

DOCKETED	
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Project Title:	Gas Decarbonization
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Description:	June 3 2022 Presentation. Presenter: David Erne
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California Energy Commission

Title: Gas Decarbonization Order Instituting Informational Proceeding Overview

Presenter: David Erne, Manager, Energy Assessments Division

Date: June 3, 2022



Workshop Overview

- California gas system and demand
- State energy agencies (CEC, CPUC, and CARB) gas planning analytics
- Equity concerns/challenges during gas transition
- California utilities' decarbonization efforts





Important Gas Decarb Questions

- What does an endpoint look like and what are interim milestones?
- What does this mean for demand, price, rates?
- How do we define an equitable transition?
- How do we ensure reliability in an interconnected electric/fossil gas system
- What end uses cannot be electrified or are hard to electrify, and what are the options?
- How do we prioritize infrastructure investments?
- How do we address the “obligation to serve?”



Proceeding Overview

- Ensure a safe, reliable, and equitable transition away from fossil gas
- Multi-year proceeding, running parallel with IEPR processes
- Continue dialogue on long-term gas transition issues
- Begin carrying out 2021 IEPR Gas Volume recommendations
- Expand interagency (CEC, CPUC, CARB, CAISO) collaboration on decarbonization efforts



Thank You!



Background: Natural Gas in California



A Few Key Facts

- CA is second-largest consumer among U.S. states (VERY desirable market)
- Natural gas is CA's Single Most-Used Fuel (28% in 2019)
- Demand varies Seasonally, Driven by Space Heating
 - Use 5.5 Billion cubic feet per day (Bcfd) on an average across a year
 - Can peak to 11 Bcfd on a very cold day
 - Store gas underground in summer to meet winter peak demand
- Focus is to serve residential load on peak winter day
- Gas utilities are “common carriers”
 - Obligation to serve those who request service
 - Cannot halt service to individual customers

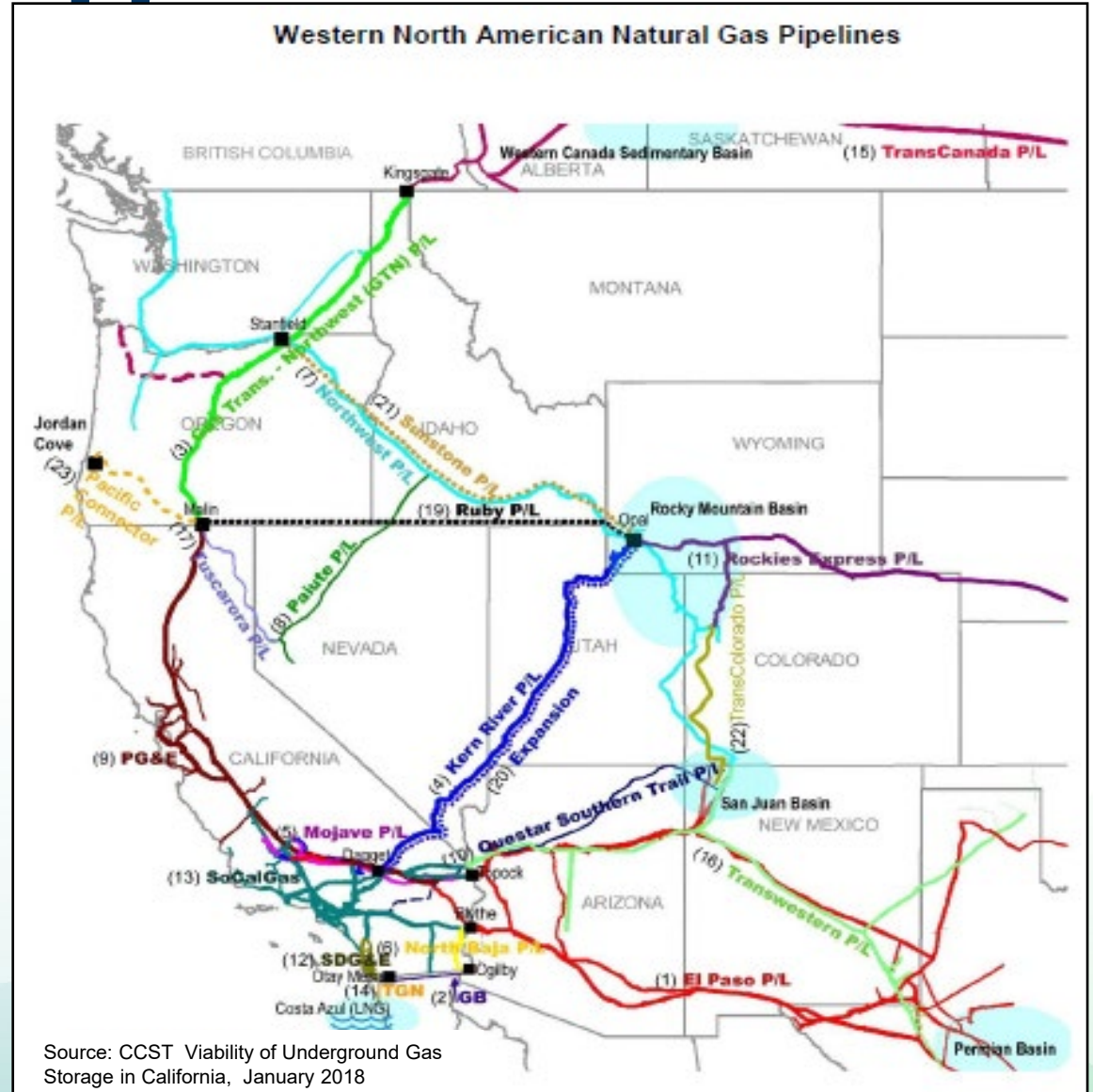
Bcfd	Demand Day
5.5	Average Annual
11	Very Cold Day

Customer Type	Rate Class	Supply Service	Delivery Service (“transportation”)
Core	<ul style="list-style-type: none">• residential• small commercial	✓	✓ Firm
Noncore	<ul style="list-style-type: none">• large commercial• industrial• refineries• electric generators		✓ Interruptible



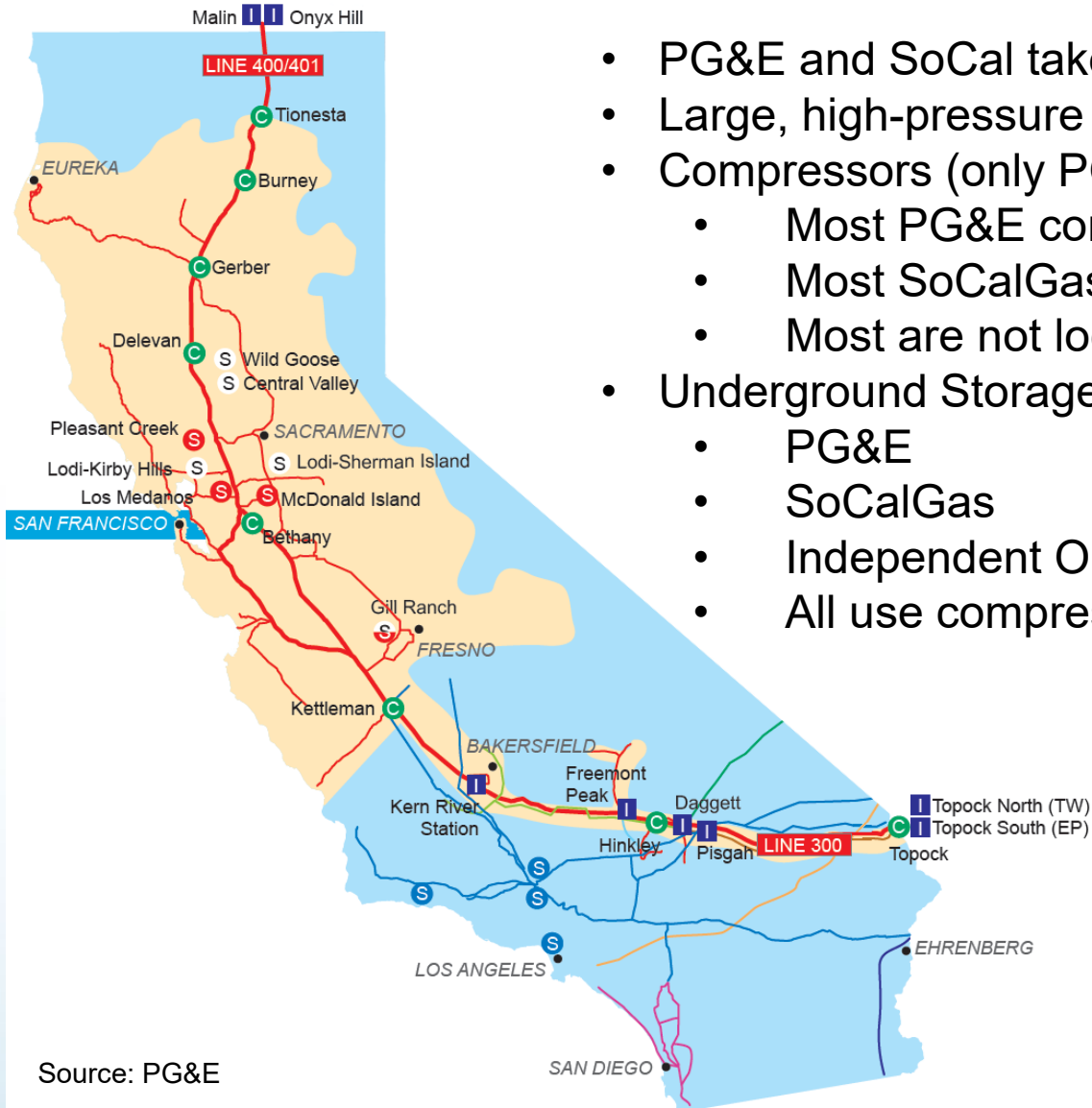
Served by Multiple Interstate Pipelines and Broad set of Suppliers

- 90% of Supply is Imported via Pipeline
- Supply Basins nearly 1000 miles away
 - Alberta, Wyoming, New Mexico, West Texas
- 5 Key Interstate Pipelines Bring Gas to CA
 - Gas Transmission Northwest
 - El Paso Natural Gas
 - Kern River Gas Transmission'
 - Ruby
 - Transwestern
- In-State Production ~ 10% Total
 - Production Declining since 1980s





PG&E + SoCalGas Operate Most Intrastate Gas Transmission



Source: PG&E

- PG&E and SoCal take possession of most gas at the state line (complex exception)
- Large, high-pressure pipelines move it to local transmission and distribution
- Compressors (only PG&E's shown) every few hundred miles push the gas through
 - Most PG&E compressors are gas-fueled
 - Most SoCalGas compressors are electricity-fueled
 - Most are not located near population centers (Ventura exception)
- Underground Storage owned by:
 - PG&E
 - SoCalGas
 - Independent Operators
 - All use compressors to inject gas underground

AND there are some private gas pipelines or lines under joint ownership such as SMUD's and few others

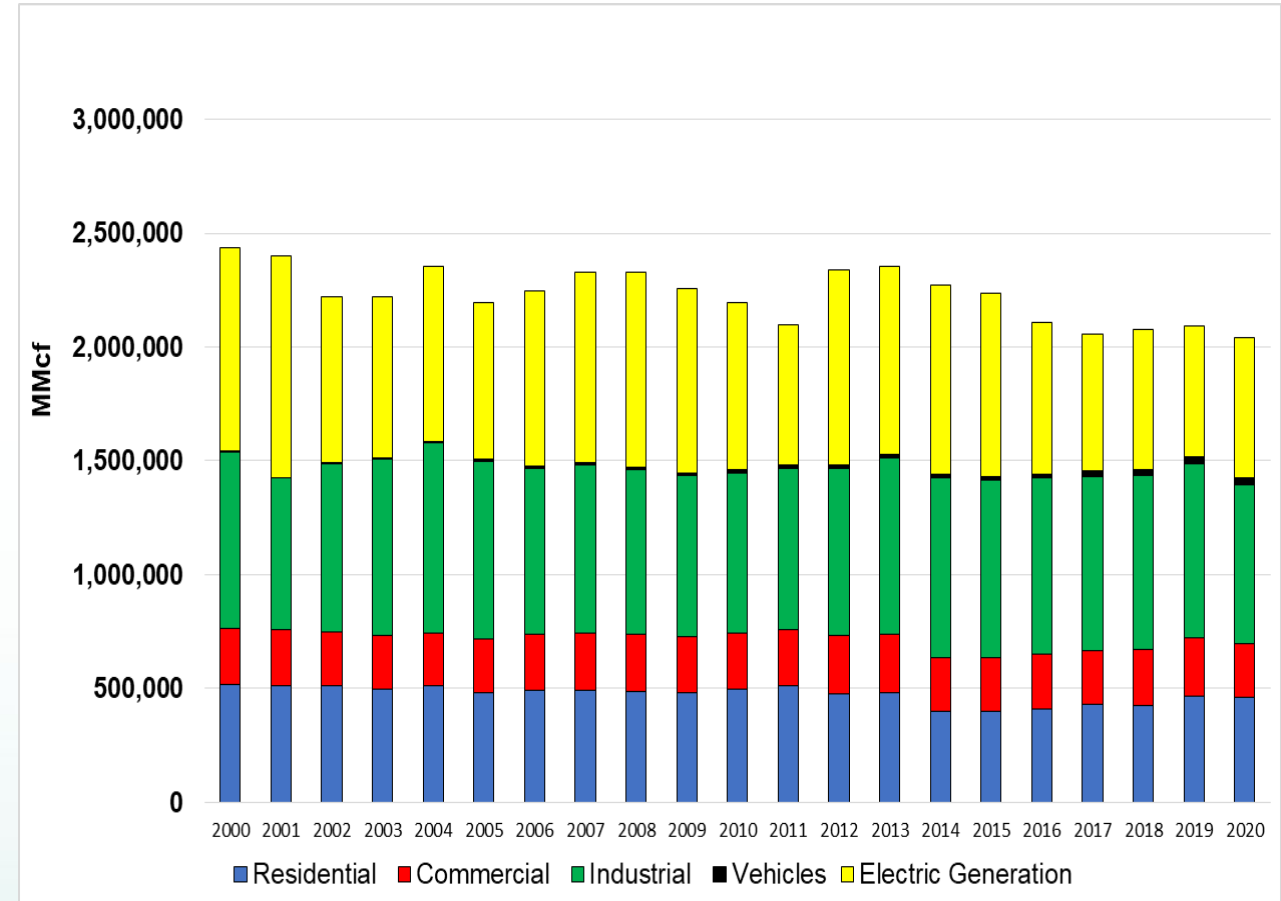
PG&E and SoCalGas are NOT well-connected



Annual Statewide Gas Demand Declining

- CA Gas Demand has declined some since over last 20 years
- Most of decline is electric generation
- Industrial demand flatter but varies with economic activity (and prices)
- Year-to-year ups and downs due primarily to weather

California Natural Gas Consumption 2000-2020 (MMcf)





Gas Jobs in CA?

The Los Angeles County Economic Development Corporation reported that in 2015 there were **36,760** workers employed in gas distribution (NAICS 2212) in California.

A similar report* two years later found that there were **33,371** workers in 2017 and forecasted a decline to **32,890** by 2022.

**OIL AND GAS IN CALIFORNIA: THE INDUSTRY, ITS ECONOMIC CONTRIBUTION AND USER INDUSTRIES AT RISK IN 2017.* Los Angeles County Economic Development Corporation, 2019, Commissioned by WSPA.



CEC Gas Demand Forecasts and Process

Cary.Garcia@energy.ca.gov

Demand Analysis Office

06/03/2022



End User Gas Demand Forecasts

- Similar process as with electricity forecasts but with some differences
 - Schedule: Odd-year IEPRs only
 - Fuel: gas demand measured in millions of Therms
 - End uses: primarily space/water heating; cooking; industrial processes
- Three primary gas demand planning areas that approximate the gas utility service areas that can be mapped to corresponding electricity zones:
 - PG&E
 - SoCal Gas
 - SDG&E
- Gas demand forecasts from the Demand Analysis Office **do not** include gas used for generation
 - Production cost modeling estimates gas demand for utility generation (Supply Analysis Office)



Sector Based Forecast Models

- Staff use a combination of end use and econometric models to develop long-term annual demand electricity and gas demand forecasts

End use energy demand models

- Residential and commercial sector demand across building types and end uses
- Supplemented by corresponding econometric models

Econometric model with **NAICS** groupings

- Industrial – manufacturing and resource extraction

Trend Analysis for smallest gas demand sectors

- Agriculture
- Transportation, communications and utilities (TCU)

*Orange text in this presentation are links to additional data/information



Primary Inputs

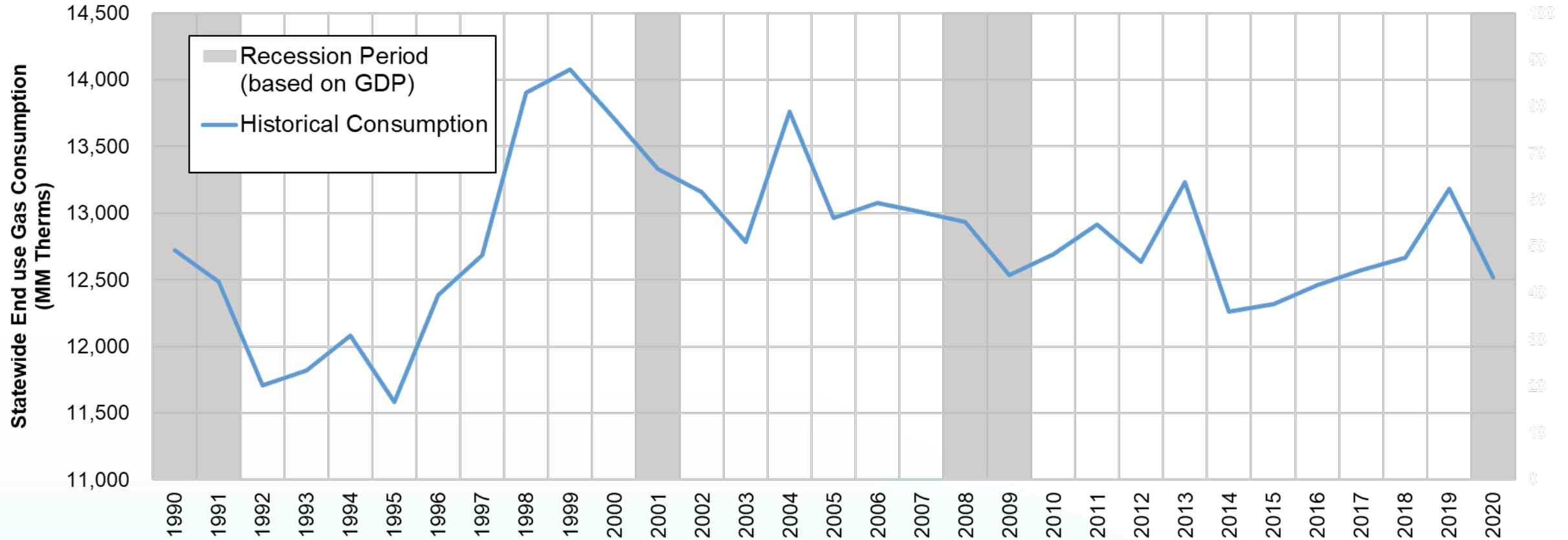
- Historical billed gas consumption data collected from utility through CEC's Quarterly Fuel and Energy Reporting (QFER)
- Residential (RASS) and commercial surveys (CEUS) for corresponding end use models
- Econ/demo drivers; energy prices; historical weather and climate change assumptions
- Additional assumptions regarding future potential energy efficiency savings (AAEE) and fuel substitution (AAFS) to generate forward looking scenarios - "managed forecasts"

*AAEE = Additional Achievable Energy Efficiency

AAFS = ... Fuel Substitution



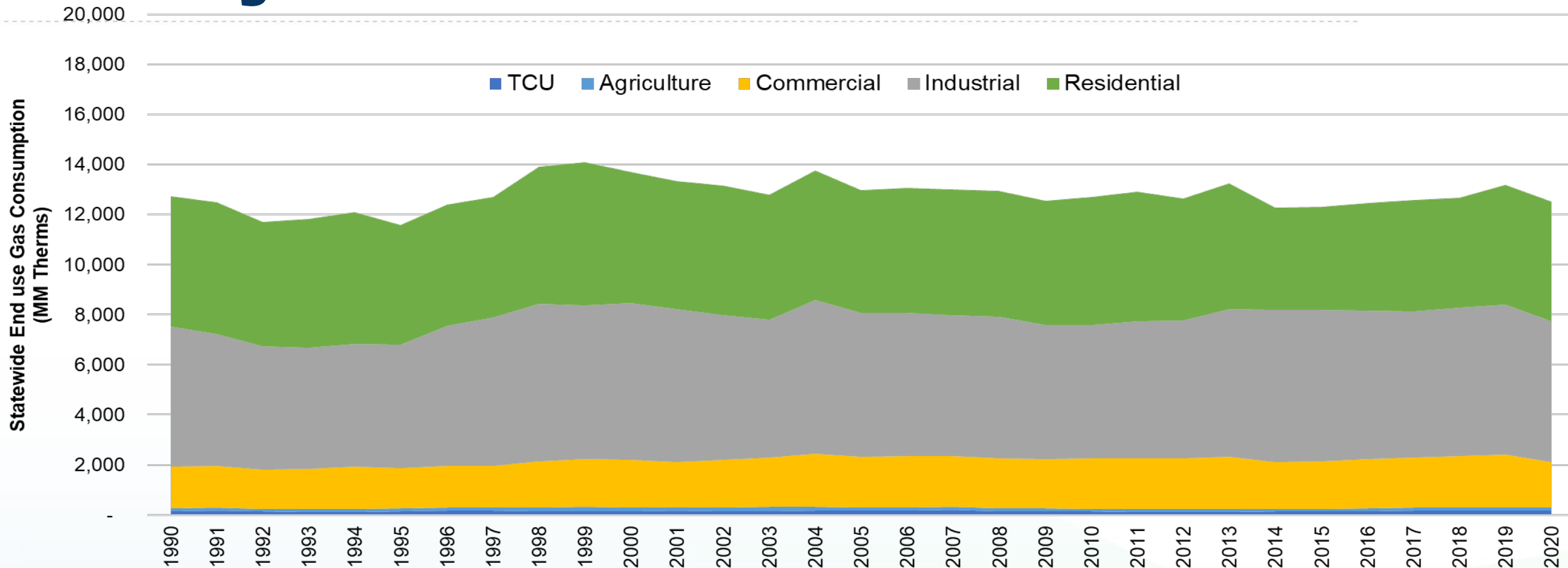
Historical Statewide End User Gas Demand



Source: CEC Demand Analysis Office, 2022 *Does not include gas demand for utility generation



By Sector



Source: CEC Demand Analysis Office, 2022

- Residential gas demand has been slowly declining – ~0.3% annually over the last decade
- Commercial and industrial demand has been increasing – ~1% annually over the same time period



CED 2021 Forecast Results

2021-2035 Gas Demand

- Statewide baseline gas demand continues to be flat - 0.2% annually
- Commercial sector grows at a similar rates as history - ~1% annually
- Very little growth in the industrial sector
- Accounting for additional efficiency and fuel substitution scenarios, results varying degrees of decline in future gas demand statewide
 - 12% decline by 2035 under “Mid-Mid” assumptions
 - 8% decline by 2035 under more conservative assumptions

[CED 2021 Baseline Gas Forecast - Mid Demand Case](#)



Modeling Updates and Improvements

- Developing an approach for forecasting **monthly** and **daily** peak gas demand under different weather conditions to assess CPUC reliability standards
- Improve understanding of industrial gas demand and impacts of fuel substitution
- Continued analysis of climate change impacts and the occurrence of extreme events with new data (California's Fifth Climate Change Assessment)



Demand Scenarios

CEC Demand Scenarios Project

- ✓ Understanding energy demand and the pattern of change from one energy form to another is critical to assuring reliability for each energy form
- ✓ Numerous uncertainties about **how** various policy goals will actually be achieved, **when** they will be achieved, and **what** their energy demand impacts will be.
- ✓ Demand Scenarios are being developed to support SB 100 analyses and interests of other agencies.
- ✓ Recently adopted 2 additional demand scenarios to be use for planning
- ✓ Will continue to refine and develop products each biennial IEPR cycle for possible use in the typical and perhaps new planning processes



Synchronized Forecast Process

- Merging demand scenario analyses and traditional forecasting process for SB100 and other planning needs
- Alignment of electricity and gas demand and supply scenario assumptions
- Expanded stakeholder engagement for forecast/scenario assumptions
 - Formal IEPR workshops
 - Demand Analysis Working Group (DAWG)
- IEPR 2023 is the goal line for finalizing new processes/products
- **Result:** More comprehensive energy demand forecast process to support long-term planning and decision-making





Questions/Comments



Additional Data and Documentation

All CED 2021 Demand Forecast Files – Both electricity and gas

- **CED 2021 Baseline Gas Forecast - Mid Demand Case**

2021 IEPR Volume IV - California Energy Demand Forecast

- Electricity and gas demand forecast

2021 IEPR Volume III - Decarbonizing the State's Gas System

- See Appendix F for gas demand for generation



California Energy Commission

Title: California Energy Commission Gas Analytics

Presenter: Jennifer Campagna, Supervisor, Gas Unit in Energy Assessments Division

Date: June 3, 2022



CEC Gas Analytics

Analytical support to identify the short- and long-term natural gas needs as the state transitions to cleaner energy sources

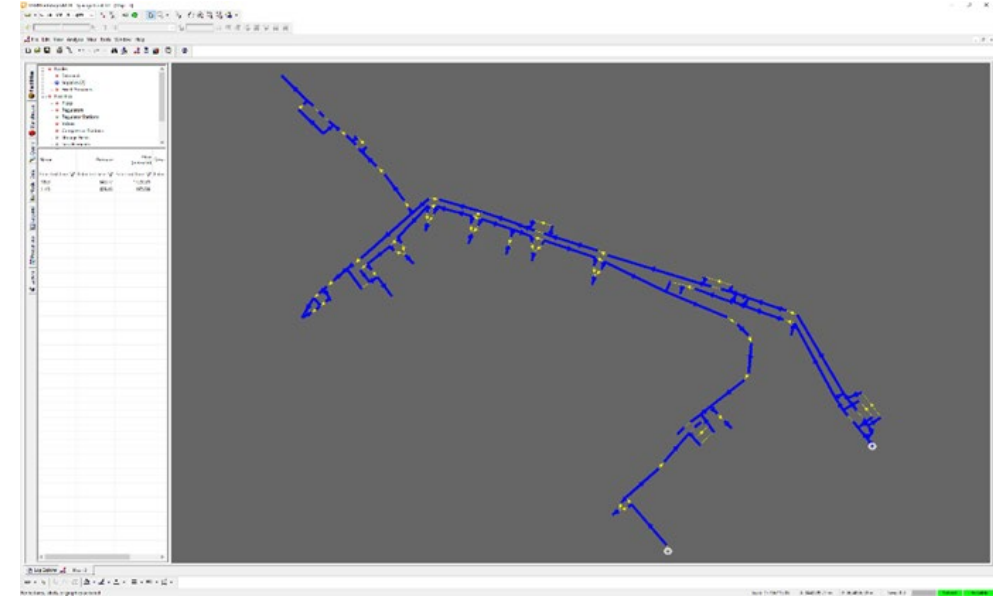
- Gas System Assessments
- Market Assessments (Price and Rates Forecasts)
- Low Carbon Fuels
- Research and Development





Gas System Assessments

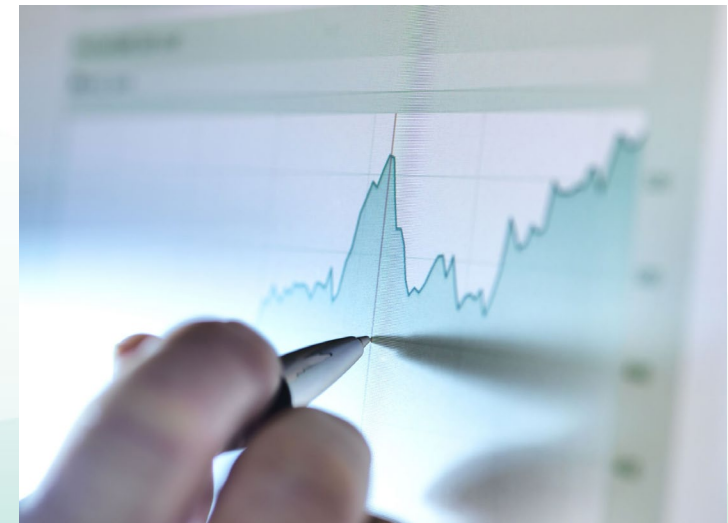
- Assess natural gas system reliability
- Assess impacts of change in electric generation to gas burn patterns
- Verify utility analysis / coordinate with gas utilities
- **Analyze potential system enhancements**
- Evaluate seasonal reliability





Market Assessments

- Assess Gas Supply Trends – US and California
- Forecast North America natural gas prices to evaluate impact on California
- Track world natural gas market (e.g., LNG) and effects on California prices and supplies





Low Carbon Fuels

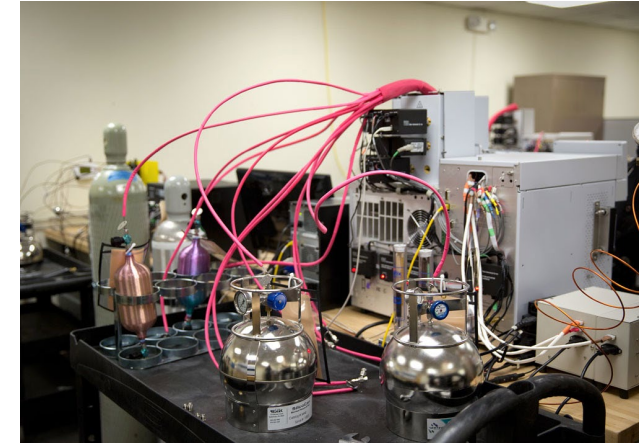
- Assess Renewable Natural Gas production potential, costs, incentives
- Assess clean hydrogen's role in the transition





Research and Development

- Energy Research & Development Division (ERDD) funds RNG and Hydrogen research – Gas R&D and EPIC programs
- Gas team tracks R&D and pilot projects demonstrating alternatives
- Work closely with ERDD to plan and identify areas where research is needed
- Existing and planned hydrogen investments in gas safety, generation, and industrial (hard to electrify), as well as other areas





Stakeholder Comments

Comments are June 17, COB. They can be submitted two ways:

- The CEC encourages use of its electronic commenting system.
 - Visit the e-commenting page at <https://efiling.energy.ca.gov/EComment/EComment.aspx?docketnumber=22-OII-02>, which links to the comment page for this docket.
 - Enter your contact information and a comment title describing the subject of your comment(s).
 - Comments may be included in the “Comment Text” box or attached as a downloadable, searchable document in Microsoft® Word or Adobe® Acrobat®. The maximum file size allowed is 10 MB.
- Written comments may be submitted by email.
 - Include docket number 22-OII-02 and “Gas Decarbonization Order Instituting Informational Proceeding” in the subject line.
 - Email to docket@energy.ca.gov.



Thank You!

Gas Transition: CPUC Proceedings & Analytics

June 3, 2022

Jean Spencer
Gas Policy & Reliability



California Public
Utilities Commission

Proceeding Overview

Gas Planning

- Long-Term Gas Planning Rulemaking (R.20-01-007)
- Aliso Canyon Investigation (I.17-02-002)
- Renewable Gas Rulemaking (R.13-02-008)

Building Electrification

- Building Decarbonization Rulemaking (R.19-01-011)
- SCE Building Electrification Application A.21-12-009
- Energy Efficiency Rulemaking (R.13-11-005)
- Self-Generation Incentive Program Rulemaking (R.20-05-012)

Gas Costs and Rates

- Affordability Rulemaking (R.18-07-006)
- PG&E GRC (A.21-06-021)
- SDG&E and SoCalGas GRCs (A.22-05-16 and A.22-05-015)

Gas-Electric Interface

- Integrated Resource Planning Rulemaking (R.20-05-003)

Interlocking Challenges

Will customers choose to electrify?

Is there enough electric capacity to meet new load?

Is gas reliable and affordable for those still on the gas system?

How & when will new technologies be integrated in the energy system?

Have enough customers electrified in the local area to trim the gas system?

Can electric generators get the gas they need during peak hours?

Can industrial customers get the power they need at prices that keep them competitive?

Long-Term Gas Planning Rulemaking

- Track 1: Design Standards (Proposed Decision Issued on 5/20)
 - What standard are we planning to?
 - What assumptions are we making to determine future demand?
 - PD requires that the CEC's California Climate Change Assessment be used in demand forecasting
- Track 2.1 (Underway)
 - What gas infrastructure should we keep, and what should we begin to transition?
 - How do we prioritize the transition?
 - Ruling required utilities to provide information about their gas systems by zip code.
 - Nonconfidential data made publicly available

Long-Term Gas Planning Rulemaking

- Track 2.2 Equity, Rates, Safety, Workforce (Begins 10/2022)
 - Equity: How can barriers to electrification be overcome?
 - Rates and Revenue: What changes should be made to current practices to keep rates affordable?
 - Safety: Can safety work required by different agencies be streamlined to increase efficiency?
 - Workforce: How can negative impacts on the gas workforce be mitigated?
- Track 2.3: Data and Process (2023)
 - Data: What additional data is needed to right-size the gas system and improve demand forecasting?
 - Process: What process should be put in place for ongoing, strategic gas system planning?

Aliso Canyon Investigation

- Phase 3: What portfolio of resources is needed to replace the services provided by Aliso Canyon?
 - Analytics:
 - Economic analysis of role of storage in gas prices
 - Production cost modeling of electric system's demand for gas
 - Hydraulic modeling of gas system on peak days
 - Economic analysis of costs of different replacement portfolios, including carbon costs
 - Summer and Winter Reliability Assessments
 - Forward-looking assessments of Southern California reliability issues for the coming season
 - Summer and Winter Conditions and Operations Reports
 - Backward looking assessments of price and reliability issues in a prior season

Building Decarbonization Rulemaking

- BUILD/TECH
 - BUILD provides technical assistance and incentives for new all-electric, low-income residential buildings.
 - CPUC implementation began in Q1 2022
 - TECH focuses on market development for low-emission space and water heaters in new and existing homes
 - Implementation began in Q3 2021; all market-rate incentives exhausted within 6 months. TECH will continue to oversee market transformation work moving forward.
- Gas line extension allowances
 - Phase 3 is currently examining whether to eliminate all gas line extension allowances, refunds, and discounts currently provided to builders.
- Electrification of wildfire rebuilds
 - The CPUC anticipates an RFP to be released by SCE later this summer.

Renewable Gas Rulemaking

- SB 1383 dairy biomethane pilots
 - The CPUC approved six total pilots. Five are currently online while the sixth has experienced delays and is anticipated to come online in 2023.
- Biomethane procurement standard
 - Sets a procurement target for 2030 of 12.2% of 2020 core gas demand
- Examining the potential role of hydrogen
 - CPUC-UC Riverside study on the feasibility of blending hydrogen into the existing gas system
 - Phase 4b is anticipated to address how to move forward on hydrogen-related issues.
 - Utility hydrogen blending tests
 - The CPUC rejected a utility application to test hydrogen blending due to a lack of information but allowed them to refile.

Energy Efficiency Rulemaking and Applications for 2024-2027 Program Cycle

- Fuel substitution measures
 - 2021 EE Potential and Goals Study: efficiency of fuel substitution measures that switch out gas appliances for electric.
 - EE plans to update the Fuel Substitution Calculator in summer 2022.
- Party motion to eliminate gas EE incentives
 - In January 2022 Sierra Club proposed to eliminate EE incentives for non-cost-effective natural gas appliances.
 - In their 2022 EE Business Plans and Applications, PG&E, SCE, and MCE indicated their support/plans to begin phasing out natural gas incentives.

Integrated Resource Planning and Resource Adequacy Rulemakings

- IRP Procurement for renewables integration and reliability
 - Developing analytical tools to inform locational planning and procurement
 - One goal is to ensure that reductions in gas infrastructure won't harm local electric reliability

Overview of Draft 2022 Scoping Plan Update



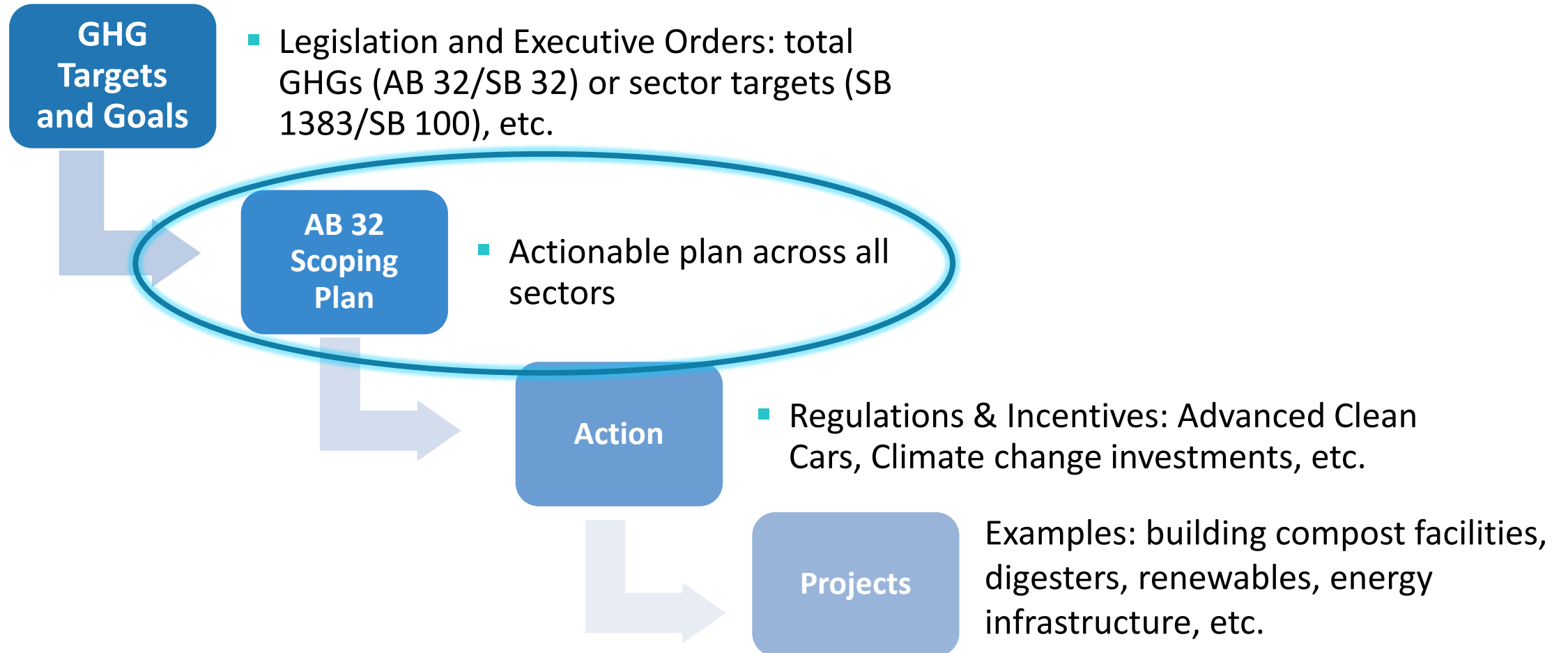
CEC WORKSHOP TO LAUNCH GAS DECARBONIZATION PROCEEDING

JUNE 3, 2022

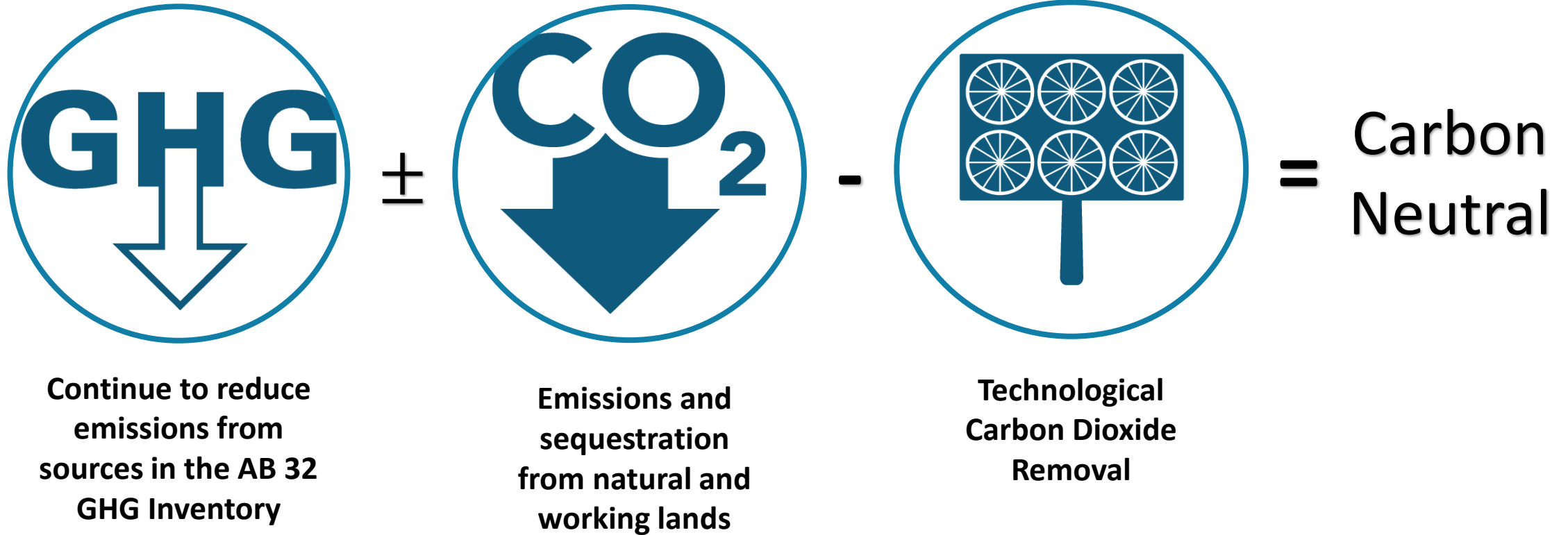
AB 32 Climate Change Scoping Plan Statutory Requirements

- Scoping Plan(s) are action plans for CA to meet statewide GHG reduction targets
 - Scoping Plan(s) outline a suite of climate policies to address emissions across all sectors
 - Required to be updated at least every 5 years
 - 2017 SP (most recent) – cost-effective and technologically feasible path to achieve the 2030 target
- Provide direct GHG emissions reductions and air quality benefits
- Minimize emissions “leakage” – increase to non-CA GHG emissions
 - Ensure high-road jobs remain
- Facilitate sub-national and national collaboration
 - Develop exportable programs for partners to adopt
- Support cost-effective and flexible compliance

California's Climate Policy Framework



What Carbon Neutrality Means



The Proposed Scenario

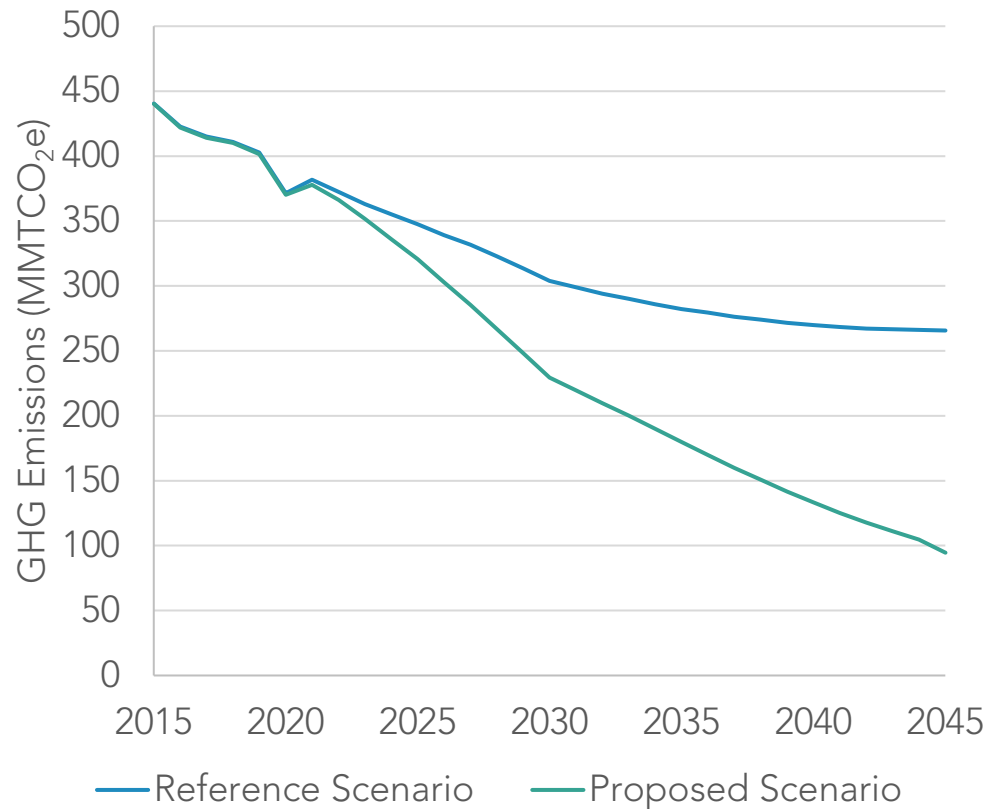


Carbon neutrality by 2045, deploy a broad portfolio of existing and emerging fossil fuel alternatives and clean technologies, and align with statutes and Executive Orders



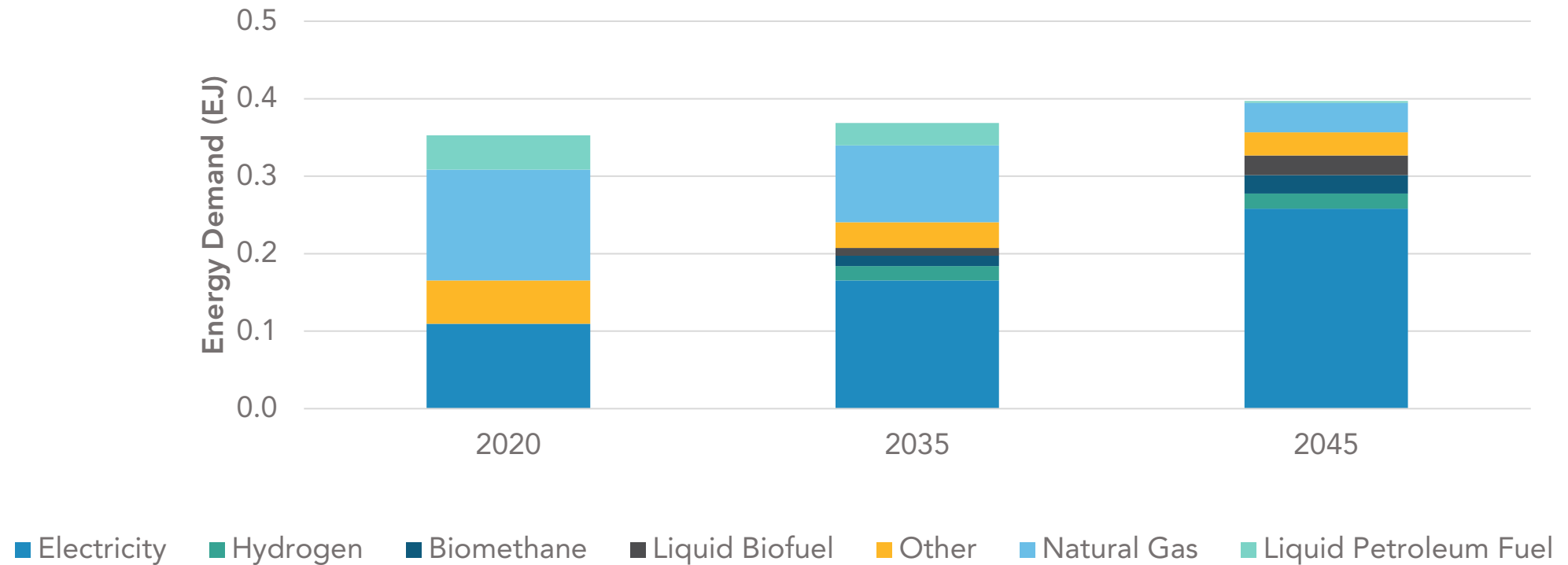
Land management activities that prioritize restoration and enhancement of ecosystem functions to improve resilience to climate change impacts, including more stable carbon stocks

Reference and Proposed Scenario

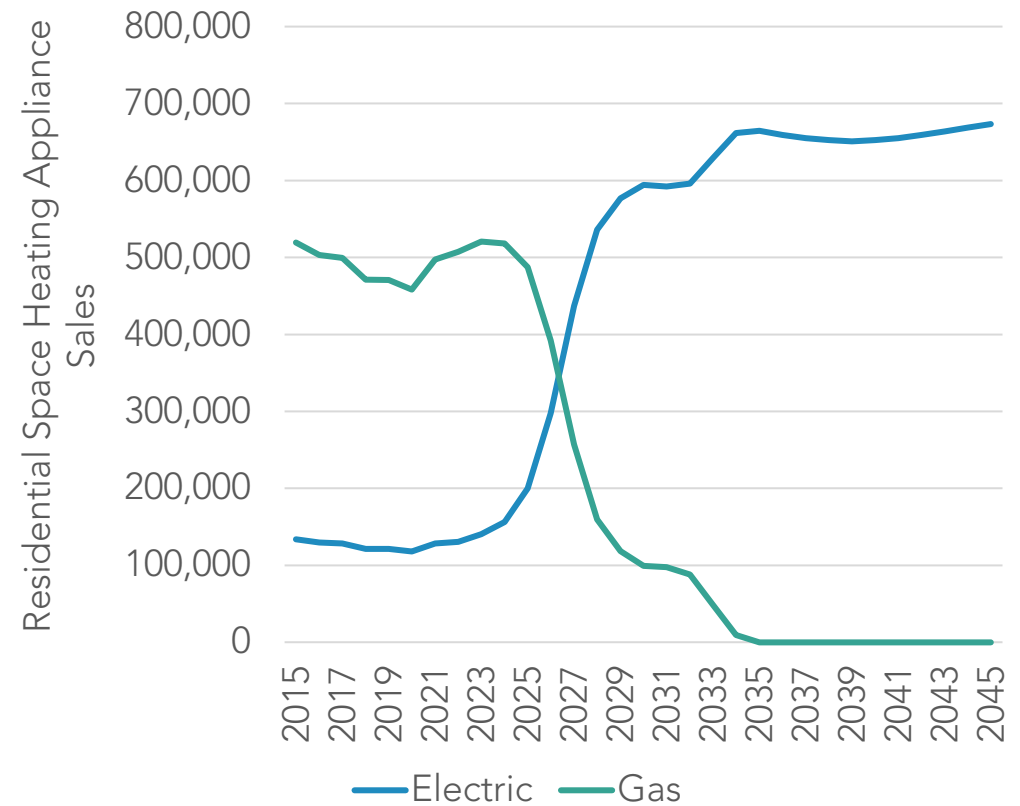
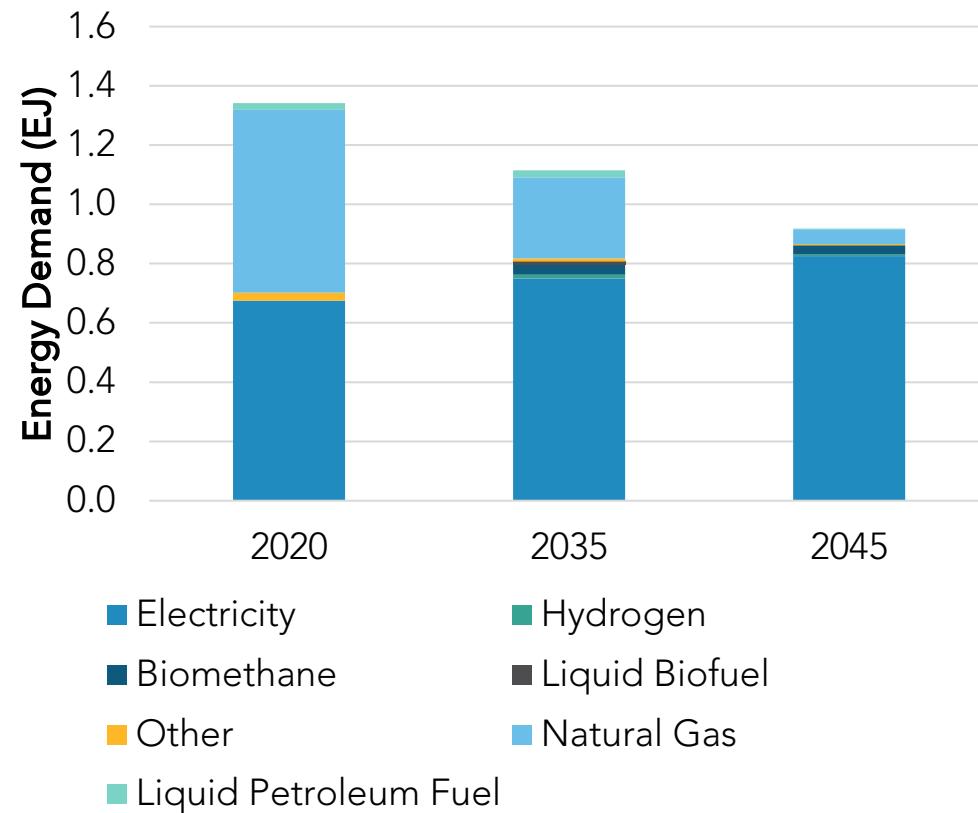


- Deploy zero-emission vehicles and reduce driving demand
- Coordinate supply of liquid fossil fuels with declining petroleum demand
- Decarbonize buildings
- Decarbonize industrial energy supply
- Reduce non-combustion emissions
- Generate clean electricity

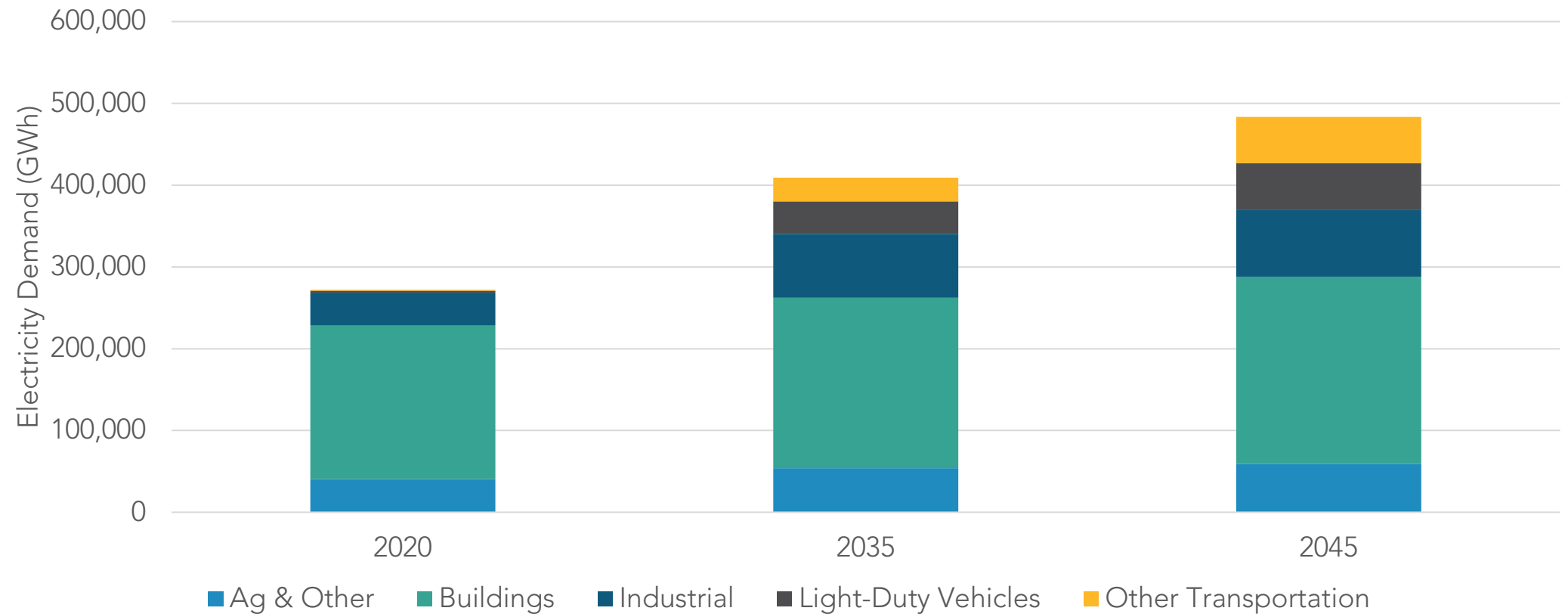
Transition Away from Fossil Gas – Industrial Manufacturing



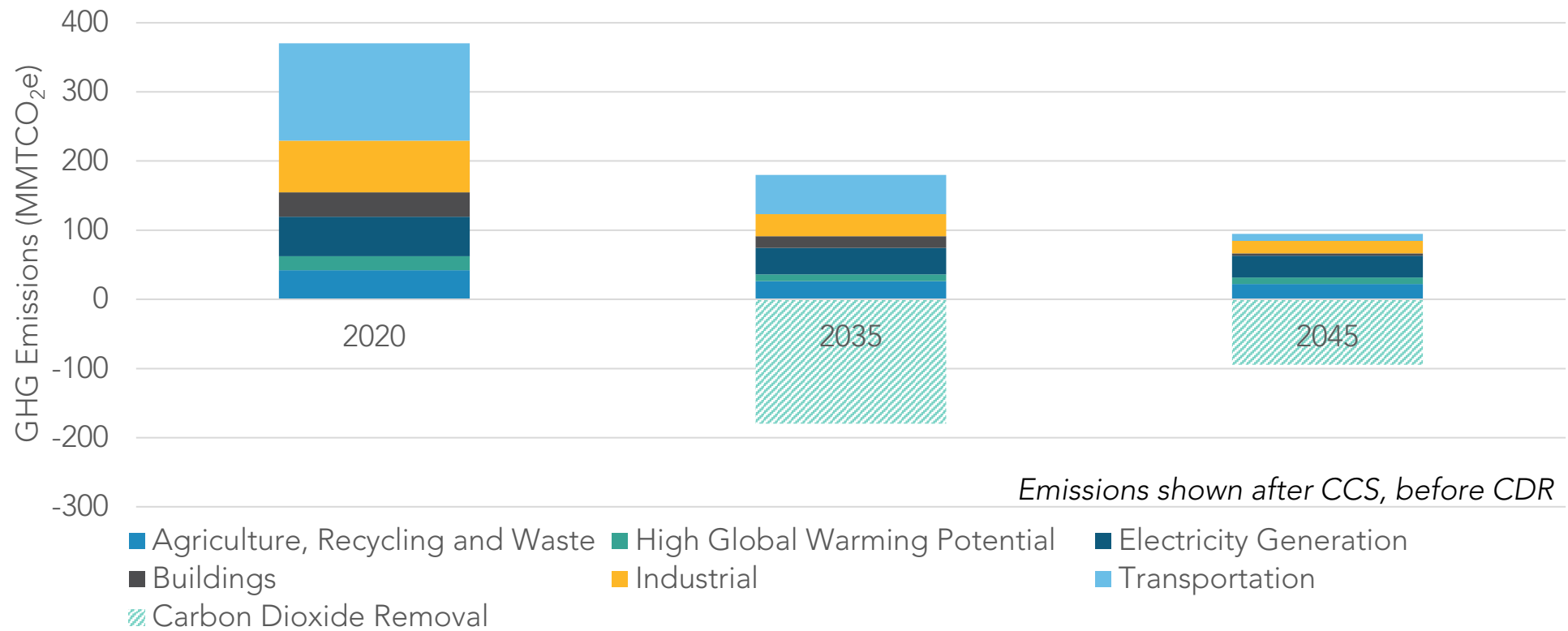
Transition Away From Fossil Gas-Buildings



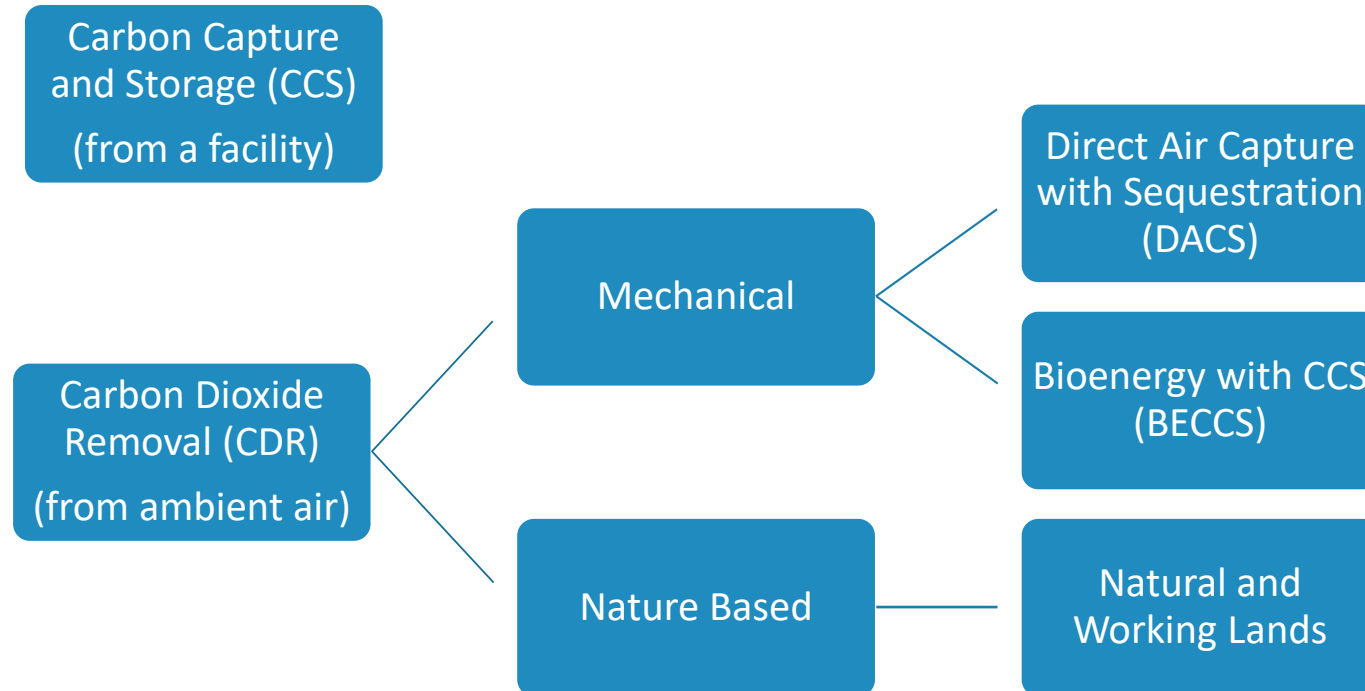
Electric Loads Increase



Residual Emissions



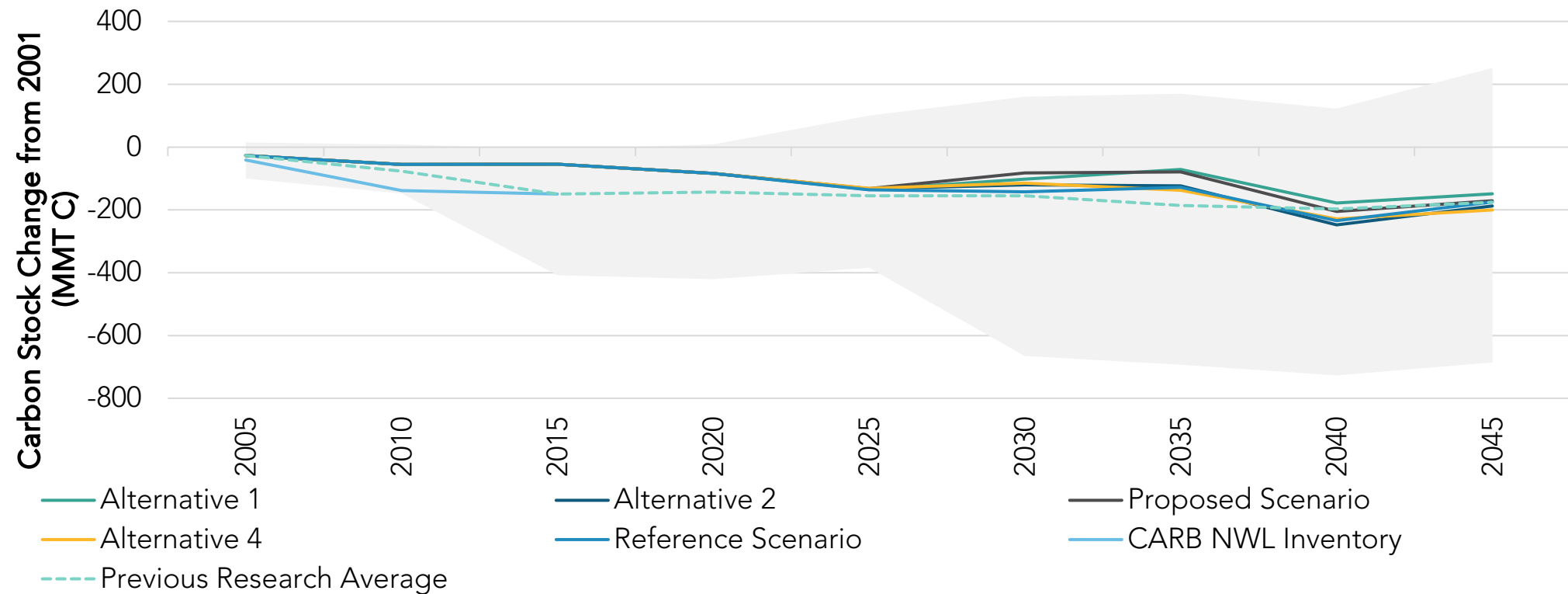
Carbon Removal and Sequestration



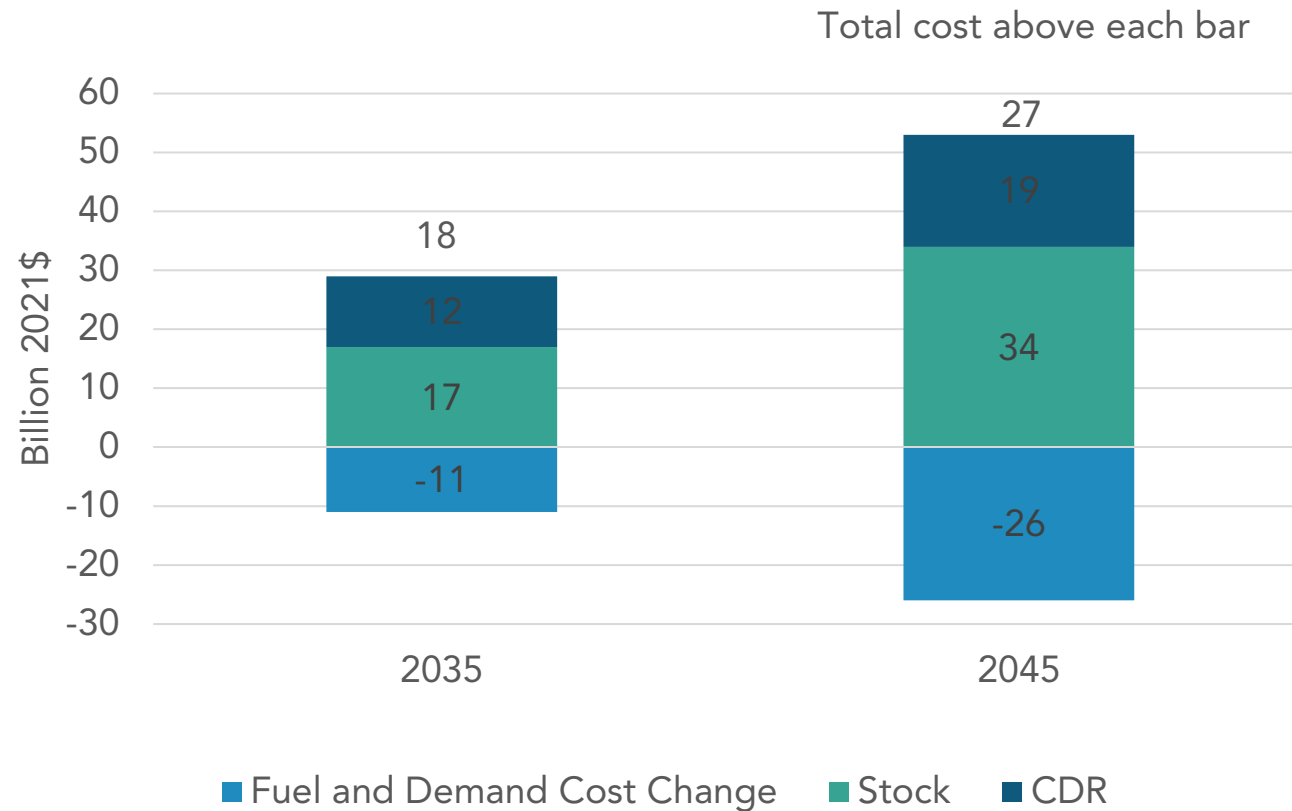
■ Proposed Scenario GHG Emissions in 2045 (MMTCO₂e):

- Gross fuel combustion and non-energy emissions: 97.9
- Captured by CCS: 3.4
- CDR: 94.5

NWL Carbon Stock Decreasing



Proposed Scenario Direct Cost



Cost and savings relative to the Reference Scenario for the AB 32 GHG Inventory sectors

Proposed Scenario Employment Impact



Employment relative to a growing California workforce for AB 32 GHG Inventory Sectors

Proposed Scenario Emission Reductions

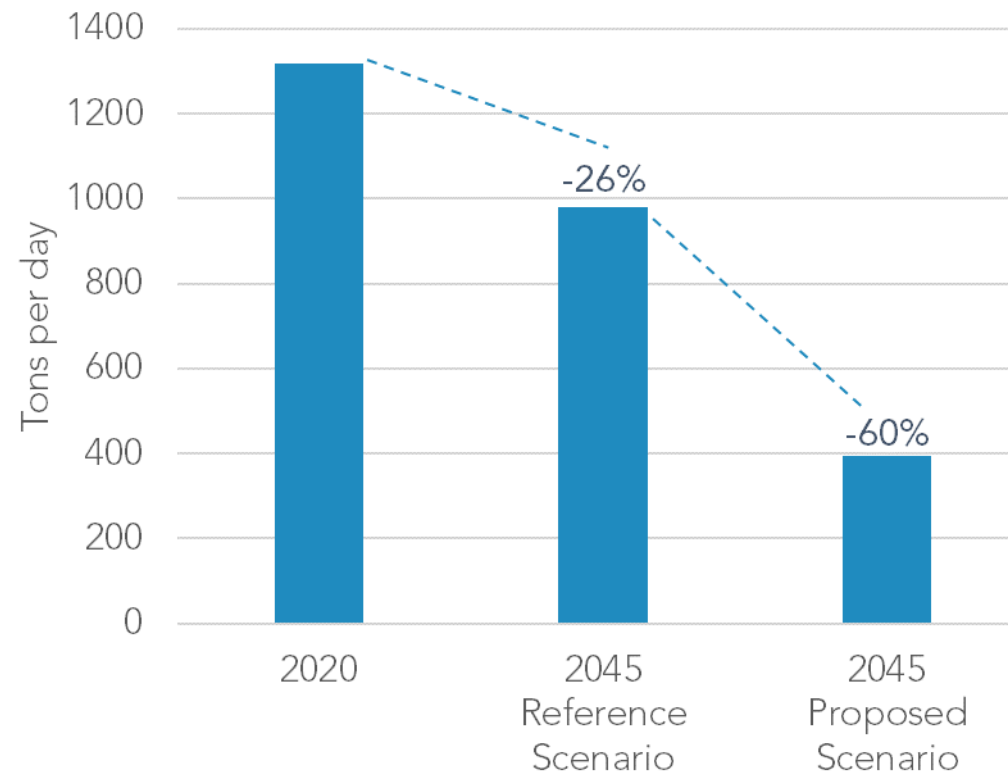
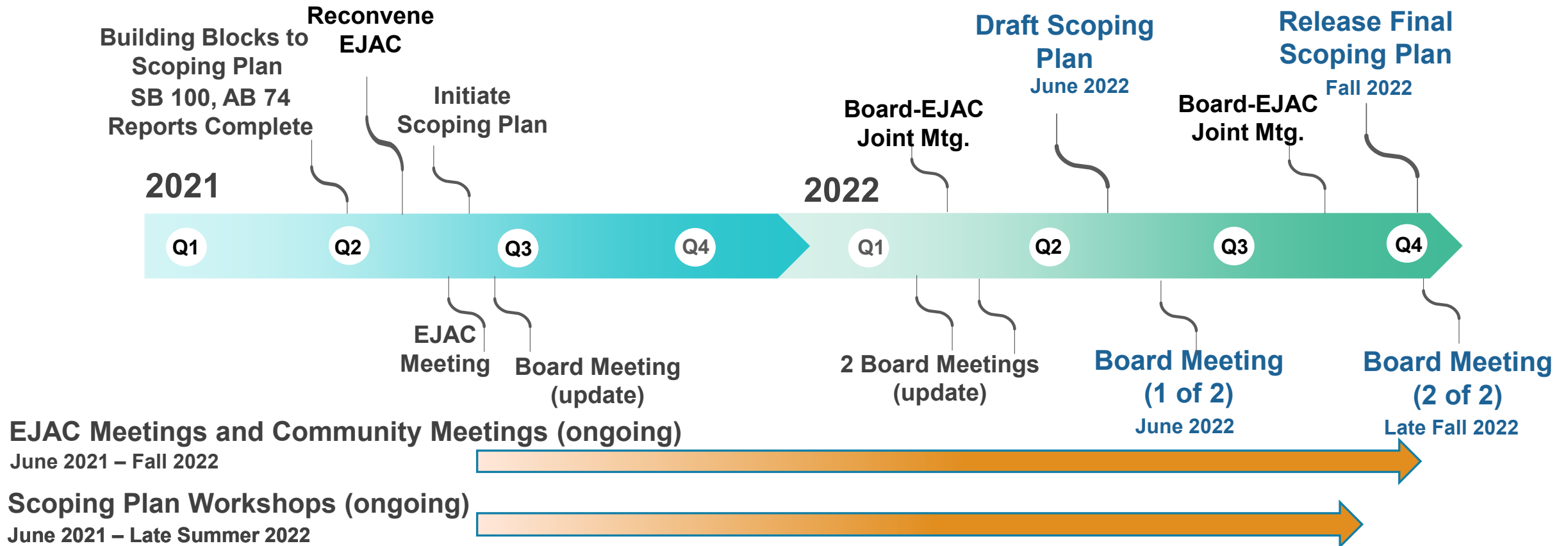


Illustration of NOx Emission Reductions from Current Levels for the Reference Scenario and Proposed Scenario in July and January 2045 for the AB 32 GHG Inventory Sectors

2022 Scoping Plan Update Schedule



Thank you

SUBMIT COMMENTS ON 2022 DRAFT SCOPING PLAN UPDATE:
[HTTPS://WW2.ARB.CA.GOV/APPLICATIONS/PUBLIC-COMMENTS](https://ww2.arb.ca.gov/applications/public-comments)

Building Electrification at SMUD

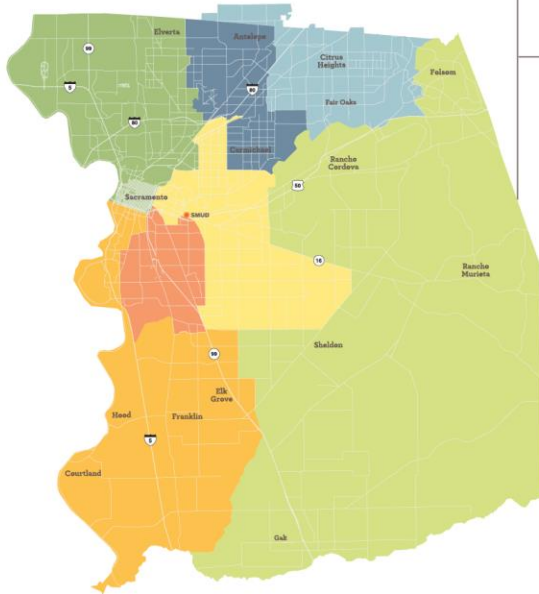
Scott Blunk
June 3, 2022

Powering forward.
Together.



SMUD is your community-owned, not-for-profit electric service.

6th largest
community-owned
in the U.S.



75+
Years
Est. 1946

Power mix
that's on average
about
50%
carbon-free*



The most
ambitious goal
of any large
utility in the
United States

~645,000 Customers

~2,300 Employees



7 member
Elected
Board of Directors

Rates among the lowest in CA. On average **45%** lower than PG&E

CleanPowerCity.org





Electrification at SMUD

CHEAPER | SAFER | HEALTHIER | BETTER



Goal → 100% Electrification of Low-income by 2040, all buildings 2045

2018 - Current

Launched Program Offerings
in All Sectors

Carbon-based metric for
efficiency portfolio created

2,500+ Equivalent electric
home conversions

18% All-electric buildings
starting in 2018

2023 - 2030

New construction codes

Full-service / turnkey
offerings

Financing options +
infrastructure for customers

35% All-electric buildings by
2030

2030 - 2040

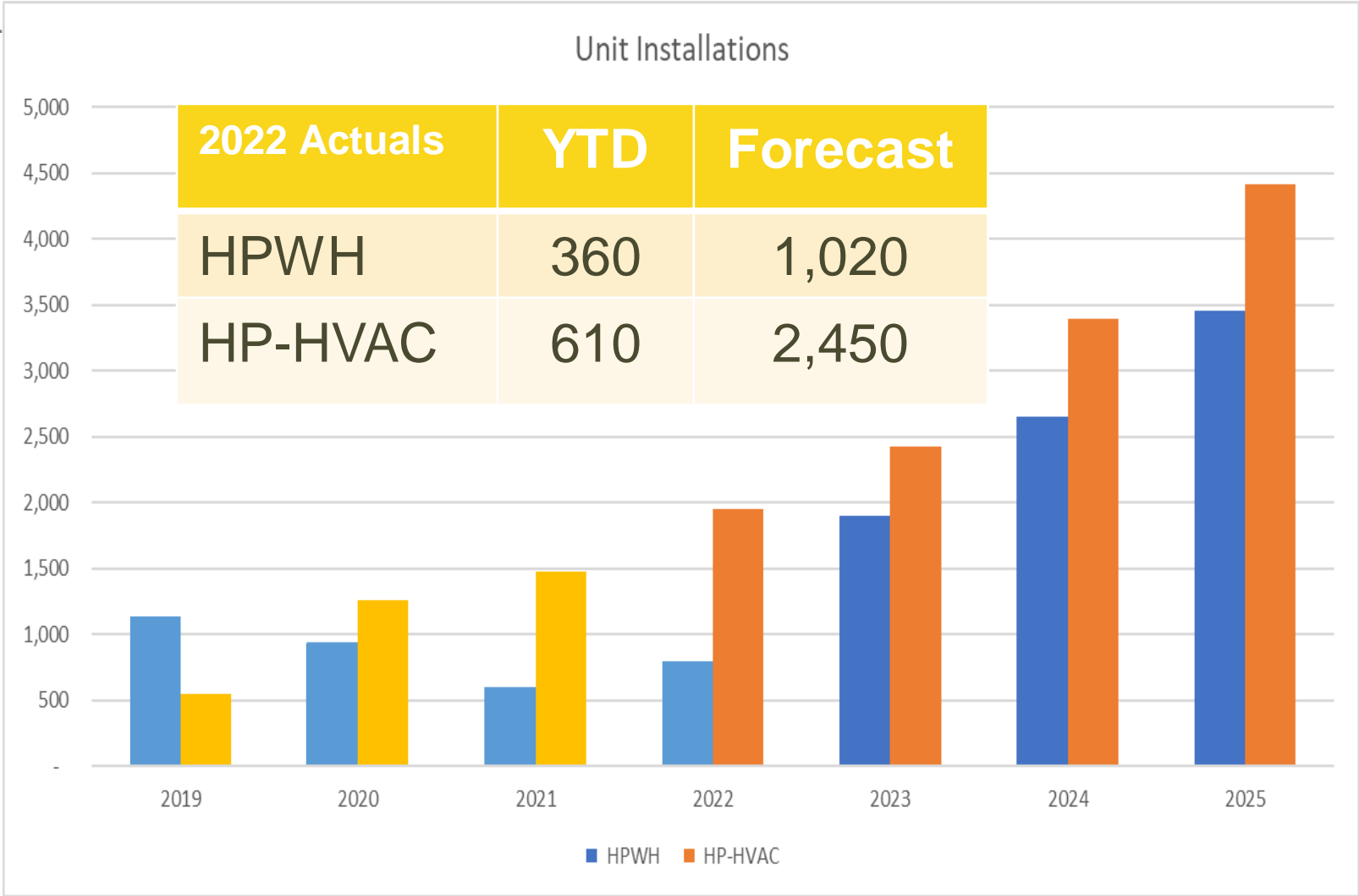
All new appliance and
vehicle sales electric by
~2030

Support 100% of low-income
customers electrified by 2040

80% All-electric buildings by
2040

Additional funding must come from external sources to be successful

Single Family Retrofit Program

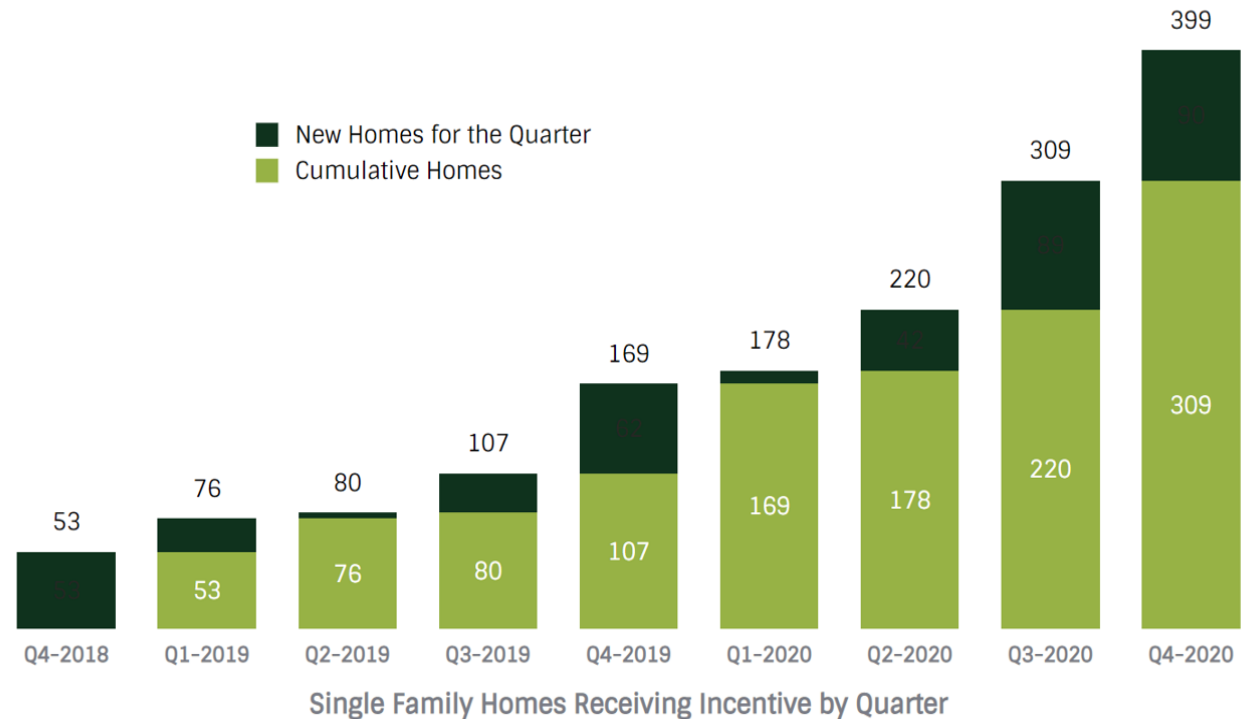


100% natural replacement will be 18-20k per year

Single Family New Construction

- *Program is well received*
- *Customers like the homes*
- *They like the appliances*
- *But they don't understand why!*

FIGURE 1-1: NUMBER OF SINGLE-FAMILY HOMES RECEIVING INCENTIVE BY QUARTER



Single Family New Construction

- *Customers like the appliances more than the industry*

FIGURE 5-5: CUSTOMERS' SATISFACTION WITH THEIR ELECTRIC APPLIANCES

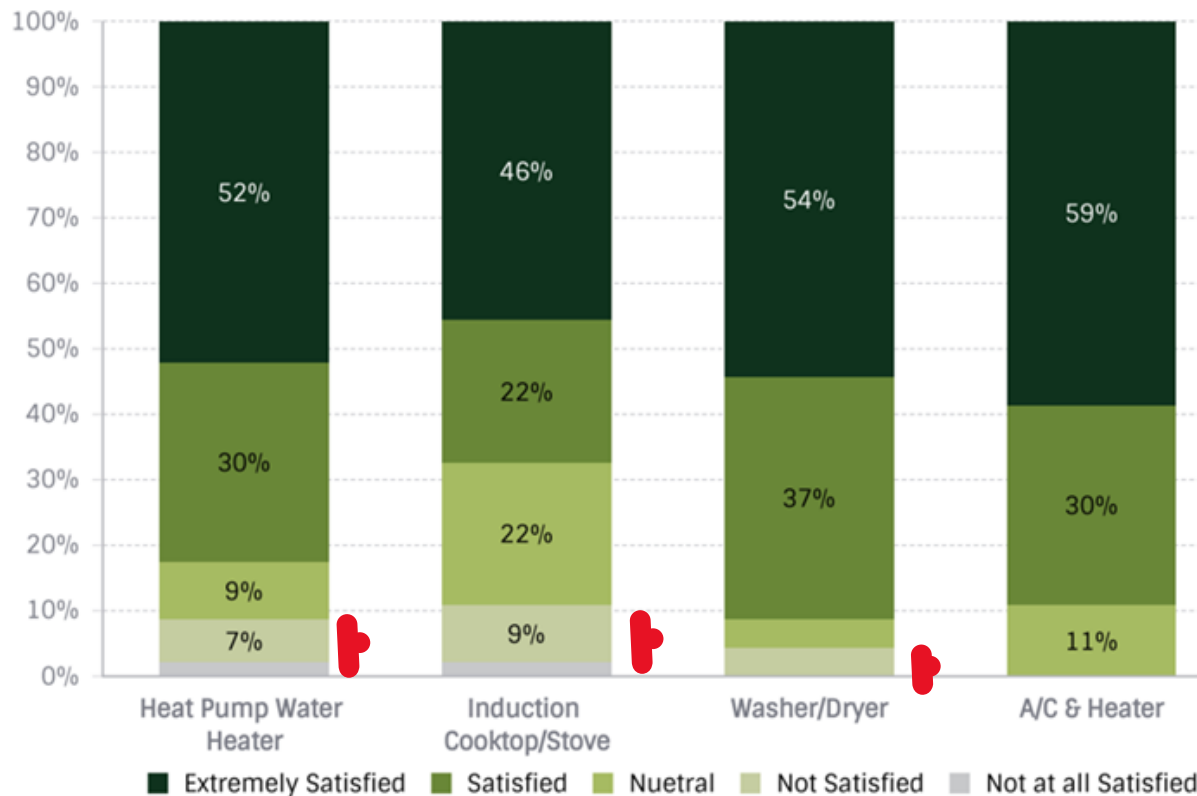
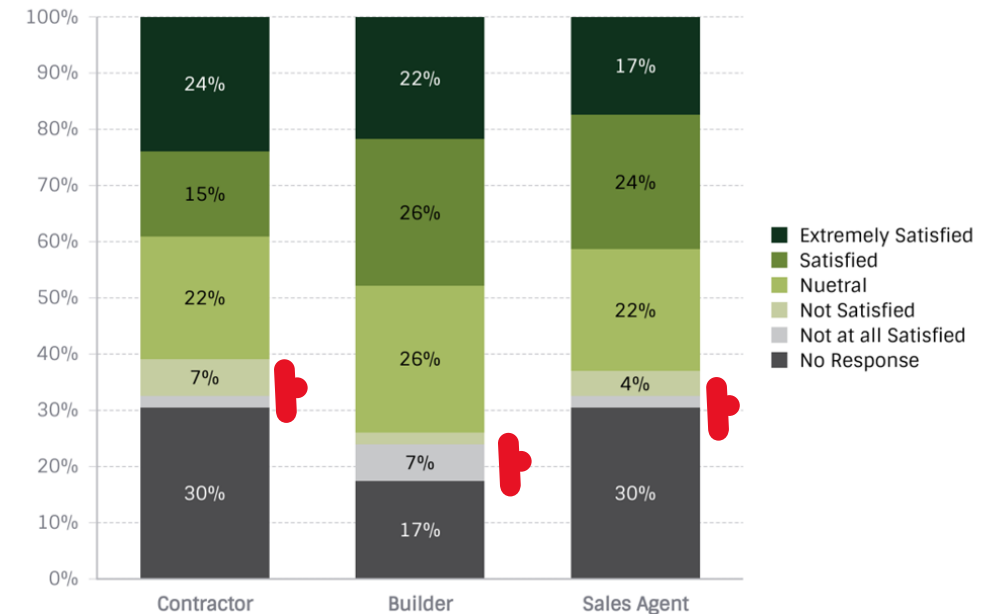


FIGURE 5-6: SATISFACTION WITH THE CONTRACTOR, BUILDER AND SALES AGENT



Single Family New Construction

- They want to do the right thing but don't understand that it is electrification*

FIGURE 1-3: VERY IMPORTANT FACTORS FOR HOMEBUYERS

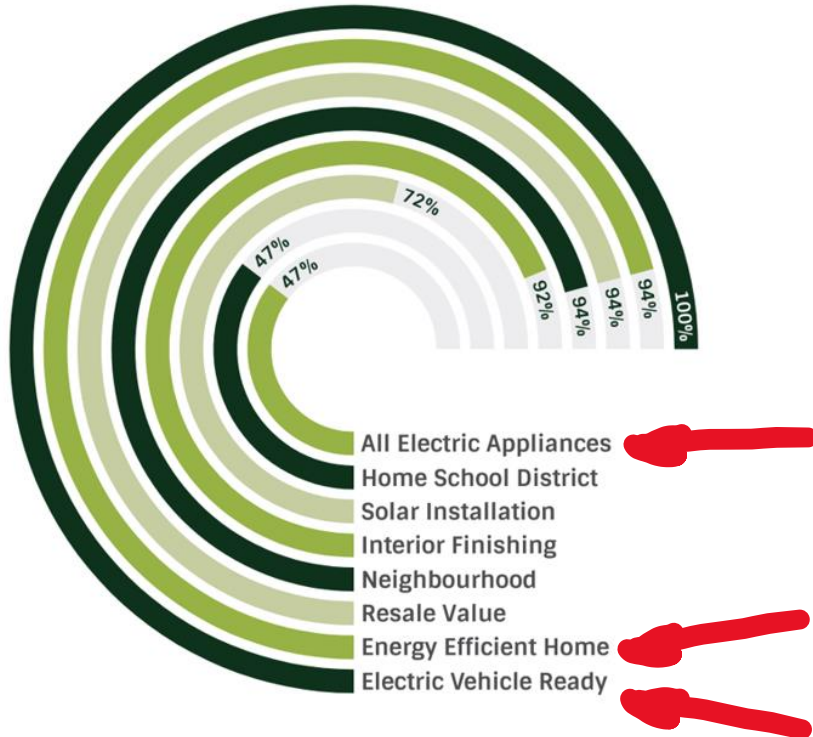
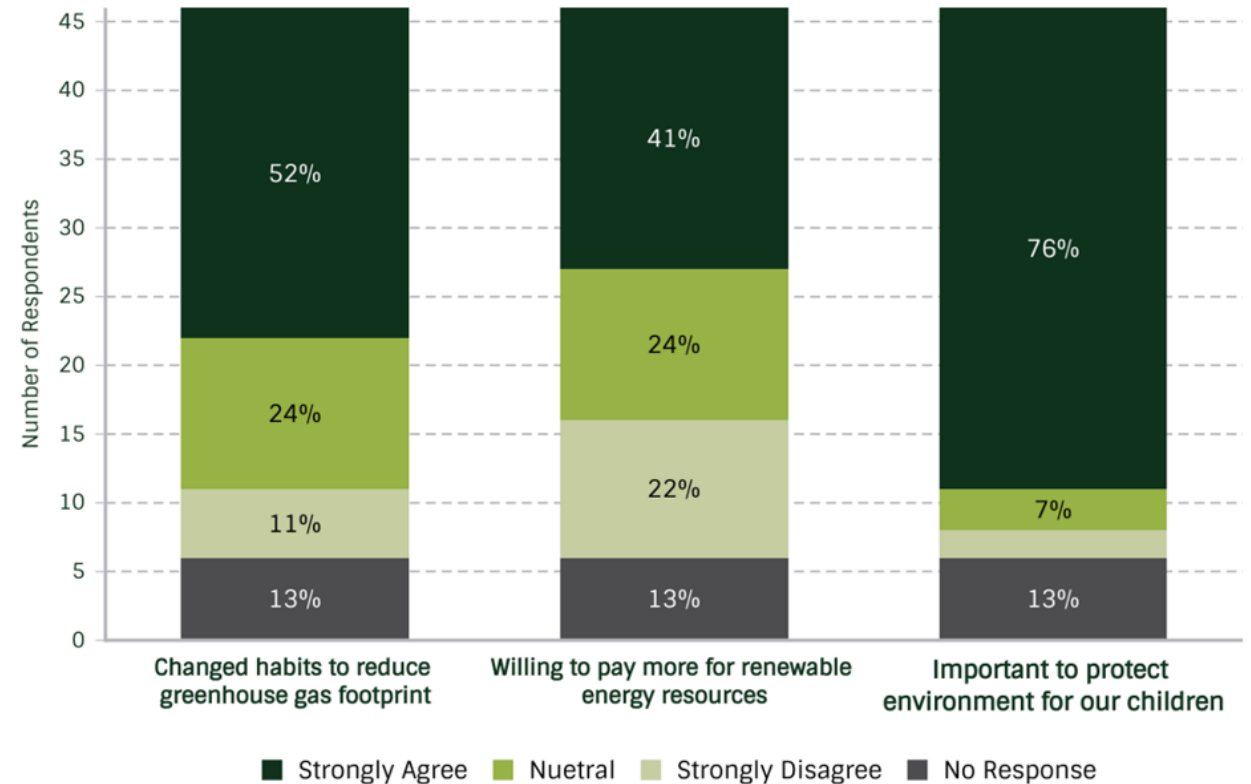


FIGURE 5-2: HOME BUYERS ATTITUDE TOWARDS GREEN ENERGY



New thinking

- Web based customer specific tool like XeroHome
 - Bill predictor
 - Loading order: EE, Electrification, PV, Panels, batteries
 - Panel capacity / headroom / calculations
- Direct installation program – geo targeting
- Moderate Income enhanced incentives
- 0% financing → equitably

Concept: 0% Financing for all Customers

Local bank partner provides 10-year loans for residential HVAC electrification

SMUD pays the interest cost of loans to the Bank

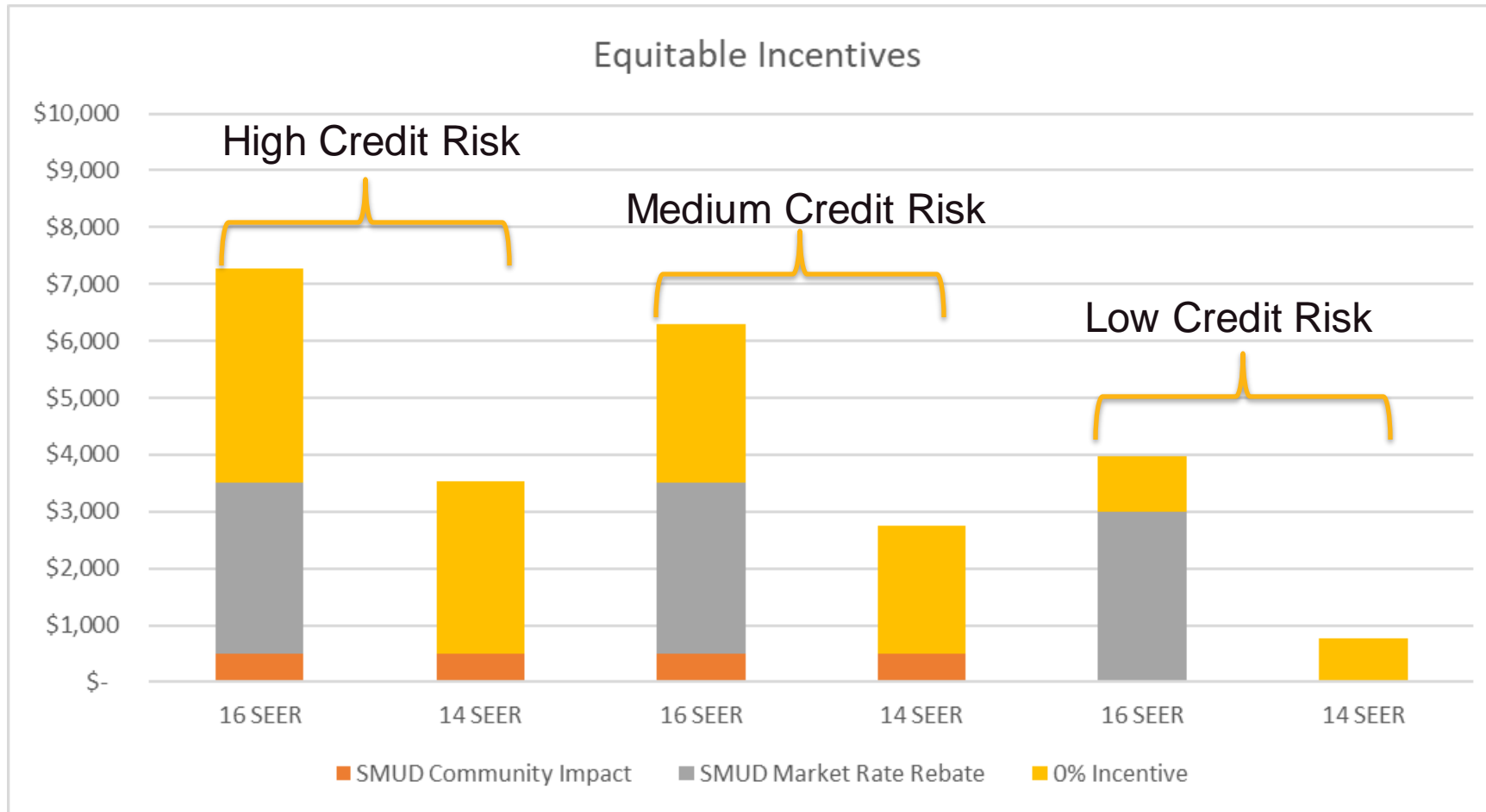
- **High credit risk customers: 0% interest for 10 years** (full loan term)
- **Medium credit risk customer: 0% interest for 5 years**
- **Low credit risk customers: 0% interest for 1 year**

SMUD maintains Default Reserve for medium / high risk loans

HVAC, Average cost to SMUD per unit ~\$1,500 vs. \$3,000 today



0% Demo Program HVAC Example

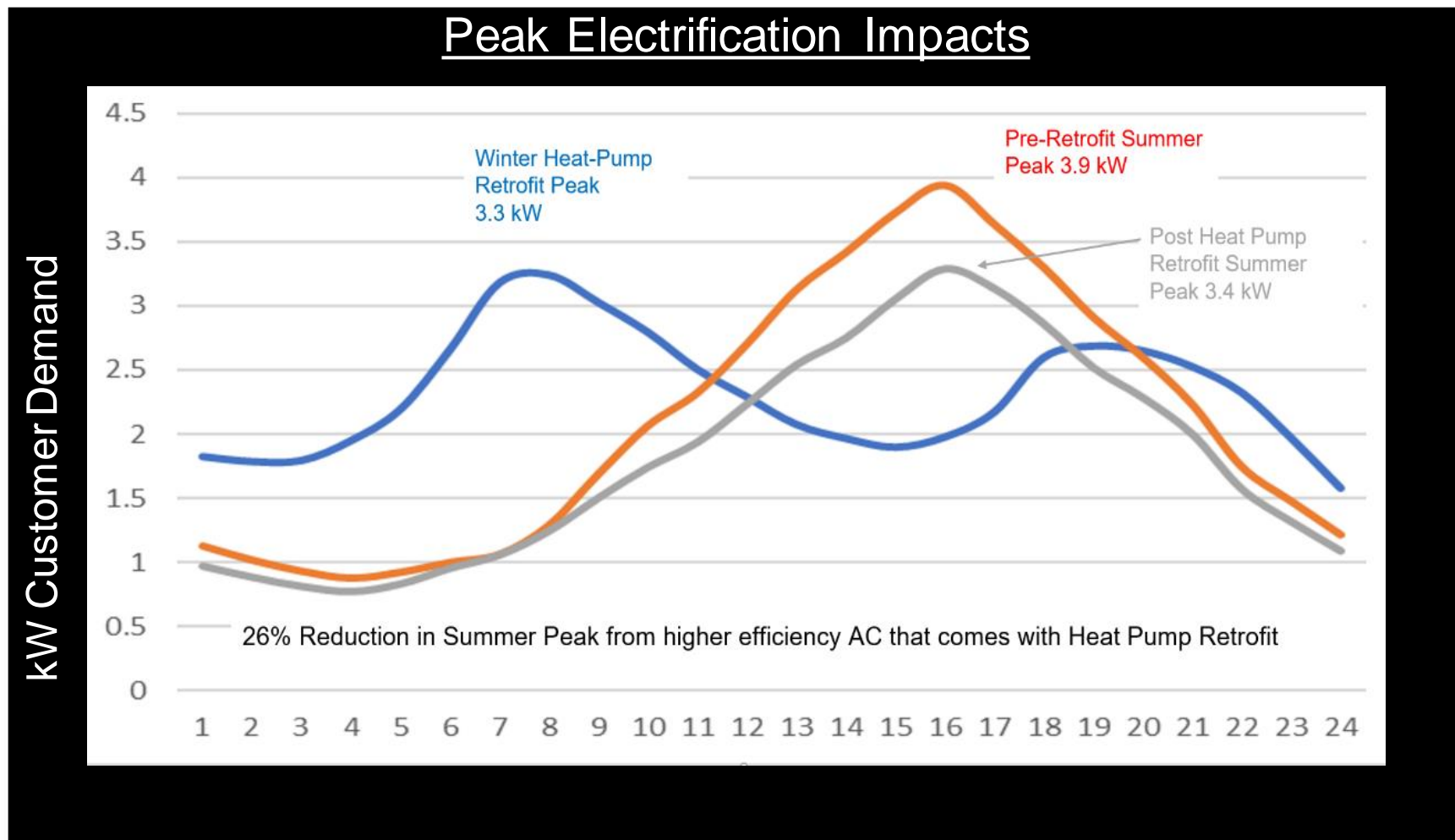


	Average Cost
SEER 14	\$10 - 13k
SEER 16	\$15 - 18k
SEER 18	\$16 - 20k

** Showing Riverside and San Diego County where there is no minimum efficiency requirement*

Electrification addresses summer peak

- Off peak
 - Most electrification is not at system peak
- Grid utilization
 - Electrification improves utilization of the grid by 5%
- On peak
 - Electrifying space heating yields a more efficient AC thus reducing summer peak



Thank you

Scott Blunk

scott.blunk@smud.org

(916) 826-9369

Powering forward.
Together.



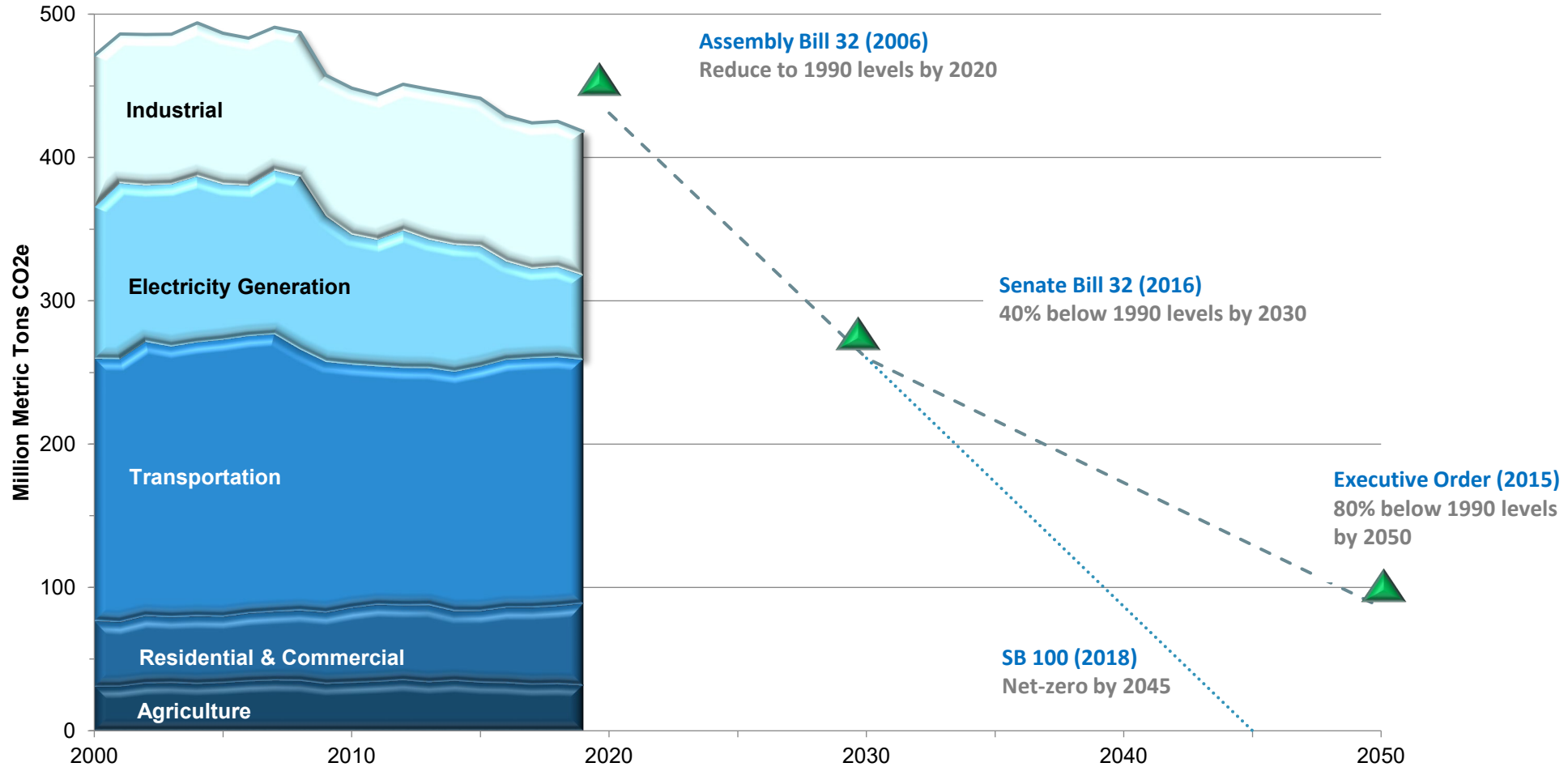
Gas Decarbonization Initiatives



David Sawaya



California's GHG Policy Goals



Source: Statewide emissions data from 2019 CARB GHG Inventory

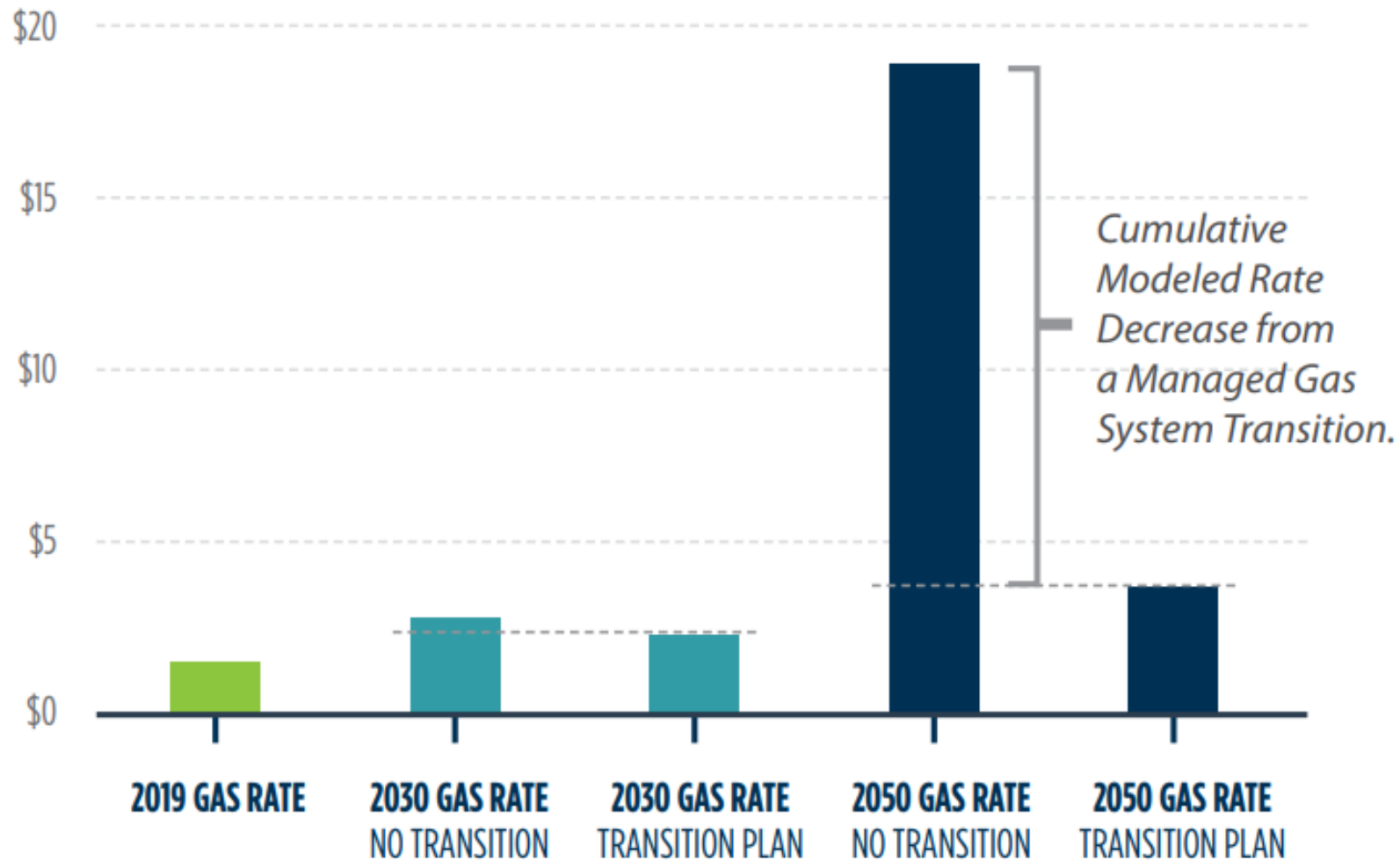


PG&E's Vision

The gas system evolves to be an affordable, reliable and safe energy delivery platform consistent with California's carbon neutrality goals.



Long-term planning is needed to ensure future affordability and carbon-neutrality



Source: [California's Gas System in Transition.pdf \(gridworks.org\)](https://gridworks.org/California's%20Gas%20System%20in%20Transition.pdf)



PG&E Gas Strategy Overview

Reduce Carbon Footprint

- Targeted and zonal building electrification
- Green the gas supply (e.g. RNG, hydrogen)
- Conversion of hard-to-electrify customers from dirtier fuels (e.g. industrial facility conversion, marine, rail)
- Methane abatement

Leverage Innovative Financial Mechanisms

- Units of production depreciation
- Rate design
- External funding

Decrease Costs

- Derate from transmission to distribution
- Retirement, asset sales, repurposing
- Targeted electrification (capital project avoidance & retirement of underutilized assets)
- Avoid System Expansion

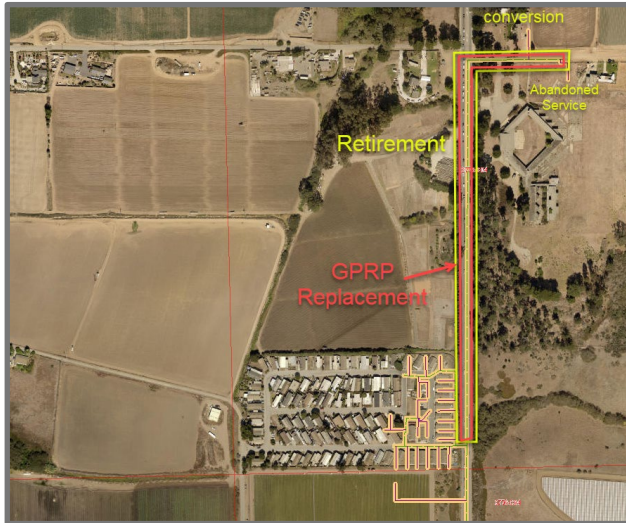
Support Customer Decarbonization

- Backup generation (conversion from diesel)
- Industrial facility conversion (conversion from dirtier fuels)
- Transportation (e.g. rail and marine)



Targeted Electrification – A Cost-Based Approach to Electrification

**Targeted electrification success story:
~2,000 ft Aldyl-A replacement project**



	Status quo gas replacement	Electrification alternative
Pipe replacement/retirement	\$1.2M	\$20K
Customer electrification	-	\$130K
Service retirement	-	\$6K
TOTAL	\$1.2M	\$156K

Progress to Date

- Established the Integrated Investment Planning (IIP) team to evaluate alternatives to gas investments and engage customers on alternatives to gas service
- Small-scale projects conducted to date have electrified 84 customers, avoided 80 high-pressure regulator rebuilds and 4.2 miles of distribution main, while enabling the retirement of 22 miles of line

Scaling Early Success

- Scale is dependent on changes to “obligation to serve”, external funding, and ability to capitalize behind-the-meter electrification costs
- Utilities need a streamlined application process for targeted electrification projects to ensure that they can be conducted on a timeline consistent with critical gas safety and/or reliability needs



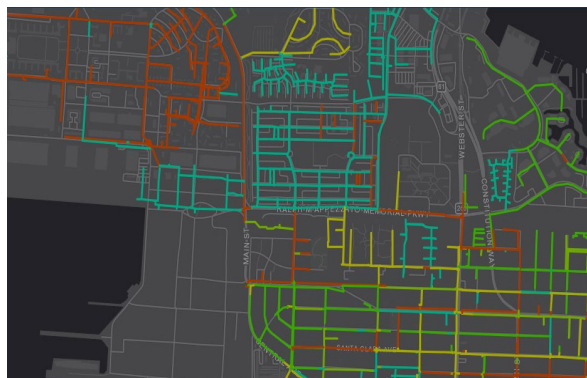
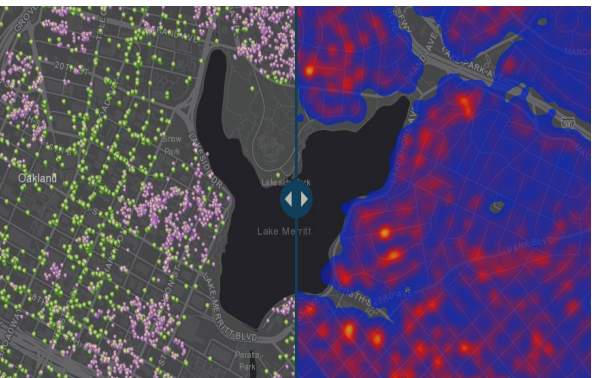
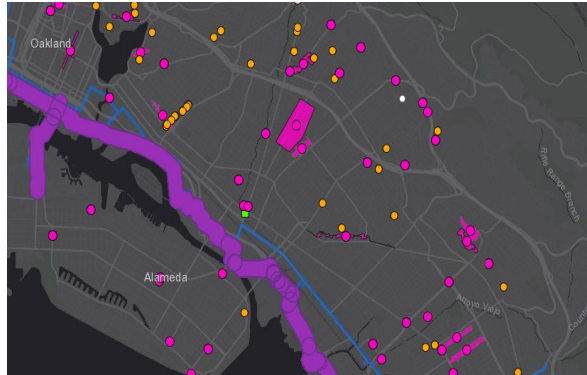
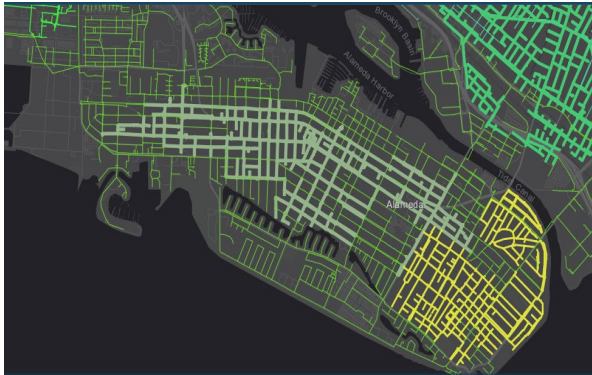
Zonal Electrification – An Equity-Based Approach to Electrification

Progress to Date

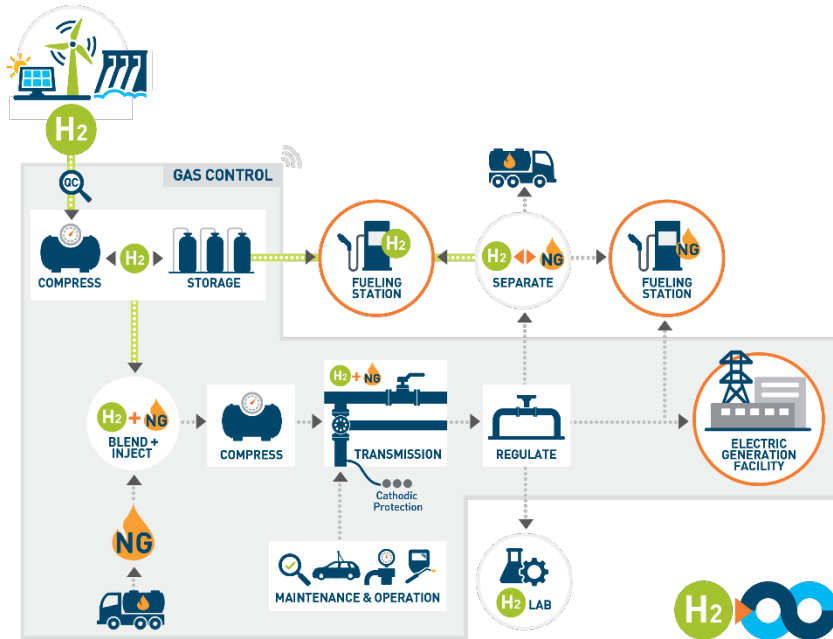
- Developed an internal *Gas Asset Analysis Tool* to evaluate potential areas for zonal electrification. The tool includes data such as customer income, prevalence of renters, geographic risks, and electric capacity
- Submitted a zonal electrification program, targeting low-income neighborhoods, in PG&E's 2023-2027 energy efficiency portfolio

Scaling Early Success

- Similar to targeted electrification “scale is dependent on changes to ‘obligation to serve’, [significant] external funding, and ability to capitalize behind-the-meter electrification costs”
- Building networks of local, trusted partners is needed to support customer acceptance for community-led electrification



Assessing the role of hydrogen



Example for illustrative purposes

H2 Infinity Demonstration

Large-scale project that will blend hydrogen (up to 30%) and natural gas in a stand-alone high pressure (720 psi) transmission pipeline system ([press release](#))

Other H2 R&D efforts

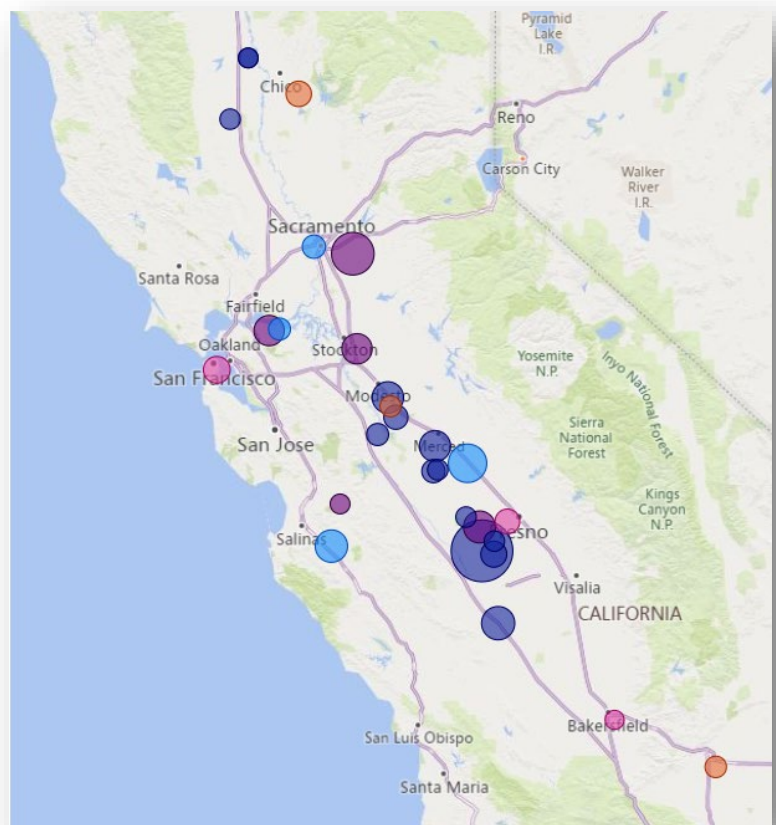
Production: portfolio of production technologies (e.g. electrolysis, steam methane reforming)

Customer utilization: assess existing appliances and equipment, understand highest value end-uses



Increasing RNG Volumes

The CPUC has mandated that by 2030 PG&E procure RNG equivalent to approximately 15% of core customer throughput; this represents a significant scale up of current supply



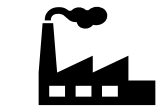
Feedstock ● Ag Waste ● Dairy ● Food Waste ● Landfill ● WWTP

37 current RNG projects in Northern California



Helping hard-to-electrify customers decarbonize

Projects in PG&E's connection queue, primarily for facility fuel conversion from dirtier fuels and backup generation, represent over 1 MMT of CO₂ annual emissions reduction



Industrial Facilities



Large Commercial



Food Processing
Facilities



Data Centers



Hospitals and Urgent
medical facilities



Fulfillment and
Distribution
Centers

	Project	~ CO ₂ savings (MMT/year)
Back-up generation	7 data centers	110,500
	Micro-grid substation project	8,800
	Commercial fulfillment center	4,800
	Mobile power generation	30,100
Facility conversion	Chemical plant	900
	3 cement/concrete plants	679,700
	Processing plant	212,900
Total		1,047,700

Thank you!

Questions?





ADVANCING THE CLEAN ENERGY TRANSITION

CEC Workshop June 3, 2022



Advancing the Clean Energy Transition | SoCalGas Clean Energy Journey

JOURNEY TO BE THE CLEANEST, SAFEST, MOST INNOVATIVE ENERGY COMPANY IN AMERICA

Climate Goal

- Announced Climate Goal
- Became the largest gas distribution utility in the nation to include scopes 1, 2, and 3
- Aligned with California's statewide decarbonization goals and the global Paris Agreement climate emissions

ESG Financing Framework

- Aligns our investments/activities across Sempra with our sustainability goals to help drive our environmental, social and governance (ESG) commitments to support long-term, sustainable value for all shareholders and our other stakeholders

Angeles Link Announcement

- Proposal to develop the nation's largest green hydrogen energy infrastructure system to deliver clean, reliable energy to the Los Angeles region
- Goal to drive deep decarbonization in hard-to-electrify sectors of the Southern California economy



SoCalGas Clean Fuels White Paper

- A California economy-wide assessment of an integrated energy system
- Key study findings note the importance and requirement of a clean fuels network if we require an affordable, resilient, and risk mitigating solution that supports electrification

ASPIRE 2045 – SoCalGas Sustainability Plan

- Holistic approach to integrating sustainability across entire business to create positive impact and strengthen business outcomes
- Five focus areas to support our business in being the cleanest, safest, most innovative energy company in America as we advance our climate objectives

Advancing the Clean Energy Transition | Progress is Underway



DECARBONIZATION

- » Reduced over 1.2 million metric tons of carbon dioxide equivalent (MTCO₂e) and \$1 billion in avoided energy costs with the nation's largest gas energy efficiency program.¹
- » Reduced over 1 million MTCO₂e two decades prior to the adoption of any mandatory compliance requirements as a founding member of the EPA's Natural Gas STAR program and advanced leak detection and repair efforts to support the natural gas leakage abatement program.²
- » Exceeded the state requirements to demonstrate a 20% reduction in fugitive methane emissions by 2025, from a 2015 baseline, in 2021, four years ahead of schedule.
- » Avoided 93% of blowdown emissions on planned high pressure pipeline projects in 2021.



DIVERSIFICATION

- » Dispensed 100% renewable natural gas for all utility-owned vehicle fueling stations, including renewable natural gas supplies from a pipeline-injected dairy digester cluster, a first for California.
- » Over 4% RNG of core throughput on system with goal to meet 20% RNG by 2030.
- » Transported low and negative carbon intensity fuel to medium and heavy-duty vehicles, contributing to the combined reduction of over 1 million MTCO₂e annually.³
- » Partnered with the University of California, Irvine to demonstrate the nation's first power-to-gas hydrogen pipeline injection project.⁴ This project used surplus renewable power to produce hydrogen for blending into the gas system, providing long-term energy storage.



DIGITALIZATION

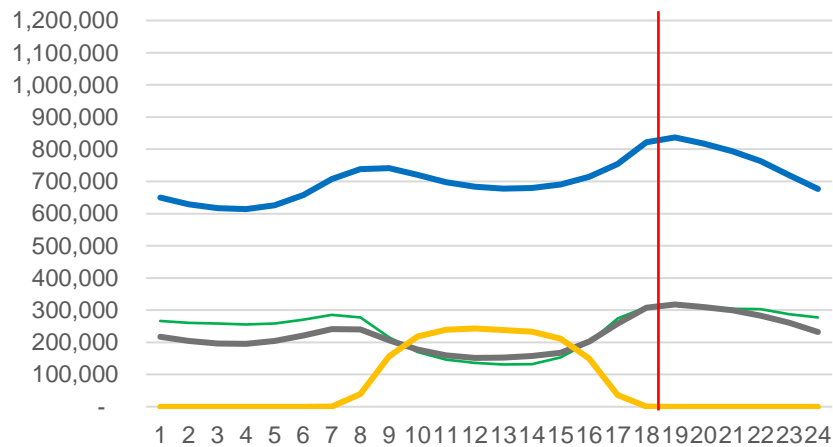
- » Installed smart meters for the gas system - first in the nation - resulting in over 3 million therms saved, equivalent to avoiding 18,000 MTCO₂e per year.⁵
- » Aerially mapped our methane emissions - first in the nation - creating one of the best performing systems in the country.⁶ The early EPA Natural Gas STAR volunteer and advanced leak detection and repair efforts support the natural gas leakage abatement program target of 20% fugitive reduction by 2025.⁷
- » Awarded 'Most Innovative Utility' in the U.S. by Utility Analytics Institute - for innovation in using data to increase safety, save money for customers, improve customer service, conserve energy, and cut greenhouse gas emissions.⁸

Advancing the Clean Energy Transition | Decarbonization of the Electric Grid

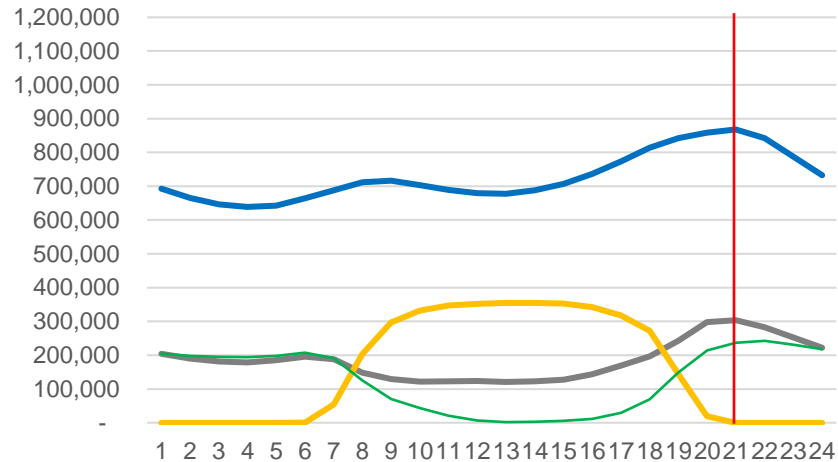
Thermal generation is critical in meeting peak hour electric system needs allowing for the reliable integration of greater levels of renewables onto the system

2021 by Season: Load, Solar, Thermal, Imports, and Peak Hour (in MWhs)¹

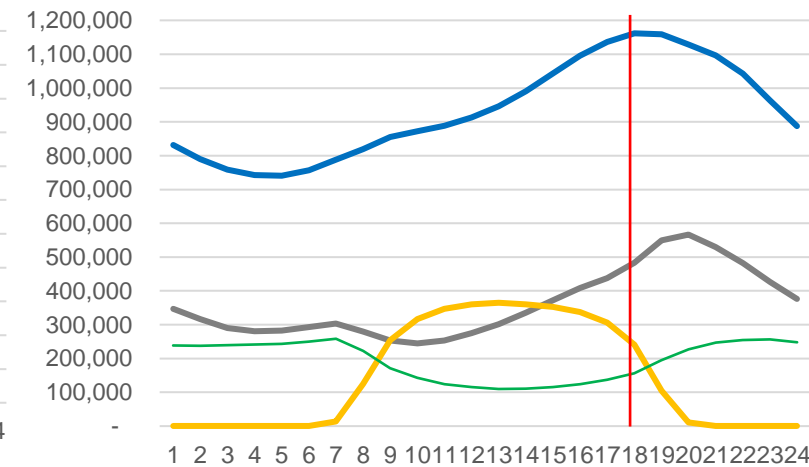
Jan '21 Hourly Load, Solar, Thermal



May '21 Hourly Load, Solar, Thermal



Aug '21 Hourly Load, Solar, Thermal

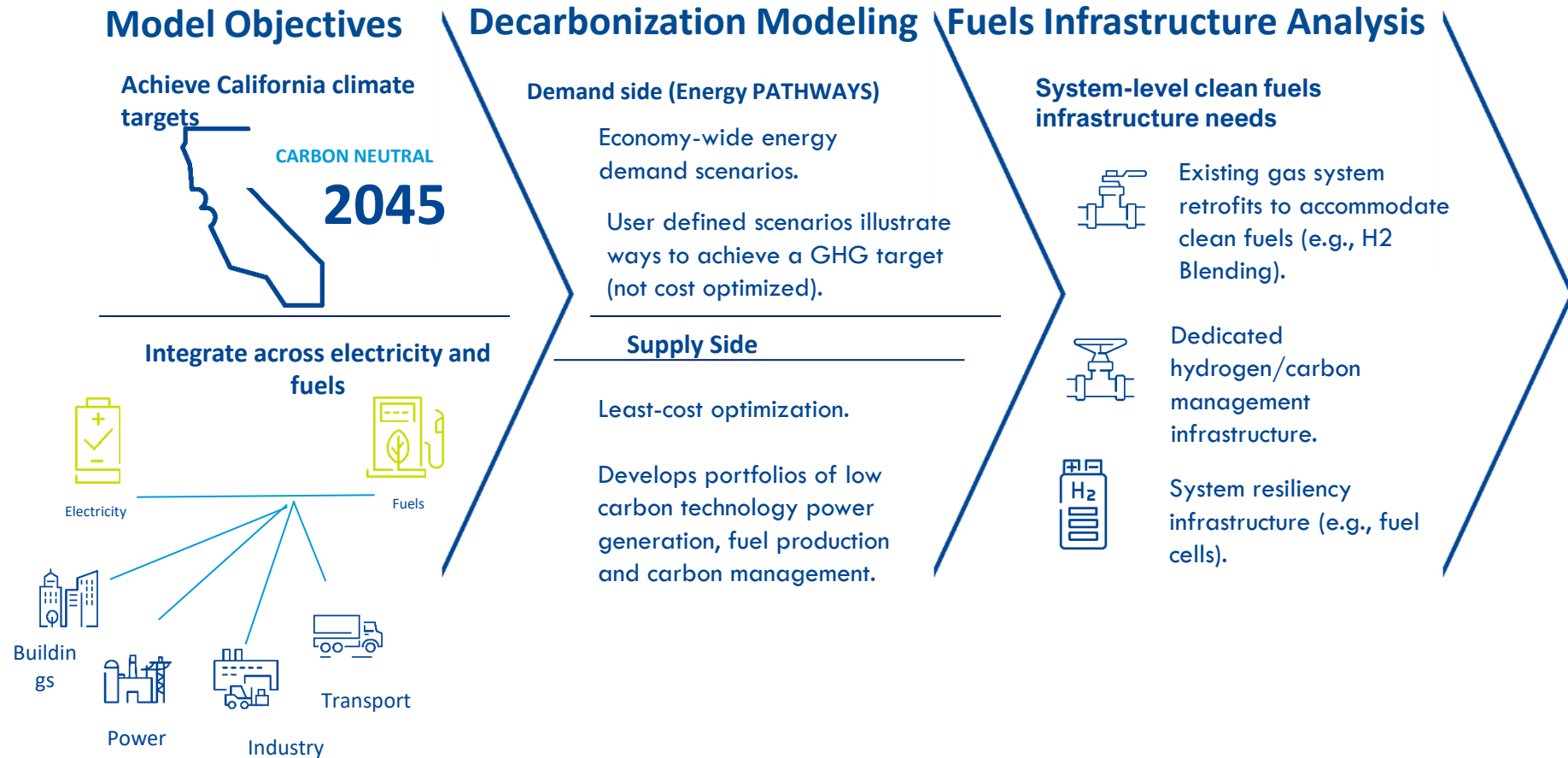


- » Gas and electric systems are becoming more interdependent due to reliability (intraday balancing) and resiliency (dispatchable long duration storage)
- » The intraday balancing and long duration capabilities of the gas system allow for the integration of greater levels of intermittent renewables while providing critical reliability and resiliency services

Advancing the Clean Energy Transition | Clean Fuels Study Questions + Methodology

Key Questions

- » What are California's options for achieving carbon neutrality across all sectors?
- » What decarbonization solutions are resilient, affordable, and address hard-to-abate economic sectors?
- » How is the role of gas utility infrastructure advance the clean energy transition?



Advancing the Clean Energy Transition | Clean Fuels Study Key Findings

RESILIENCY, COST, DIVERSIFICATION

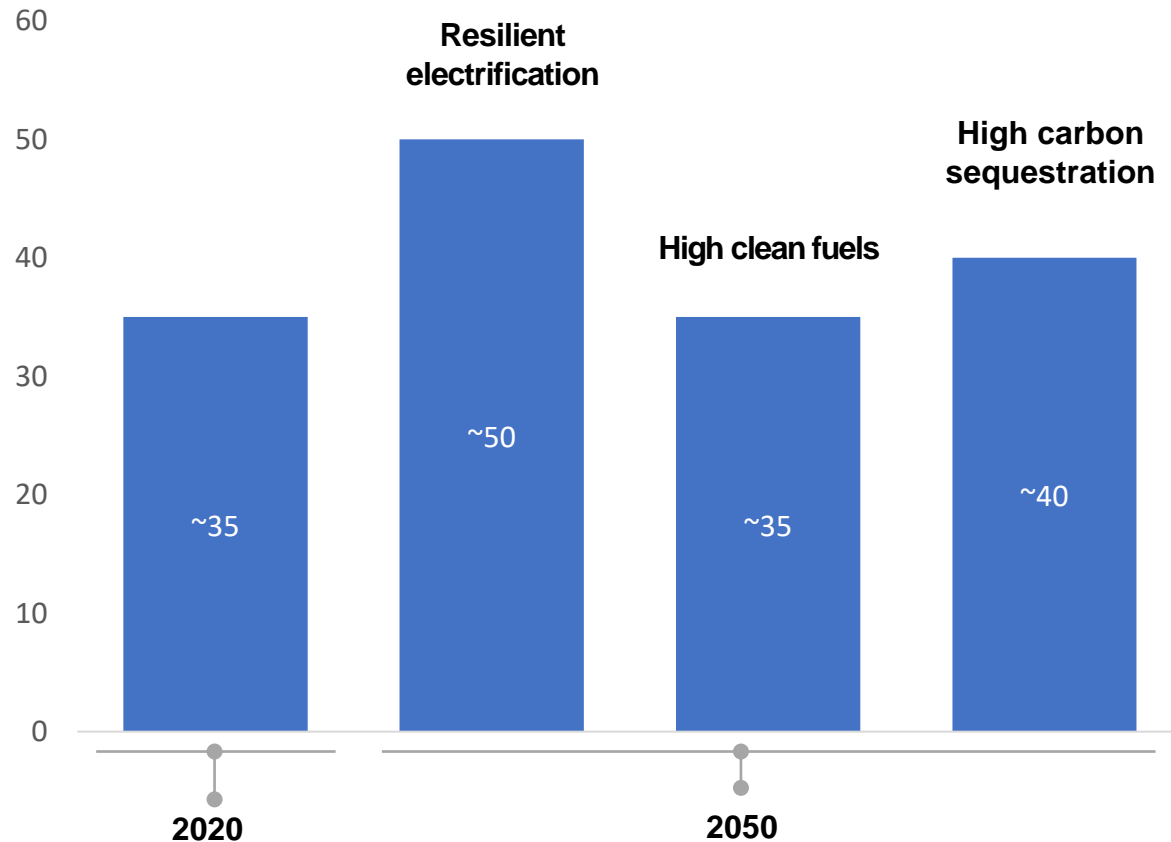
- The most affordable, resilient, and technologically proven decarbonization pathways require a clean fuels network.
- A clean fuels network that supports clean, thermal electric generation with carbon management is the most cost-effective solution.
- A clean fuels network supports electrification and reduces risk.



Advancing the Clean Energy Transition | Reliability Modeling

Higher levels of economy-wide electrification signal greater dependency of the gas system to provide balancing services and fuel for firm dispatchable generation, despite decline in annual throughput

Gas plant capacity in California, GW

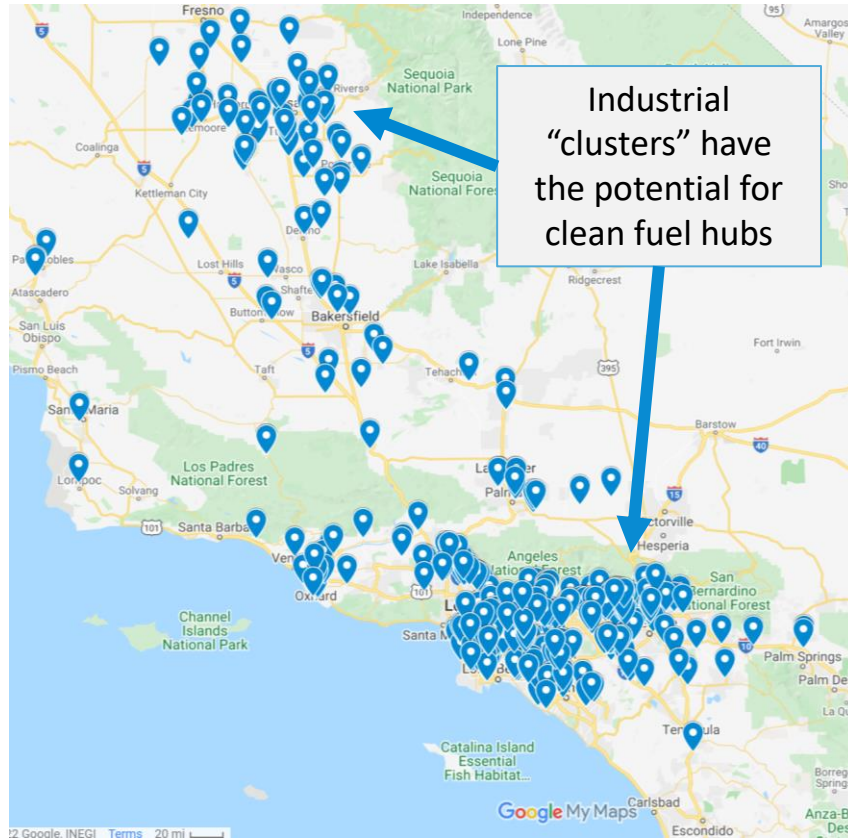


- » Clean Fuels Study shows more thermal generation capacity is needed in higher electrification cases
- » Modeling results show a min of ~35 GW of gas capacity needed in 2050 to provide system reliability
- » SoCalGas is currently undertaking a reliability assessment evaluating the operational performance of the electric sector portfolios from the Clean Fuels Study under a 1 in 10 Loss of Load Expectation (LOLE)

Advancing the Clean Energy Transition | System Planning for Net Zero

Planning for a future clean fuels network will necessitate an analysis of all decarbonization options, including the feasibility of strategic electrification to ensure energy transition is resilient, equitable and affordable

Hard to abate customers SoCalGas service territory¹



1. Illustrative – only a subset of industrial high heat applications are shown. Does not include electric generators located on transmission, cogeneration, or refineries.

- » Economy-wide decarbonization studies that project significant building electrification are not designed to assess customer barriers, including location of hard to electrify end uses, consumer preference, system topography, electric capacity constraints or resiliency needs
- » System planning for the energy transition will require development and optimization of a suite of decarbonization solutions, including a clean fuels network, development of a NPA framework, an examination around the feasibility of strategic electrification and decommissioning via pilots
- » Analysis of the SoCalGas system is underway to provide clarity on where electrification is cost effective and feasible, and where the fuels network will continue to be relied upon (with clean molecules) for critical resiliency and customer affordability (CEC pilot with RAND and GTI). Pilot programs will provide critical learnings to inform system planning

Advancing the Clean Energy Transition | Angeles Link

ENERGY TRANSITION THROUGH INNOVATION, COLLABORATION, AND PARTNERSHIP



Memo account application filed with California Public Utilities Commission in February 2022

- » Proposal to develop what would be the **nation's largest green hydrogen energy infrastructure system** to deliver clean, reliable energy to the Los Angeles region.
- » When built, the Angeles Link green hydrogen system could **reduce greenhouse gas emissions, improve local air quality,** and help SoCalGas **serve California's energy needs** for generations to come.
- » Angeles Link can drive **deep decarbonization** of heavy-duty transportation, dispatchable electric generation, industrial processes and other **hard-to-electrify sectors** of the Southern California economy.

Advancing the Clean Energy Transition | Hydrogen RD&D Projects



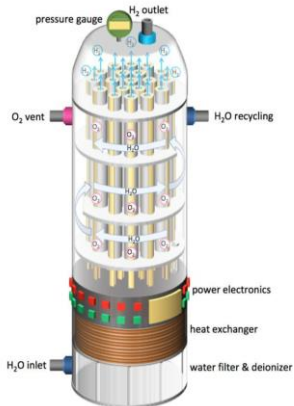
H2 Hydrogen Home



H2 PureComp



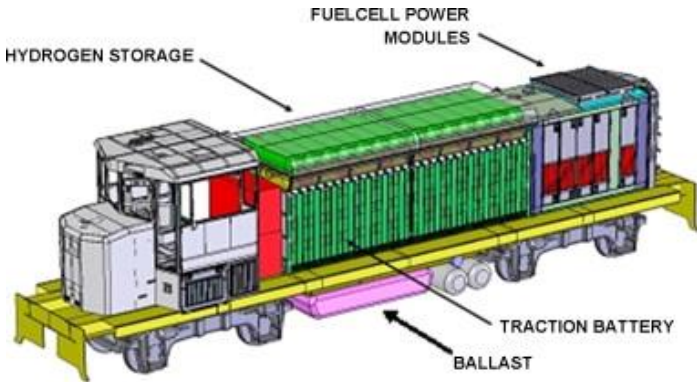
H2 SilverSTARS



H2U Technologies



Hydrogen Fuel Cells for Marine Vessels



Hydrogen for Commercial Transportation

Advancing the Clean Energy Transition | Key Considerations



As California decarbonizes, the way we produce, deliver and consume energy will fundamentally change



Gas utilities, as prudent owners and operators of the system, must thoughtfully examine the effects of decarbonization on system planning, operations, and customer affordability



Integrated energy system planning is essential to capturing critical interdependencies and feasibility risks to ensure California pursues the most affordable, resilient and feasible approach to decarbonization



Sophisticated scenario analysis examining multiple approaches to decarbonization is needed to 1) account for modeling uncertainty; 2) identify critical signposts for change; and 3) assess feasibility and risk mitigant strategies

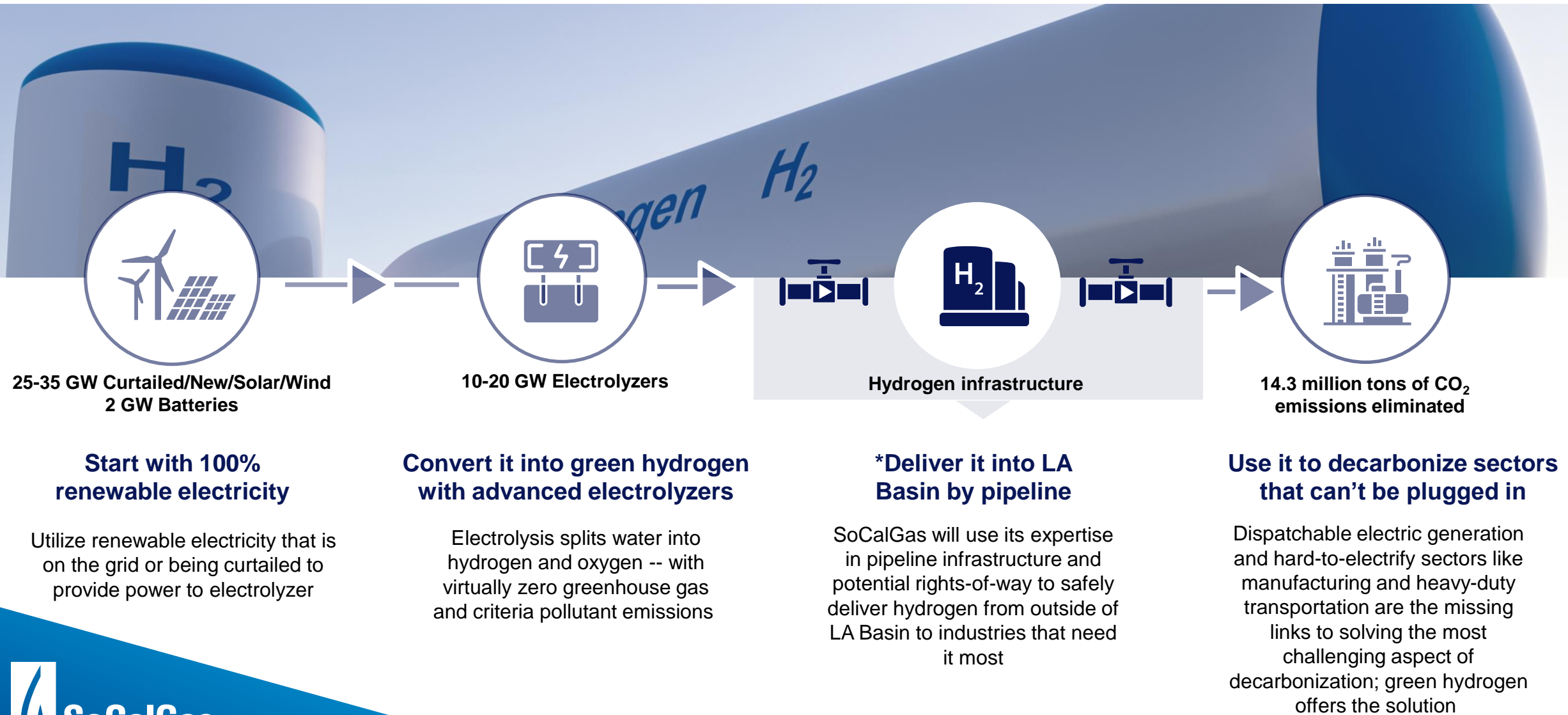


Current cost allocation and ratemaking principles will scale poorly and inequitably during the energy transition – new cost allocation and rate designs and perhaps financial restructuring should target equity and sustainability for all stakeholders

APPENDIX

Angeles Link: How Could It Work?

DECARBONIZATION WITH RENEWABLE ELECTRICITY AND RENEWABLE GAS



1. Total savings in EE program from 2016 to 2020. Data reported to California Energy Data and Reporting System (CEDARS), available at: Summary Report - CEDARS (sound-data.com).
2. Total reduction from voluntary program years 1993 to 2015. 2018 Natural Gas STAR Summary Report: Southern California Gas Company, (2018). See also <https://www.epa.gov/natural-gas-star-program/natural-gas-star-program-partners>.
3. Calculated based on total 2020 volumes of renewable natural gas delivered to utility owned natural gas vehicle fueling stations and G-NGV tariff customers; see also LCFS Pathway Certified Carbon Intensities, California Air Resources Board (CARB), available at: <https://ww2.arb.ca.gov/resources/documents/lcfs-pathway-certified-carbon-intensities>.
4. See SoCalGas and University of California Irvine Demonstrate Power-to-Gas Technology Can Dramatically Increase the Use of Renewable Energy, PR Newswire (March 30, 2017), 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>.
5. Total therm savings from program years 2016 to 2020. See Southern California Gas Company Advanced Meter Semiannual Report, (2017), available at: [SoCalGas_Advanced_Meter_Semi_Annual_Report_August_2017.pdf](#).
6. SoCalGas participated in a 2015 study by Washington State University researchers as part of the Environmental Defense Fund's natural gas value chain analysis on methane emissions from distribution systems across the country. The study found utilities in the western United States contributed the least amount of emissions to the nation's inventory (~17%). See key results from the study, available at: <https://methane.wsu.edu/key-results/>.
7. See Chapter 14 of SoCalGas' 2020 SB 1371 Compliance Plan, available at: https://www.socalgas.com/2020_Final_SCG_SB1371_Compliance_Plan.pdf.
8. See 2020 UAI Excellence Award Winners, Utility Analytics Institute, available at: <https://utilityanalytics.com/2020-award-winners/>.

Information regarding forward looking statements

This document contains statements that constitute forward-looking statements within the meaning of the Private Securities Litigation Reform Act of 1995. Forward-looking statements are based on assumptions with respect to the future, involve risks and uncertainties, and are not guarantees. Future results may differ materially from those expressed in any forward-looking statements. These forward-looking statements represent our estimates and assumptions only as of March 23, 2021. We assume no obligation to update or revise any forward-looking statement as a result of new information, future events or other factors.

In this document, forward-looking statements can be identified by words such as “believes,” “expects,” “anticipates,” “plans,” “estimates,” “projects,” “forecasts,” “should,” “could,” “would,” “will,” “confident,” “may,” “can,” “potential,” “possible,” “proposed,” “in process,” “under construction,” “in development,” “target,” “outlook,” “maintain,” “continue,” or similar expressions, or when we discuss our guidance, priorities, strategy, goals, vision, mission, opportunities, projections, intentions or expectations.

Factors, among others, that could cause actual results and events to differ materially from those described in any forward-looking statements include risks and uncertainties relating to: decisions, investigations, regulations, issuances or revocations of permits and other authorizations, renewals of franchises, and other actions by (i) the California Public Utilities Commission (CPUC), U.S. Department of Energy, and other regulatory and governmental bodies and (ii) states, counties, cities and other jurisdictions in the U.S.; the success of business development efforts and construction projects, including risks in (i) completing construction projects or other transactions on schedule and budget, (ii) the ability to realize anticipated benefits from any of these efforts if completed, and (iii) obtaining the consent of partners or other third parties; the resolution of civil and criminal litigation, regulatory inquiries, investigations and proceedings, and arbitrations, including, among others, those related to the natural gas leak at the Aliso Canyon natural gas storage facility; the impact of the COVID-19 pandemic on our capital projects, regulatory approval processes, supply chain, liquidity and execution of operations; actions by credit rating agencies to downgrade our credit ratings or to place those ratings on negative outlook and our ability to borrow on favorable terms and meet our substantial debt service obligations; moves to reduce or eliminate reliance on natural gas and the impact of volatility of oil prices on our businesses and development projects; weather, natural disasters, pandemics, accidents, equipment failures, explosions, acts of terrorism, computer system outages and other events that disrupt our operations, damage our facilities and systems, cause the release of harmful materials, cause fires and subject us to liability for property damage or personal injuries, fines and penalties, some of which may not be covered by insurance (including costs in excess of applicable policy limits), may be disputed by insurers or may otherwise not be recoverable through regulatory mechanisms or may impact our ability to obtain satisfactory levels of affordable insurance; the availability of natural gas and natural gas storage capacity, including disruptions caused by limitations on the withdrawal of natural gas from storage facilities and equipment failures; cybersecurity threats to the storage and pipeline infrastructure, the information and systems used to operate our businesses, and the confidentiality of our proprietary information and the personal information of our customers and employees; volatility in interest and inflation rates and commodity prices and our ability to effectively hedge these risks; changes in tax policies, laws and regulations; and other uncertainties, some of which may be difficult to predict and are beyond our control.

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