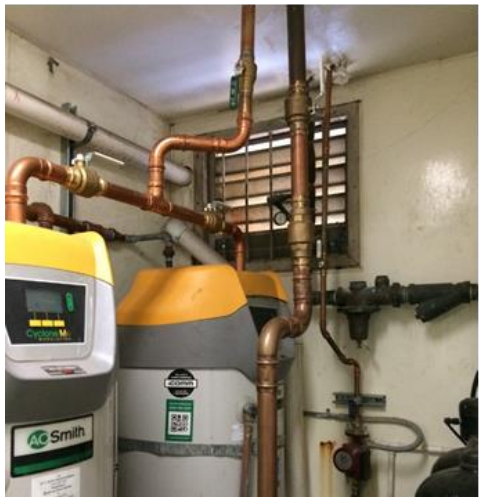
SoCalGas' Research, Development & Deployment's Mission

» 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

	Gas Standard	Gas Tankless	Gas Heat Pump
Water Heater Technology			
Operating Efficiency	62%	95%	130%

California GHPWH Field Demonstration Results



Source: GTI MATERIAL SHARED WITH PERMISSION

- Residential Gas Heat Pump Water Heater[1]:
  - 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)

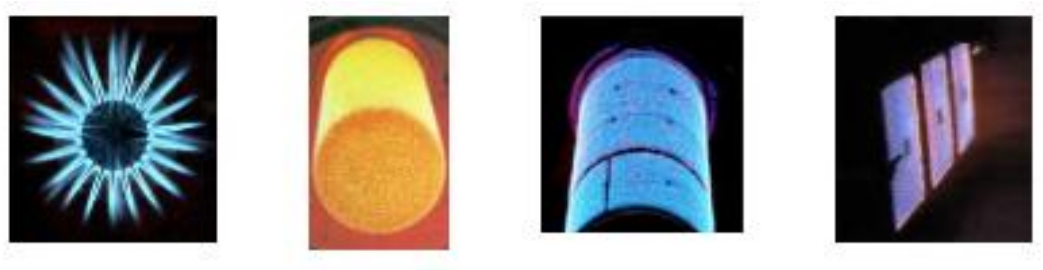
- Gas Heat Pump Water Heating and Space Cooling in Restaurants[2]:
  - Energy Efficiency:
    - **~50% natural gas savings** from hot water and **~15% electricity savings** from 'free cooling'
  - Emissions:
    - **~50% GHG emissions reduction**
    - Ultra Low NO_x certification (Rule 1146.2-14 ng NO_x/J)

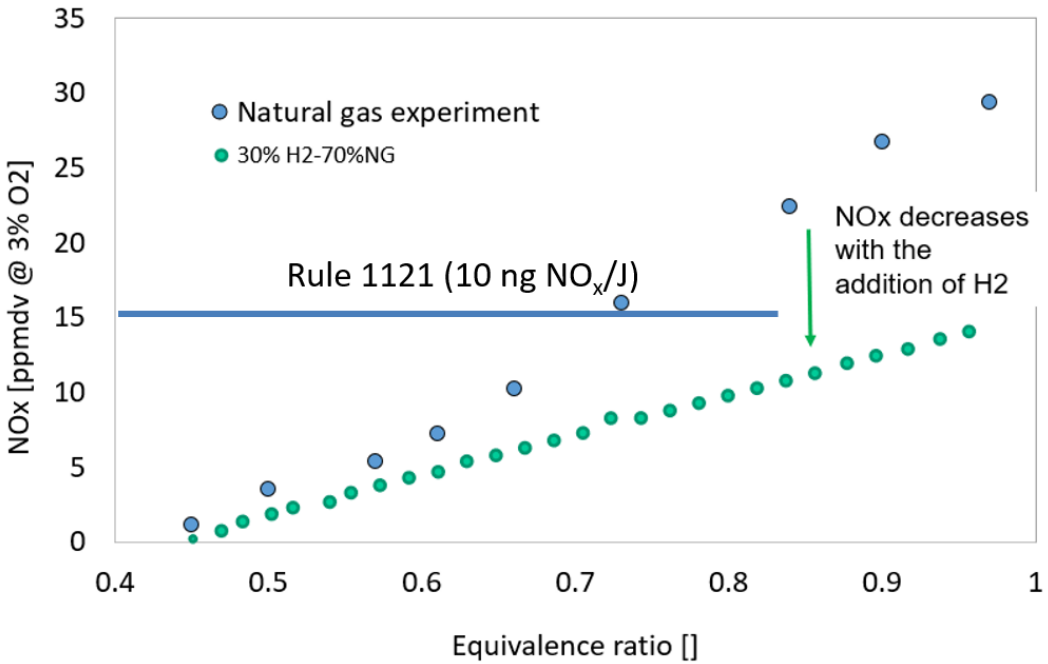
[1] Glanville, P.et al. (2020) Integrated Gas-fired Heat Pump Water Heaters for Homes: Results of Field Demonstrations and System Modeling, ASHRAE Transactions; Vol. 126 325-332

[2] Glanville, 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
  - Emissions Potential: Low single digit NOx values or even sub 1ppm





Source: UCI MATERIAL SHARED WITH PERMISSION

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 region[2]
- **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 https://energyathaas.wordpress.com/2020/05/26/electricity-outages-lead-to-substantial-backup 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

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 goals[1]
- Install 5.3 million units by 2030[2]

[1] http://pace-energy.eu/japan-a-success-story-in-deploying-fuel-cell-micro-cogeneration/

[2] Japan's Strategic Energy Plan released in July 2018

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