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Building Decarbonization Efforts at the CPUC

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Presentation Overview

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7) Refrigerants
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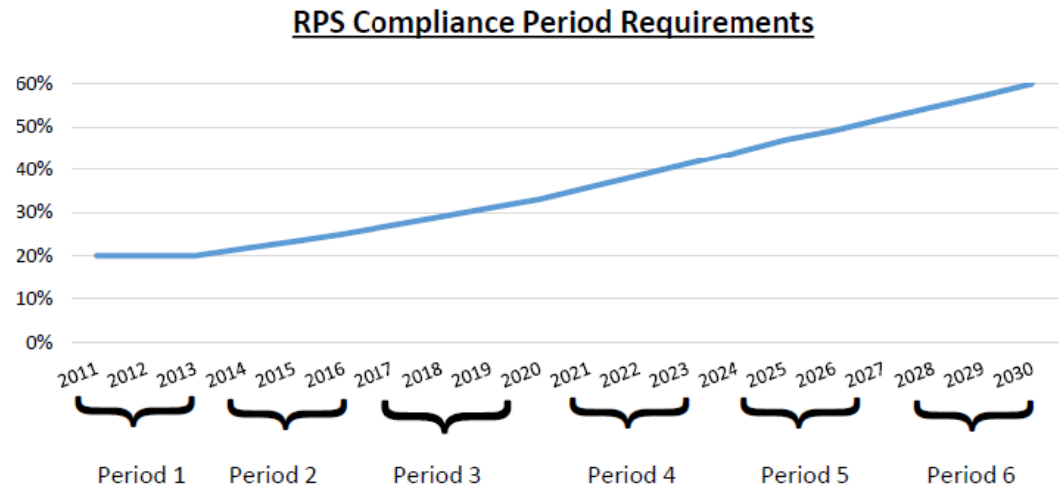
RPS Progress (1 of 3)

RENEWABLES PORTFOLIO STANDARD (RPS)

RPS REQUIREMENTS BY COMPLIANCE PERIOD

- SB 100 specifies that all load-serving entities **must procure at least 60 percent of their resources from eligible renewable energy resources by 2030**



Note: The SB 100 mandate for a 60% RPS has not yet been formally implemented by the Commission.

$$\text{RPS \%} = \frac{\text{Renewable Energy Procurement (MWh)}}{\text{Retail Sales (MWh)}}$$

RPS Progress (2 of 3)

There are Three large Investor-Owned Utilities (IOUs) in California

Figure 1: Aggregated IOU Progress Towards 60% RPS
(2010-2030)

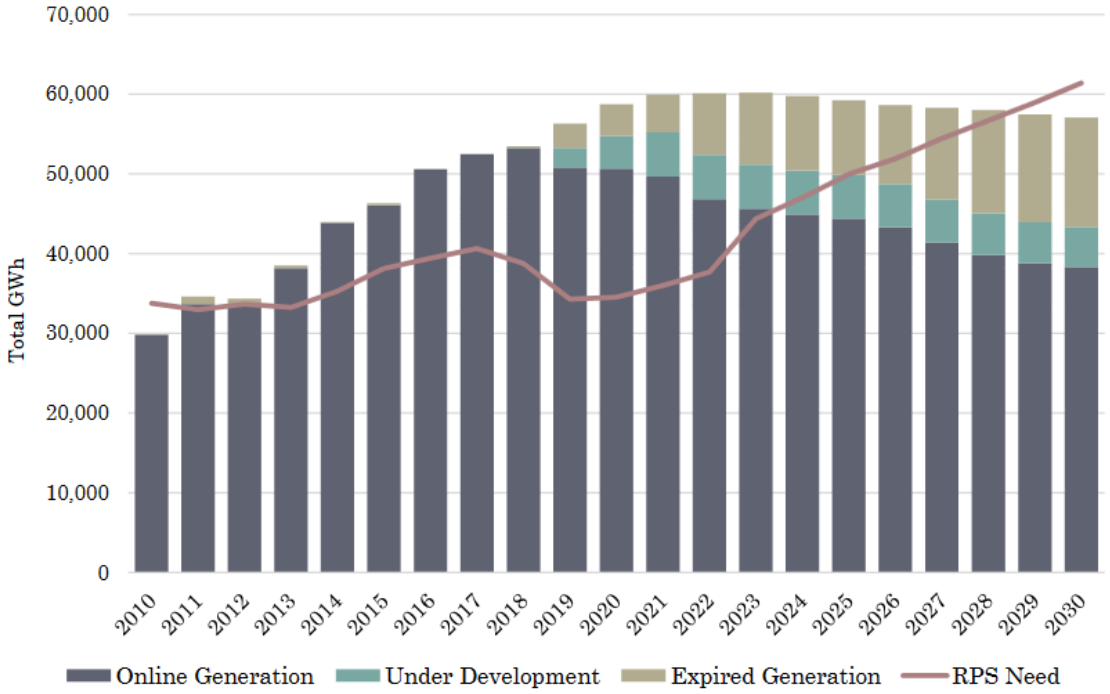


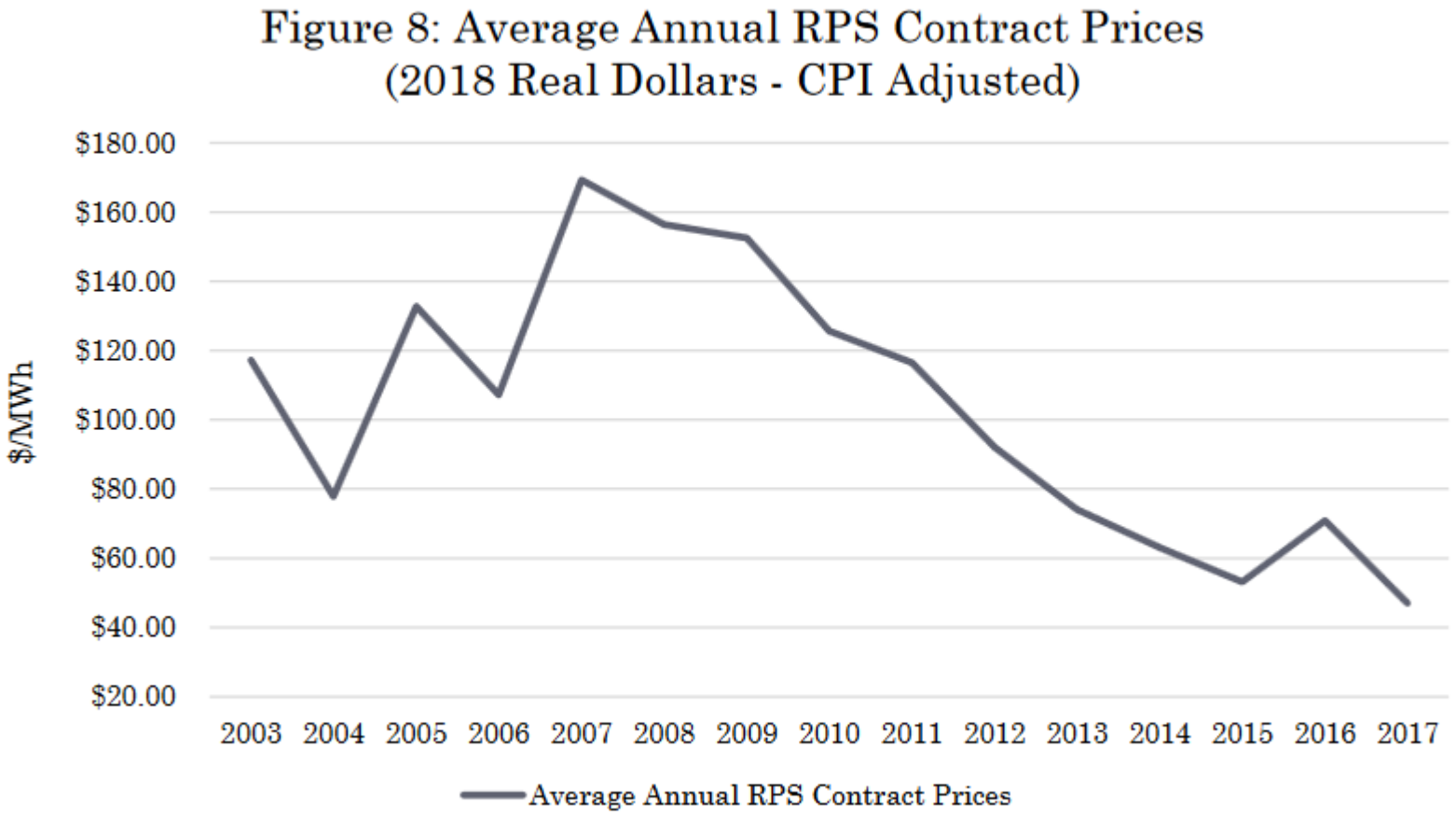
Table 1: Actual 2017 IOU RPS Procurement Percentages	
PG&E	33%
SCE	32%
SDG&E	44%

Data Source: IOU Annual RPS Compliance Reports, August 2018

There are also Municipal-Owned Utilities (MOUs), Community Choice Aggregators (CCAs), electric service providers (ESPs)

RPS Progress (3 of 3)

RPS Contract Prices are Decreasing Drastically



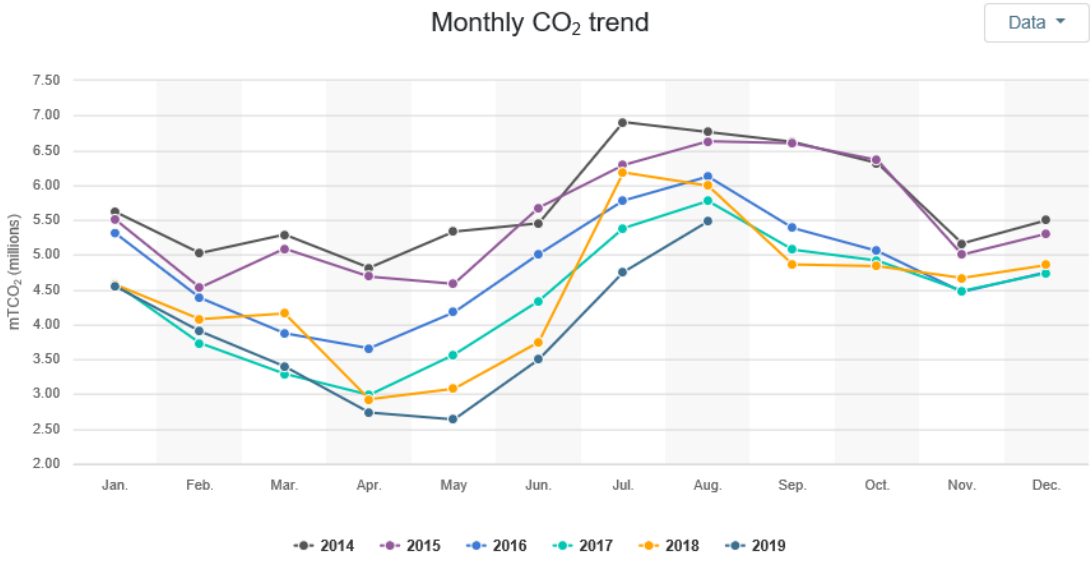
Energy Sector Emissions (1 of 3)

CAISO GHG Emissions on Downward Trend

- CAISO GHG Emissions have a clear downward trend since 2014, consistent with the overall energy resource portfolio
- Each line on the graph shows months of the year
- The highest line depicts the highest emissions – which is 2014
- The lowest line depicts the lowest emissions – which is 2019 YTD

Historical CO_2 emissions (serving ISO load)

The addition of zero or very low carbon renewable resources to the grid is reducing CO_2 emissions over time.

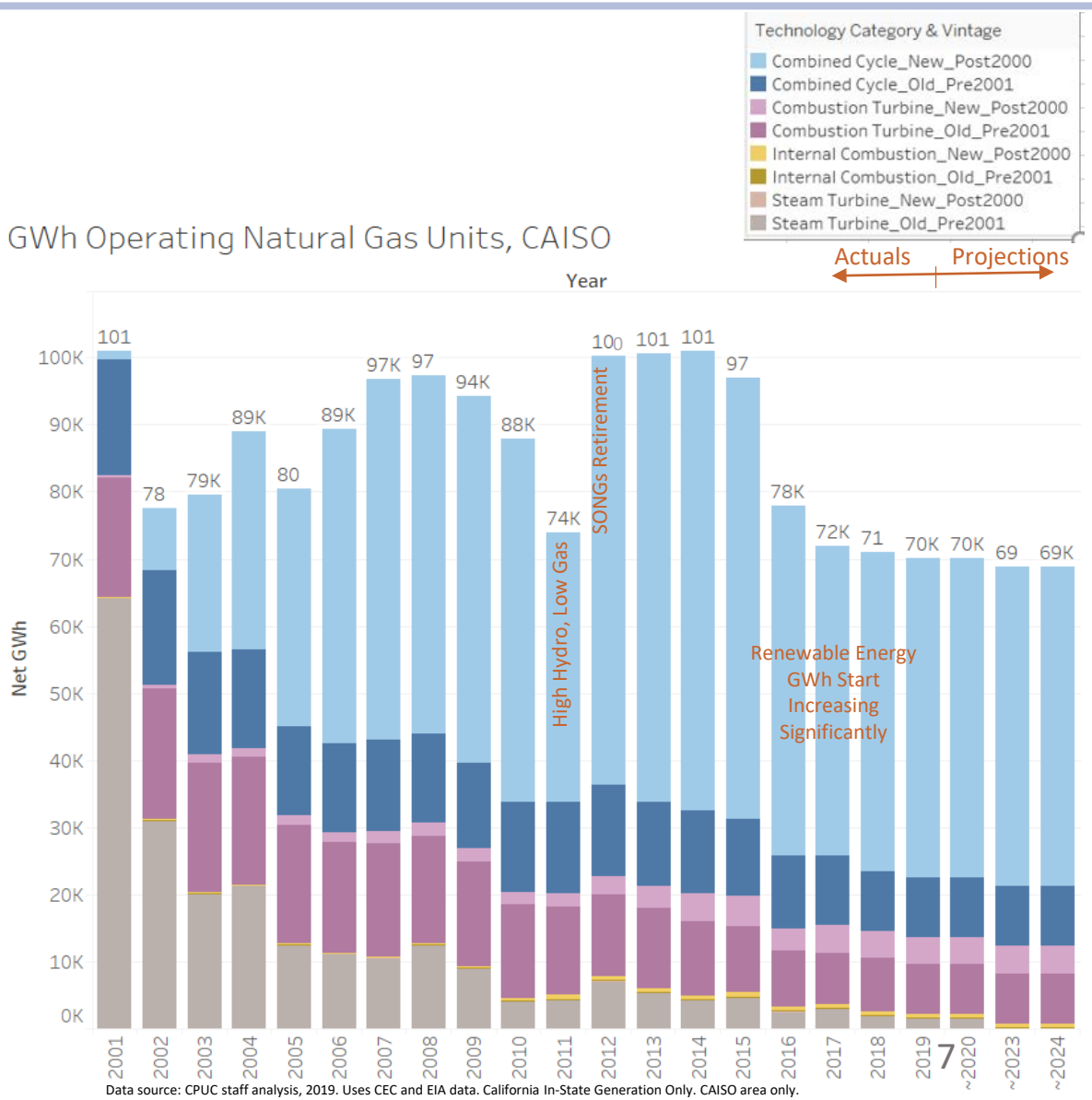


Source: CAISO Outlook, November 2019
http://www.caiso.com/TodaysOutlook/Pages/emissions.aspx
CAISO data shown here are inclusive of imports, per CAISO's GHG reporting methodology described: https://www.caiso.com/Documents/GreenhouseGasEmissionsTracking-Methodology.pdf

Energy Sector Emissions (2 of 3)

Natural Gas Generation Down 30%

- By 2019, fleet generates 30% less energy (GWh) compared to 2001
  - Variability driven by hydro conditions, except as renewables broke through in past 5 years
    - low hydro years = more gas burn
    - high hydro years = less gas burn
- In 2001, fleet was inefficient
  - Most generation was from inefficient (high heat rate) and heavily used (high capacity factor) steam units
- By 2019, fleet is efficient, new units
  - Aging, Steam Units provide very little energy
  - Most of the energy is provided by the newest unit
  - Cogeneration comprises 30% of the total natural gas generation by 2019 (and most of the energy from older CCs and CTs are cogen - dark pink, dark blue
- By 2024 – old steam units all retire

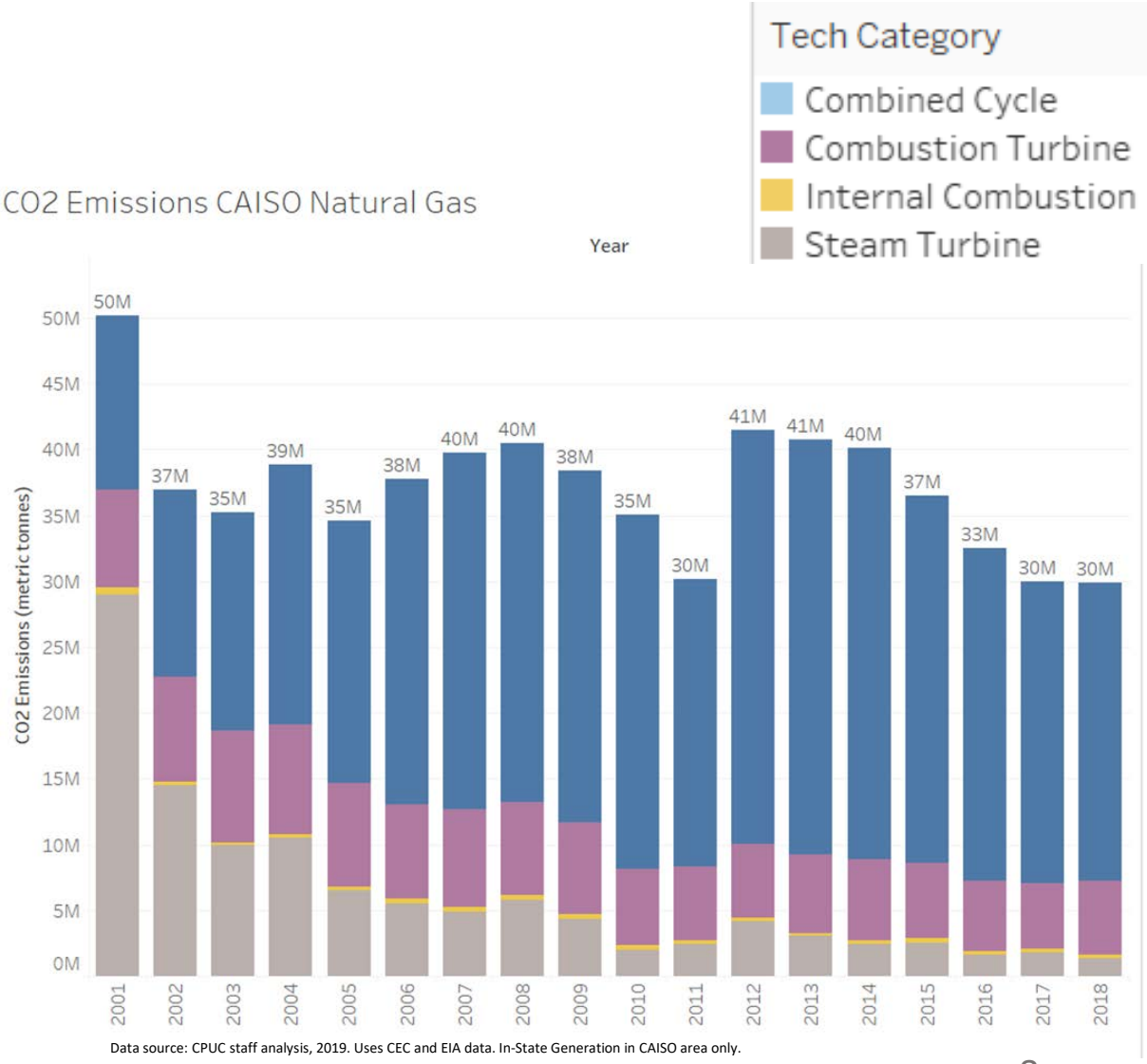


Data source: CPUC staff analysis, 2019. Uses CEC and EIA data. California In-State Generation Only. CAISO area only.

Energy Sector Emissions (3 of 3)

Natural Gas GHG Emissions Down by 40%

- Improved efficiency means emissions from Natural Gas are down significantly
  - Operating fleet is more efficient (with lower heat rates)
  - Emissions from Cogeneration is included in these emission figures
- By 2019, Aging Steam Turbine units (grey) contribute a small % of total CO2 emissions
  - Majority of emissions in 2001
  - Less than 1% in 2019



Data source: CPUC staff analysis, 2019. Uses CEC and EIA data. In-State Generation in CAISO area only.

Building Decarb Proceeding (1 of 3)

Phase 1: Implementation of SB 1477 (Stern, 2018)

- Authorizes the CPUC to select a program implementer for BUILD and TECH programs
  A. BUILD = Building Initiative for Low Emissions Development
  B. TECH = Technology and Equipment for Clean Heating

- May set rules and guidelines for program implementation, including design, participant eligibility, incentive levels, and evaluation protocols

- 30% of total funding reserved for low-income new residential housing

- Proposed Decision currently under development. Staff proposal available at www.cpuc.ca.gov/buildingdecarb

Photos: Orange County Register

Building Decarb Proceeding (2 of 3)

Phase 2: Pilot programs for post-fire rebuilding

- Considers consistent, unified statewide approach for fire victims to rebuild homes all-electric
- CPUC approved a PG&E program in Sonoma and Mendocino counties for all electric rebuild. A CCA (Sonoma Clean Power) is a partner. The program leverages Bay Area Regional Air Quality Management District funds
- CPUC approved SCE's Clean Energy and Resiliency (CLEAR) Rebuild Program for customers impacted by the Woolsey, Hill and Thomas fires

Photo: Sonoma Magazine

Building Decarb Proceeding (3 of 3)

Phase 3: Building and Appliance codes and standards

- CPUC will consider specific program policies, procedures, and rules to incent builders to choose Title 24 compliance pathways that maximize GHG reductions.

Phase 4: Develop a Building Decarbonization Policy Framework

- Development of a coherent and comprehensive set of CPUC rules, policies, and procedures to accelerate the reduction of GHG from buildings.

- Draw on lessons learned from the smaller-scale programs authorized by SB 1477 to scale up, including rate design.

San Joaquin Valley Pilots (1 of 1)

Assembly Bill 2672 (Perea, 2014) Access to Energy: Disadvantaged Communities: San Joaquin Valley

- *"Requires CPUC to identify disadvantaged communities in the San Joaquin Valley meeting specified requirements and to analyze economically feasible options to increase access to affordable energy in those disadvantaged communities"*

San Joaquin Valley Affordable Energy Proceeding (Initiated March 2015)

- **Phase 1 Outreach & Community Identification –** 170 disadvantaged communities that met the criteria established in the statute, related to household income levels, population size, and distance from a natural gas pipeline
- **Phase 2 Pilot Projects & Data Gathering –** 11 pilot communities chosen to analyze and implement ways to offer cleaner, more affordable energy options

Decision 18-12-015

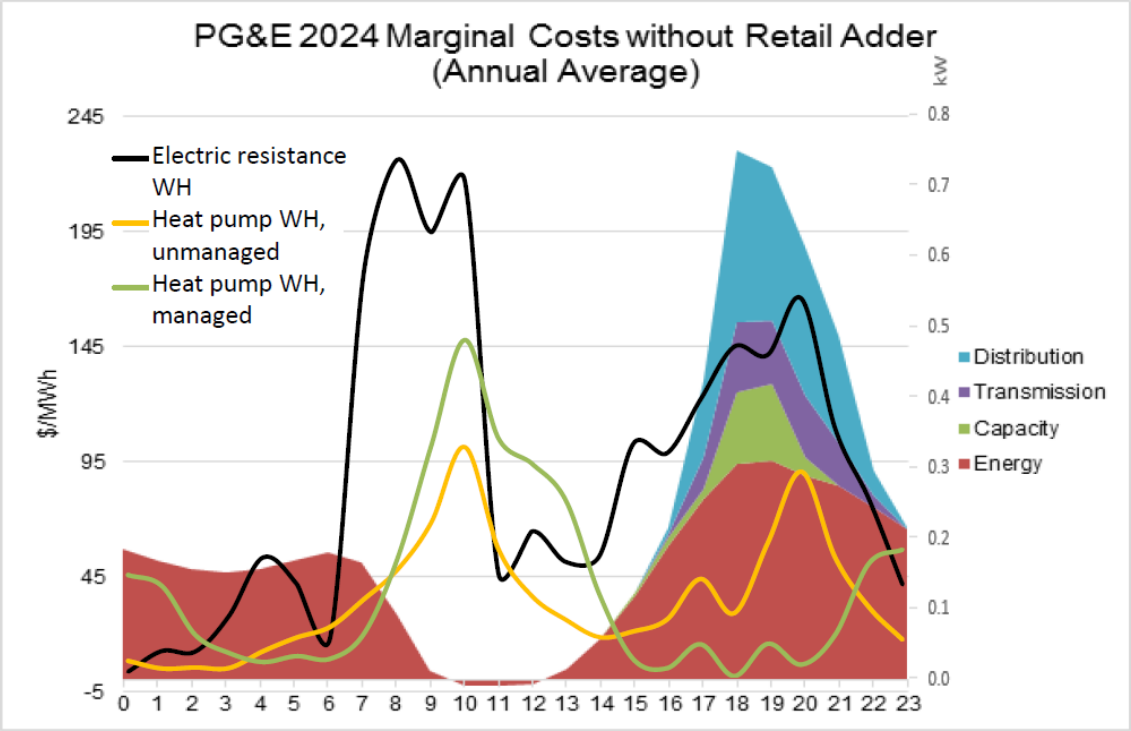
- Approves $56 million in funding in affordable energy option upgrades for 1944 households in 11 communities, **including the full/partial electrification of 1,720 households**

SGIP Incentives (1 of 1)

Exploring Heat Pump Water Heaters (HPWHs) as grid assets via SGIP. Decision 19-09-027 requires:

- Program Administrators to make available $4 million via a new equity residential HPWH set aside
- Energy Division Staff to host a workshop to discuss and identify barriers to HPWH participation in the SGIP program in early 2020
- Commission is interested in understanding the multiple services, benefits, and goals the technology can achieve

Sample results
CZ12*, 3 bedrooms, 50G ERWH, 66G HPWH



* CA climate zone 12: Sacramento

Graph: Natural Resources Defense Council

Renewable Natural Gas (1 of 1)

Senate Bill 1383 (Lara, 2016) Short-lived climate pollutants: methane emissions: dairy and livestock: organic waste: landfills

- Six pilot projects approved to prove the viability of dairy biomethane interconnection/injection into natural gas pipeline system
- Total Cost: $149,634,756
- All off-take agreements for use in transportation sector

Senate Bill 1440 (Hueso, 2018) Energy: biomethane: biomethane procurement

- R.13-02-008, Phase 4: “The Commission, in consultation with the State Air Resources Board, shall consider adopting specific biomethane procurement targets or goals for each gas corporation so that each gas corporation procures a proportionate share, as determined by the commission, of biomethane annually.”

R.19-02-015 is exploring a SoCalGas/SDG&E Opt-In Green Gas Tariff

Refrigerants (1 of 2)

Senate Bill 1013 (Lara, 2018) Fluorinated refrigerants

- *"The Public Utilities Commission shall consider developing a strategy for including low-GWP refrigerants in equipment funded by the energy efficiency programs overseen by the Public Utilities Commission."*

Action Expected in 2020 in the Energy Efficiency Proceeding (R.13-11-005)

November 20, 2019 Staff Proposal in IDER Proceeding (R.14-10-003) would factor refrigerant GWP into the Avoided Costs Calculator

Staff Proposal for SB 1477 pilot programs envisions "kicker" incentives for low GWP refrigerant appliance use

Refrigerants (2 of 2)

Global Warming Potential (GWP) of Common Refrigerants

Refrigerant	100-yr GWP	Uses
R-717 (Ammonia)	0	Industrial Heat pump for non-residential buildings
R-600a (Iso-Butane)	0	Industrial heat pump technology replacement for R-22
R-600 (N-Butane)	0	Industrial heat pump technology
R-744 (CO2)	1	Currently used for water heat pumps around the world and marketed in the US, cost issue
R-290 (Propane)	4	Used widely in Europe
R-1234yf and R-1234ez	4	Residential heat pumps for water heaters
R-447A (HFO L-41)	583	Replacement for R-410a in residential heat pumps
R-454B (HFO DR-5A)	466	Replacement for R-410a in residential heat pumps
R-32	675	Drop in replacement for R-410a in residential heat pumps
DR-55 HFO	698	Mini Split Air Conditioner replacement for R-410a
R-466A	733	Non-flammable replacement for wide use in heat pumps
R-134a	1430	Current wide use in heat pumps
R-22	1810	Current wide use in air conditioners
R-410a	2088	Current wide use in heat pumps

Fuel Substitution Decision (1 of 2)

- New test established in D.19-08-009
- The Fuel Substitution Test has two parts:
  1) The measure must not increase source BTU
  2) The measure must not increase GHG Emissions
- Applied at a measure level
- No cost effectiveness screen

Fuel Substitution Decision (2 of 2)

- Fuel substitution measures must:
  1) Substitute regulated fuel for another regulated fuel
  2) Pass the fuel substitution test

- Fuel substitution measures are not:
  1) New construction measures
  2) Building weatherization measures

- Fuel substitution measures are likely not:
  1) Add-on equipment
  2) In behavioral, retro-commissioning and operational (BRO) programs