Building Decarbonization Coalition Presents:

Long-Term Gas Planning Proceeding Webinar Series


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COLMAC WATERHEAT A division of Colmac Industries.
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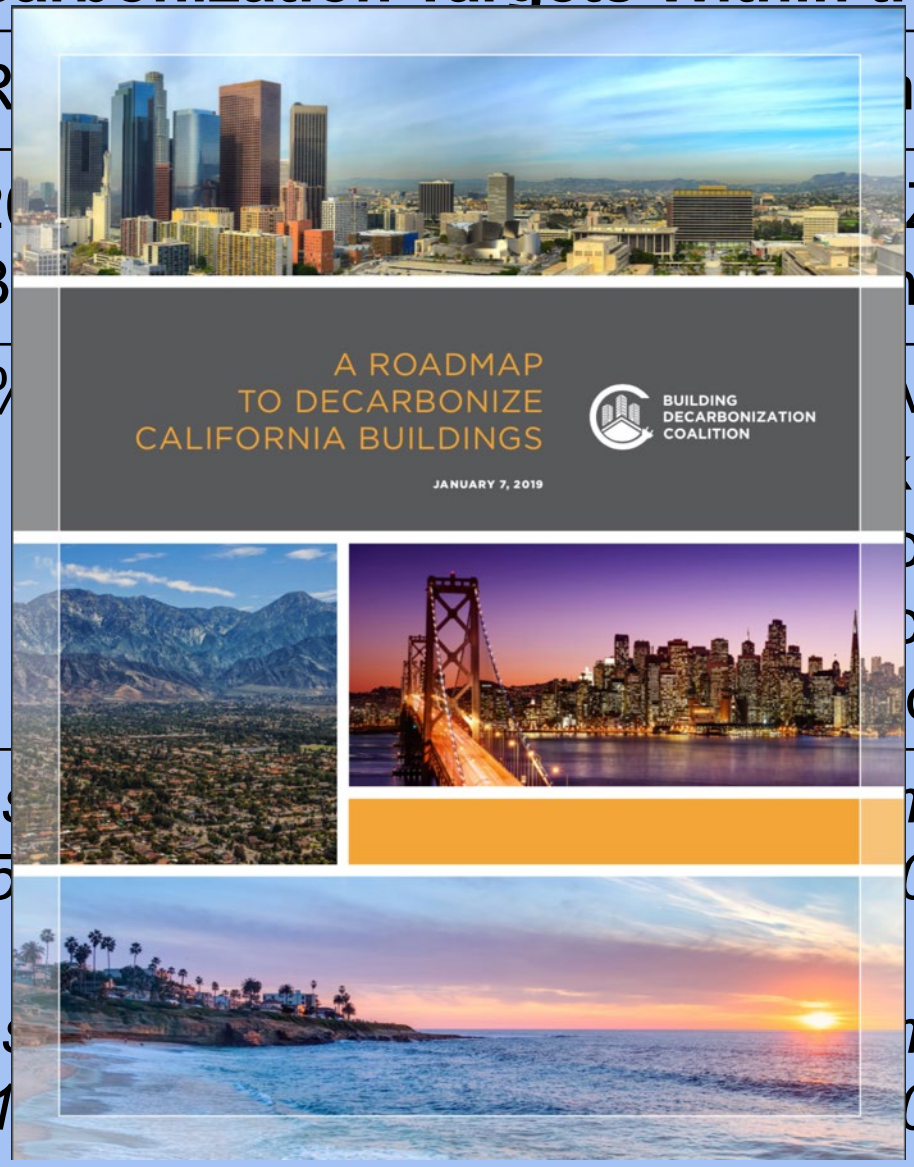
WAYPOINT ENERGY
EDF ENVIRONMENTAL DEFENSE FUND Finding the ways that work
SUSTAINABLE SFUSD
WRCOG Western Riverside Council of Governments
SOUTHERN CALIFORNIA EDISON An EDISON INTERNATIONAL Company
williams+paddon ARCHITECTS + PLANNERS
Xcel Energy
ReplaceNow
pickmysolar
ehdd architecture
EAST BAY COMMUNITY ENERGY
BRADFORD WHITE WATER HEATERS

Figure 1: Decarbonization Targets Within the Building Sector

	R	ercial
New Buildings	2 B	Zero Emissions g Code
Retrofits	%	vels from the overall : om building sector om building sector om building sector
•*Increase the s* *heating from 5* *2030.* •*Increase the s* *heating from 1* *2030.*		*mps for space* *025 and 100 % in* *mps for water* *025 and 100 % in*



Roadmap Goals

Goal 1: Build customer, builder, contractor and policy-maker awareness and interest in decarbonization.

Goal 2: Ensure that customers receive a good value from adopting building decarbonization measures.

Goal 3: Ensure that building decarbonization provides a better value to builders and contractors than fossil-fuel heating.

Goal 4: Prepare supply-chains and ensure delivery agents are ready to meet rising demand for carbon-free building technologies with a quality product.

Goal 5: Align Policy to meet other goals.

About this webinar series

This BDC Webinar Series will introduce participants to the main issues addressed in the California Public Utilities Commission's long-time gas system planning proceeding (R.20-01-007), and teach best practices in participating in proceeding discussions.

This proceeding is designed help California plan its gas infrastructure needs as it meets its carbon emissions reductions goals.

- *Seven webinars scheduled from 11 am-12 pm on Wednesdays from October 14 to December 16, 2020*

Coming gas proceeding webinars

- **The Role of Resource Planning in the CPUC's Long-Term Gas Proceeding**
  - Oct. 28 – Register
  - Speakers: Katie Wu, Director, Gridworks, and Michael Colvin, California Energy Director, Environmental Defense Fund
- **The Utility Perspective on California's Gas and Electrification Evolution**
  - Nov. 11 – Register
  - Speakers: Hannah Kaye, Policy Product Manager at PG&E, and Erica Bowman, Director of Resource & Environmental Planning and Strategy at Southern California Edison
- **What California Can Lean From Other States About Long-Term Gas Planning**
  - Nov. 18 – Register
  - Speakers: Mark Kresowik, Eastern Region Deputy Director at the Sierra Club; Alice Napoleon, Electric System Policy Analyst at Synapse Energy Economics; and Edward Yim, Energy Policy Advisor at Washington, DC Department of Energy and Environment

Details of other webinars in this series are at https://bit.ly/BDCGasWebinars (case sensitive)

Webinar Logistics

- Everyone is muted.
- Please ask your questions via chat and we will ask speakers to answer at the end of remarks.
- This webinar is being recorded.
- Members of the Coalition can access the recording, slide deck, and other resources on the Members-Only website.
  - To learn more about membership and how to access this recording and other decarb benefits, visit www.buildingdecarb.org or reach out to Ashleigh at Ashleigh@buildingdecarb.org

Today’s speakers

- Dan Aas, Managing Consultant, Energy and Environmental Economics

- Merrian Borgeson, Senior Scientist, Natural Resources Defense Council

Energy+Environmental Economics

The Challenge of Retail Gas in California's Low-Carbon Future

BDC Briefing - October 2020

Dan Aas
Amber Mahone
Zack Subin
Michael Mac Kinnon
Blake Lane
Snuller Price

About E3: consultants passionate about the clean energy transition

Technical & Strategic Consulting for *the Clean Energy Transition*

Deep expertise in engineering, economics, mathematics & public policy

70 full-time consultants with a wide variety of backgrounds

San Francisco

New York

Boston

Calgary

250+ projects per year across a diverse client base

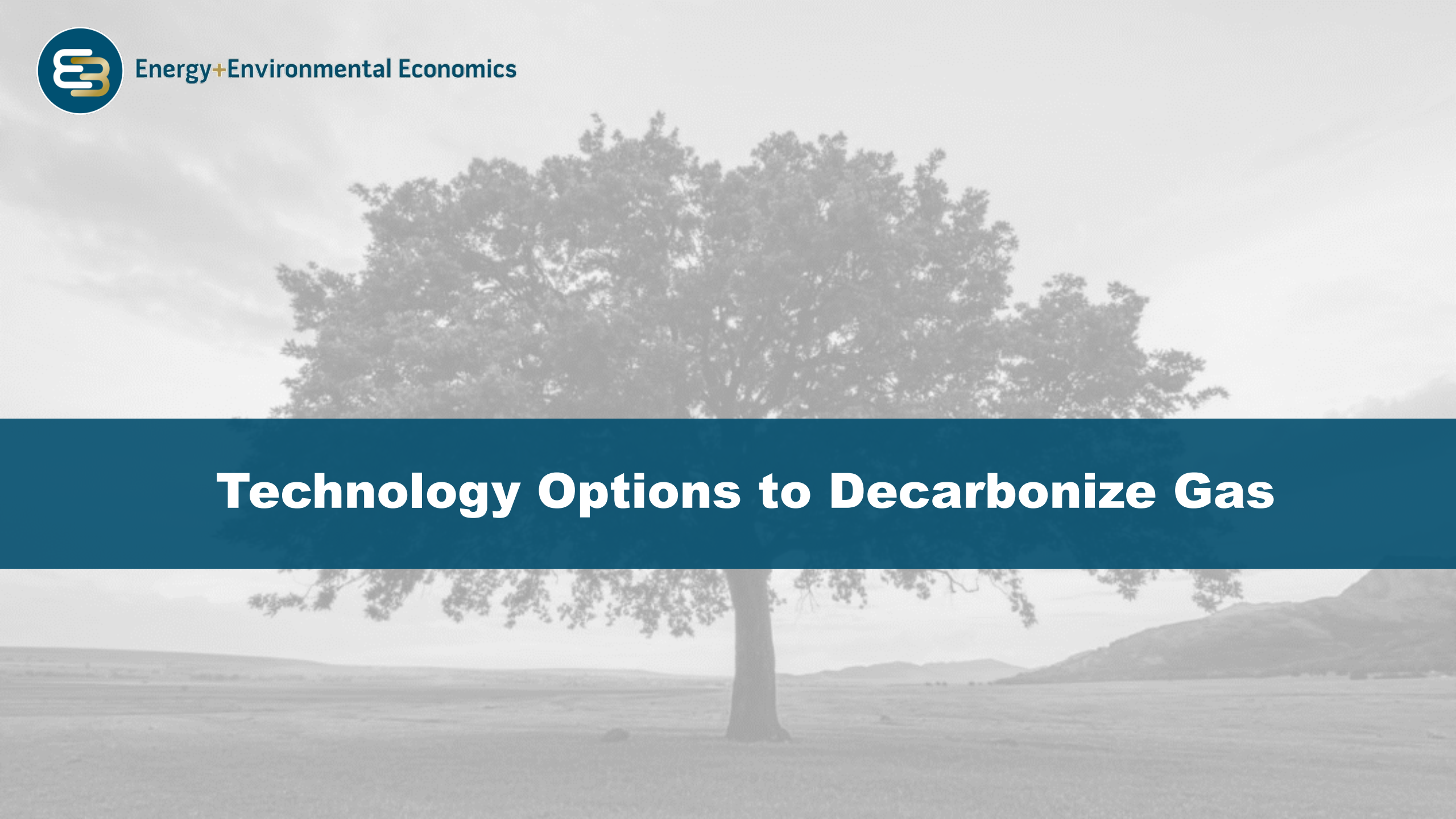
- Advisory and bid evaluation services to the State of South Carolina for the potential sale of Santee Cooper (~$9 billion valuation)
- Integrated Resource Planning for the CA Public Utilities Commission (CPUC) to achieve state clean energy targets (SB100)
- Evaluation of gas peaker replacement and/or hybridization with energy storage in New York City and Long Island
- Price and revenue projections and due diligence for GIP acquisition of NRG renewables portfolio (~$1.4 billion)
- Multiple studies on costs and feasibility of high renewables integration and low-carbon transition pathways from 2020-2050
- Reliability analysis of closing coastal gas-fired power plants and assessment of alternatives (transmission, storage, etc.)

Research Questions and Project Team

- **Work was funded by a CEC PIER grant, and asked the following questions:**
  - **What are the technology options to decarbonize the natural gas system?**
    - UC Irvine Advanced Power & Energy Program lead renewable natural gas technical analysis
    - E3 led synthesis of technology analysis into California economy-wide GHG PATHWAYS scenarios
  - **What are potential implications for natural gas customers?**
    - E3 developed gas utility revenue requirement tool to evaluate gas transition scenarios, bill impacts
  - **What are the outdoor air quality and public health implications of these scenarios?**
    - UC Irvine Advanced Power & Energy Program lead renewable natural gas technical analysis
- **Technical Advisory Committee provided input, not asked to endorse study findings**
  - SoCalGas, SMUD, PG&E, NRDC, EDF, and others

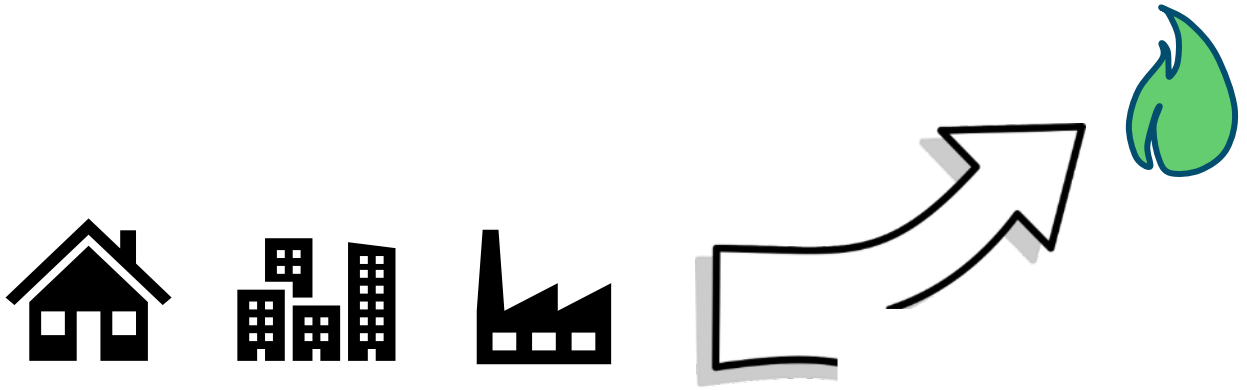
Key takeaways

- Building electrification is a critical component of California's economy-wide decarbonization toolkit
- Renewable natural gas and hydrogen will have important roles to play if California is to meet its 2045 carbon neutrality goal, but are likely to be most useful in hard to electrify use cases and for electric reliability
- California's gas utilities earn the bulk of their revenues from residential customers; widespread electrification of those customers will have profound impacts on the gas system
- This research motivates the need for long-term gas planning in the context of California's decarbonization goals



Technology Options to Decarbonize Gas

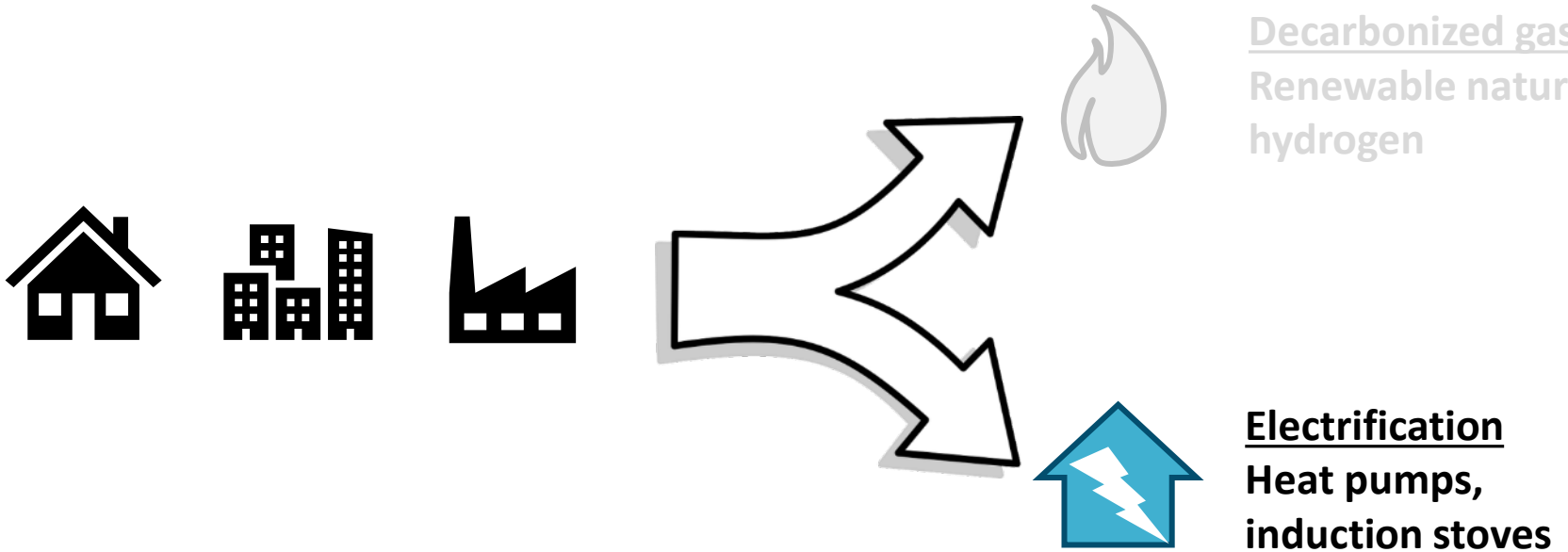
How will we heat our buildings?



Decarbonized gas
Renewable natural gas or hydrogen

+ **Potential Advantages**: **repurposes existing infrastructure, minimal consumer disruption**
+ **Potential Drawbacks**: **cost, not commercial at scale**, can require extensive utility infrastructure retrofits

How will we heat our buildings?



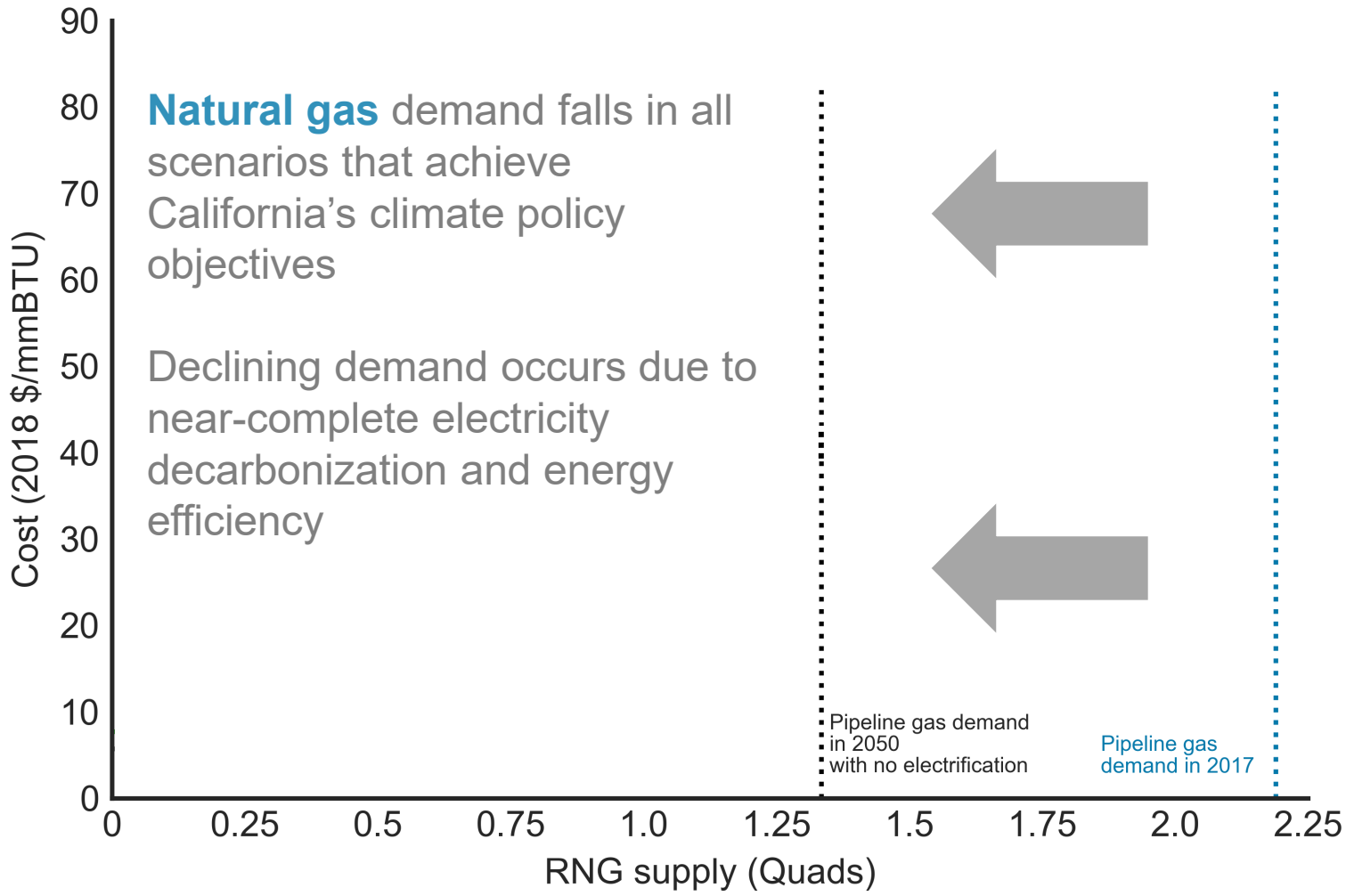
Decarbonized gas
Renewable natural gas or hydrogen

Electrification
Heat pumps, induction stoves

+ **Potential Advantages**: **commercially available** products, **complementary to decarbonized electricity**, assists with climate adaptation
+ **Potential Drawbacks**: requires building retrofits, **upfront consumer costs**, electric peak load impacts, potential for **stranded assets** and **workforce reductions**

Natural gas demand in a low-carbon future

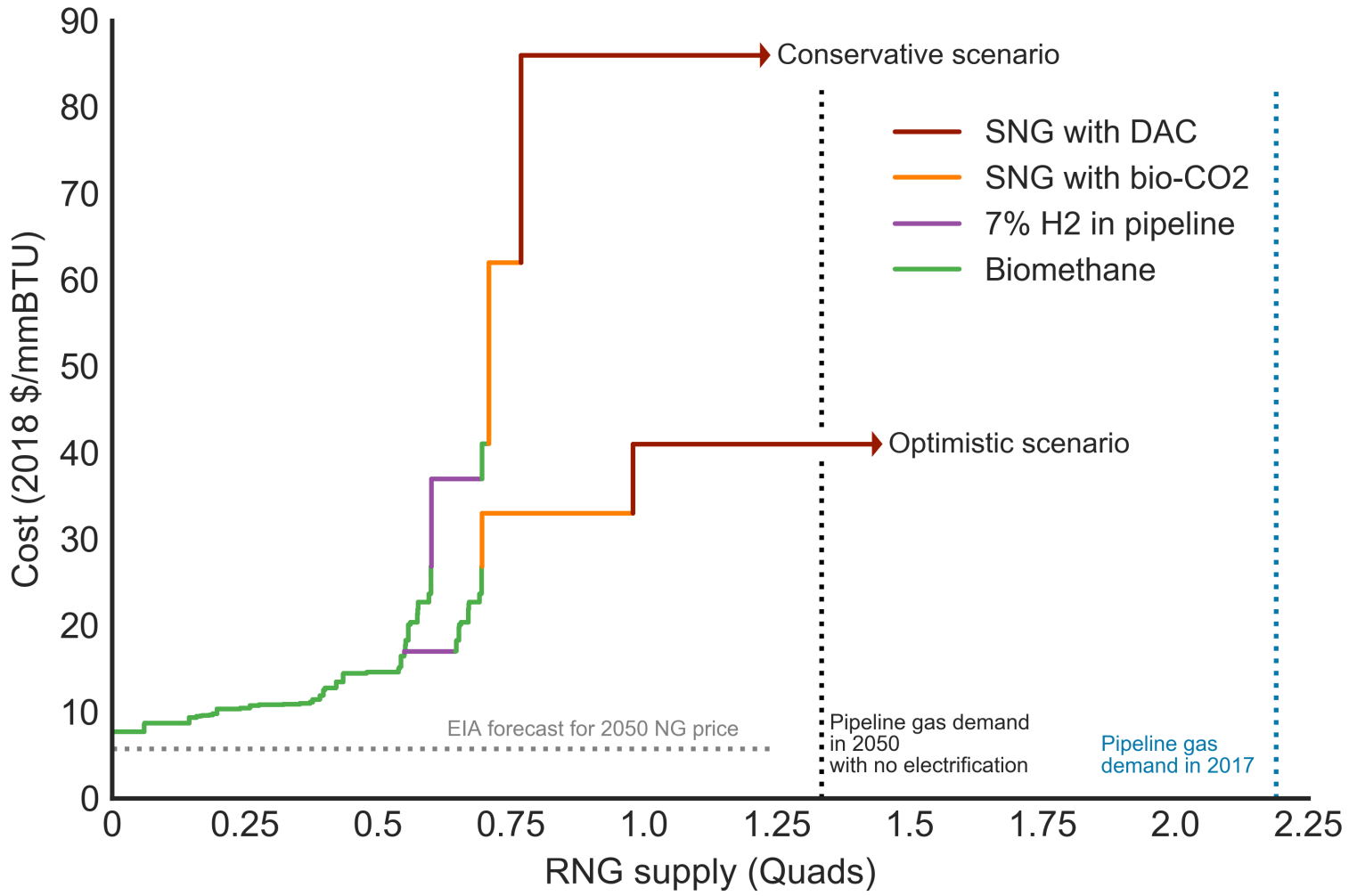
California Renewable Natural Gas (RNG) Supply Curve, 2050



Scenarios evaluate an 80% reduction in California economy-wide GHG emissions by 2050, relative to 1990 levels

E3 RNG Supply Curve: Conservative vs Optimistic

California Renewable Natural Gas (RNG) Supply Curve, 2050



'Conservative' scenario assumes slower technology learning rates for electrolyzers and that carbon-neutral CO2 for SNG must be sourced from within California

This figure represents the technical potential for biomethane assuming California uses in-state and imported biomass, up to CA's population-share of U.S. biomass wastes and residues

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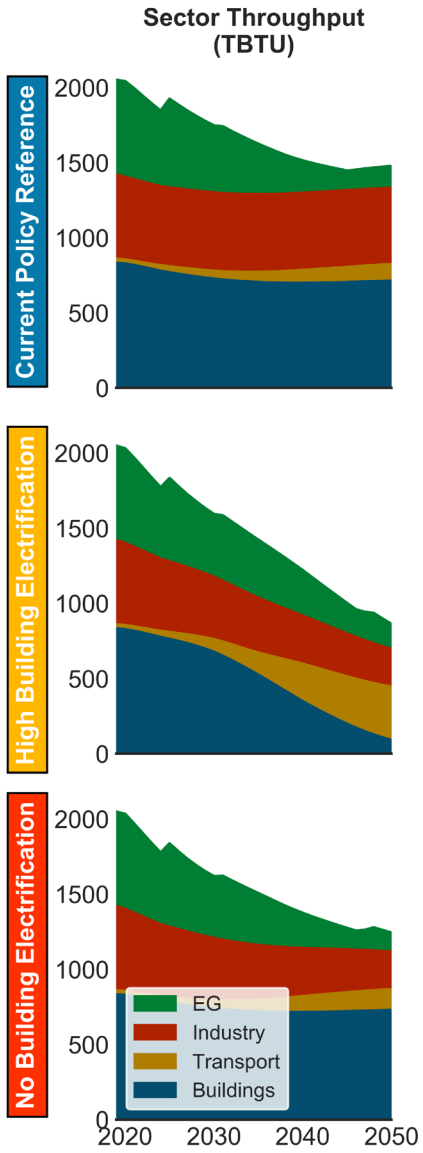
California PATHWAYS Scenarios to Deep Decarbonization

Gas demand declines in all three scenarios

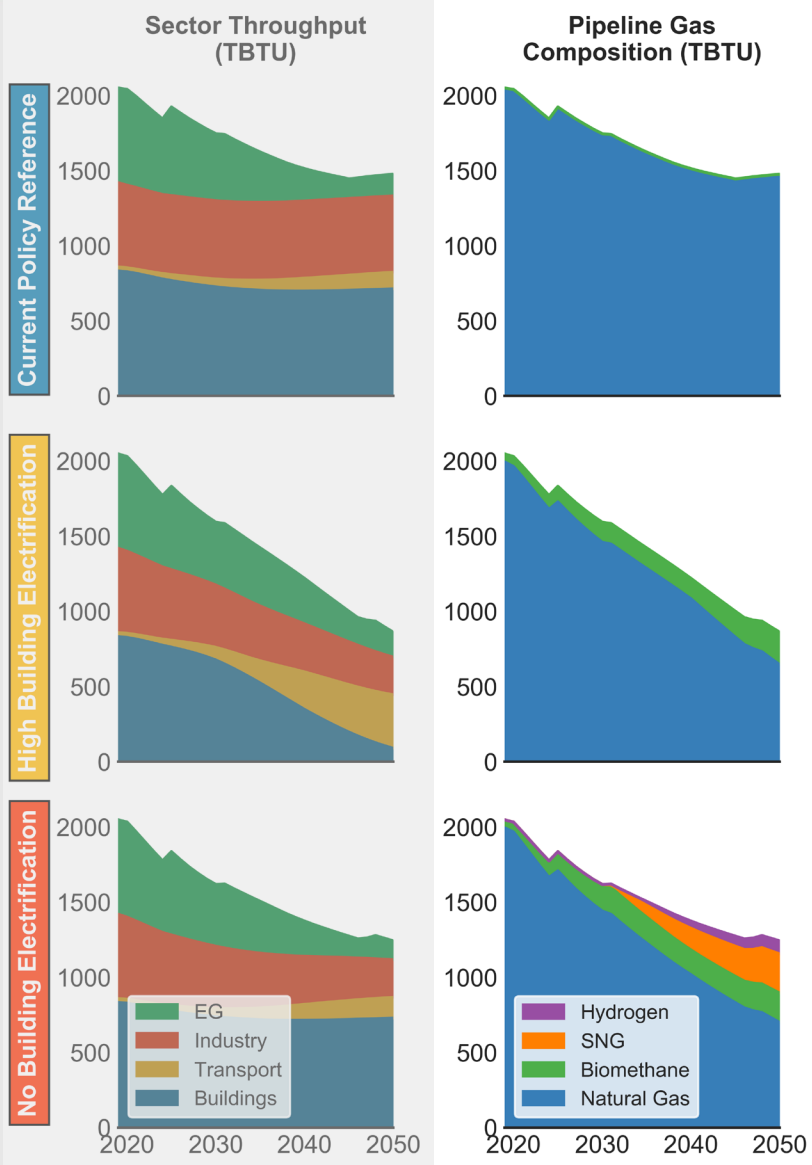


Electric sector gas consumption falls sharply in the Reference case due to SB 100, direct-use gas demands are flat as a result of existing EE policy

In the High Building Electrification scenario, gas demand falls sharply in the buildings sector. New gas demands are from CNG in freight transportation sector

In the No Building Electrification scenario, gas demand is similar to Reference

Pipeline gas composition varies by scenario

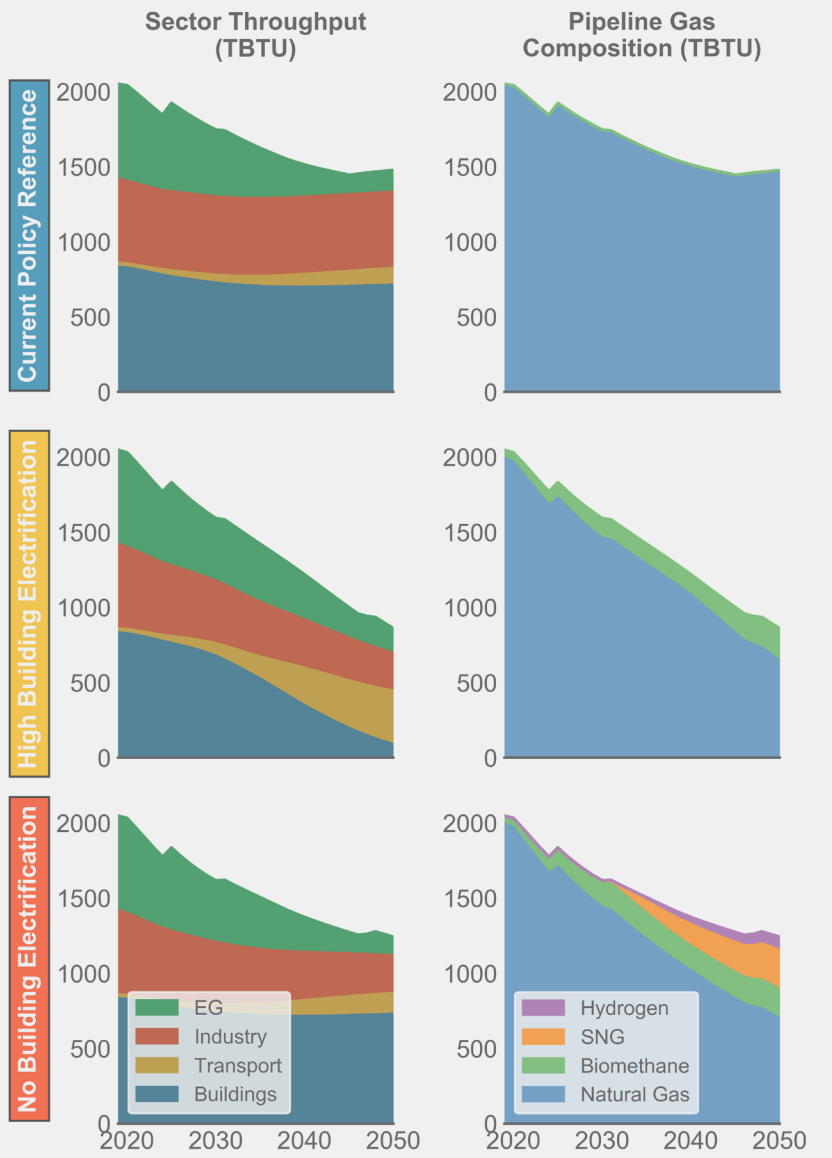


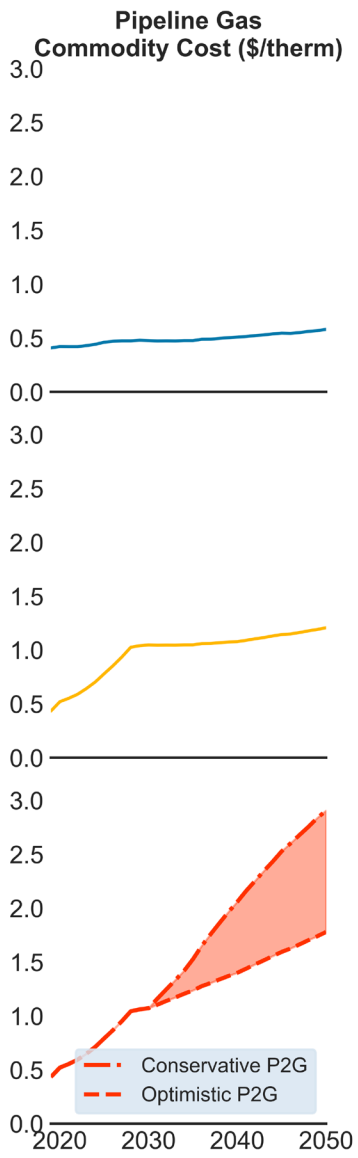
The energy delivered via the state's gas system is nearly 100% natural gas in the Reference case.

Biomethane is 25% of the pipeline demands by 2050. That blend helps reduce the GHG intensity of hard-to-electrify sectors of the economy.

The No Building Electrification Scenario requires a blend of 44% RNG in order to achieve CA's economy-wide climate policy goals. The remainder of pipeline energy is delivered via fossil gas.

Pipeline gas commodity costs increase in both GHG mitigation scenarios





Commodity costs follow EIA forecasts in the Reference case

The blended cost of fuel delivered via pipeline nearly doubles by 2030 as biomethane is blended into the pipeline

Pipeline commodity costs increase beyond 2030 in the No Building Electrification scenario as more costly hydrogen and SNG are blended into the pipeline

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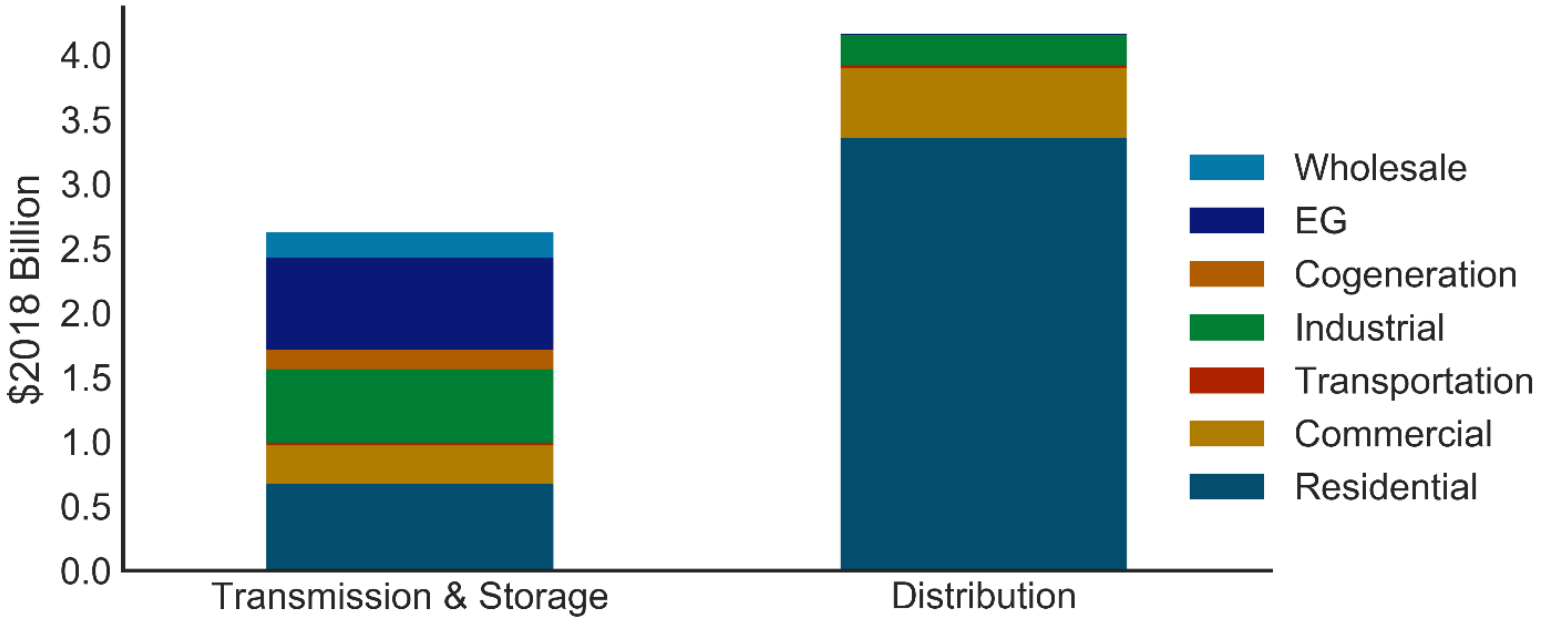
Implications for Natural Gas Customers

E3's gas revenue requirement tool evaluated customer gas rates in each scenario

Estimated 2019 California Gas System Revenue Requirement by Customer Type and System Segment

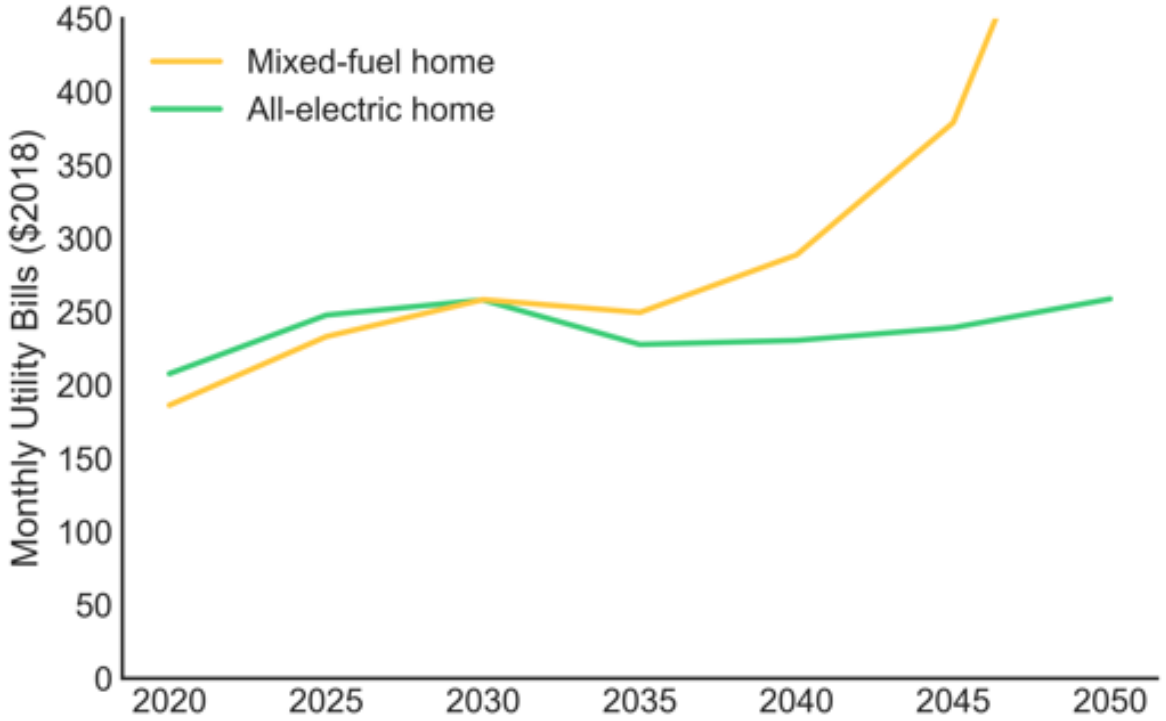


The majority of revenues that cover distribution system costs are collected from residential customers

If residential throughput or customer counts fall, rates for remaining customer rise

All-electric customers see lower energy bills post-2030 in the High Electrification Scenario

Monthly utility bills in High Building Electrification Scenario
(Wildfire Sensitivity)

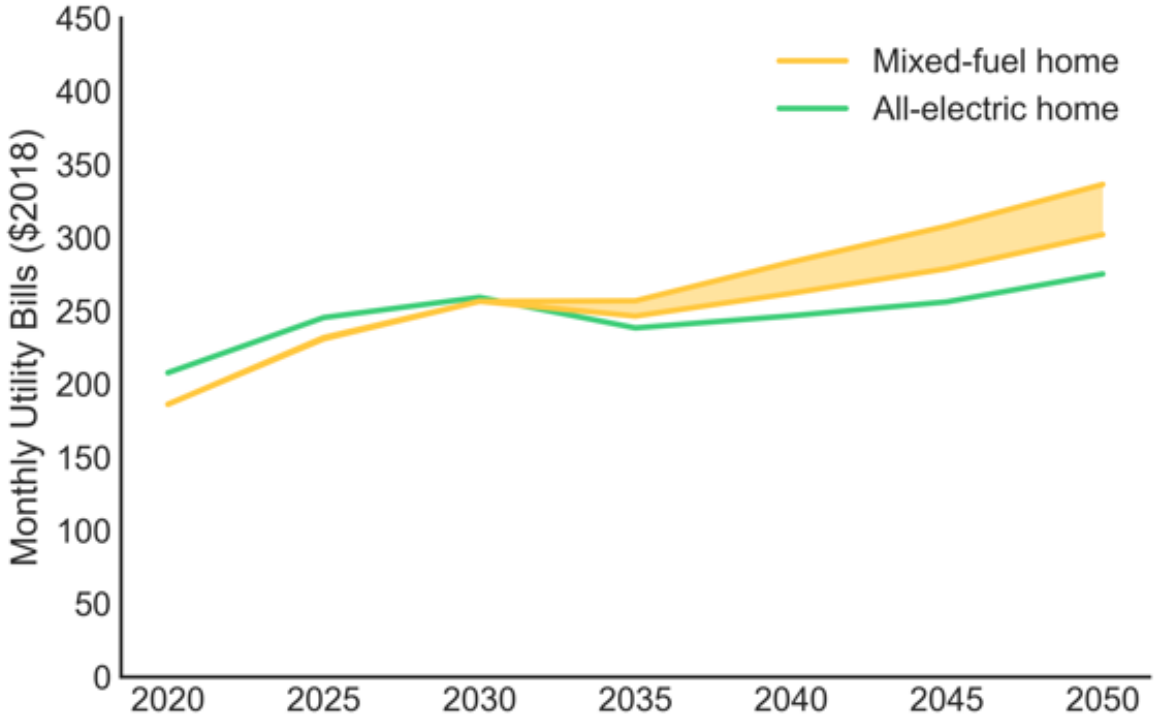


Declining natural gas throughput leads to higher gas rates and gas bills for remaining mixed-fuel customers

Absent a gas transition strategy, this outcome raises troubling equity issues. Renters and low-income customers would be less likely to electrify and insulate themselves from higher gas costs.

All-electric customers also see lower energy bills post-2030 in the No Electrification Scenario

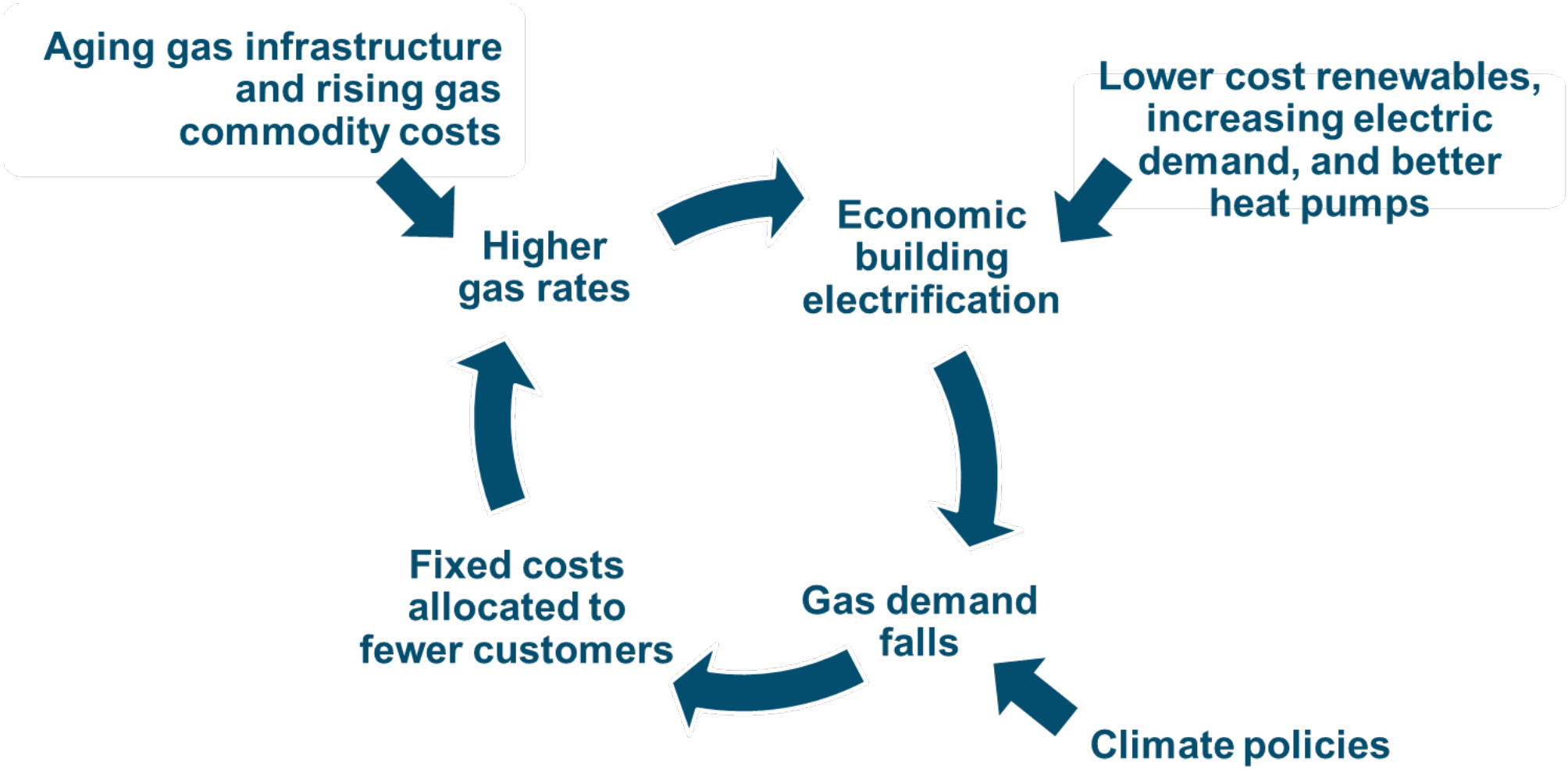
Monthly utility bills in No Building Electrification Scenario
(Wildfire Sensitivity)



The increasing commodity costs associated with increasing RNG blends mean that all-electric customers have lower bills in both scenarios

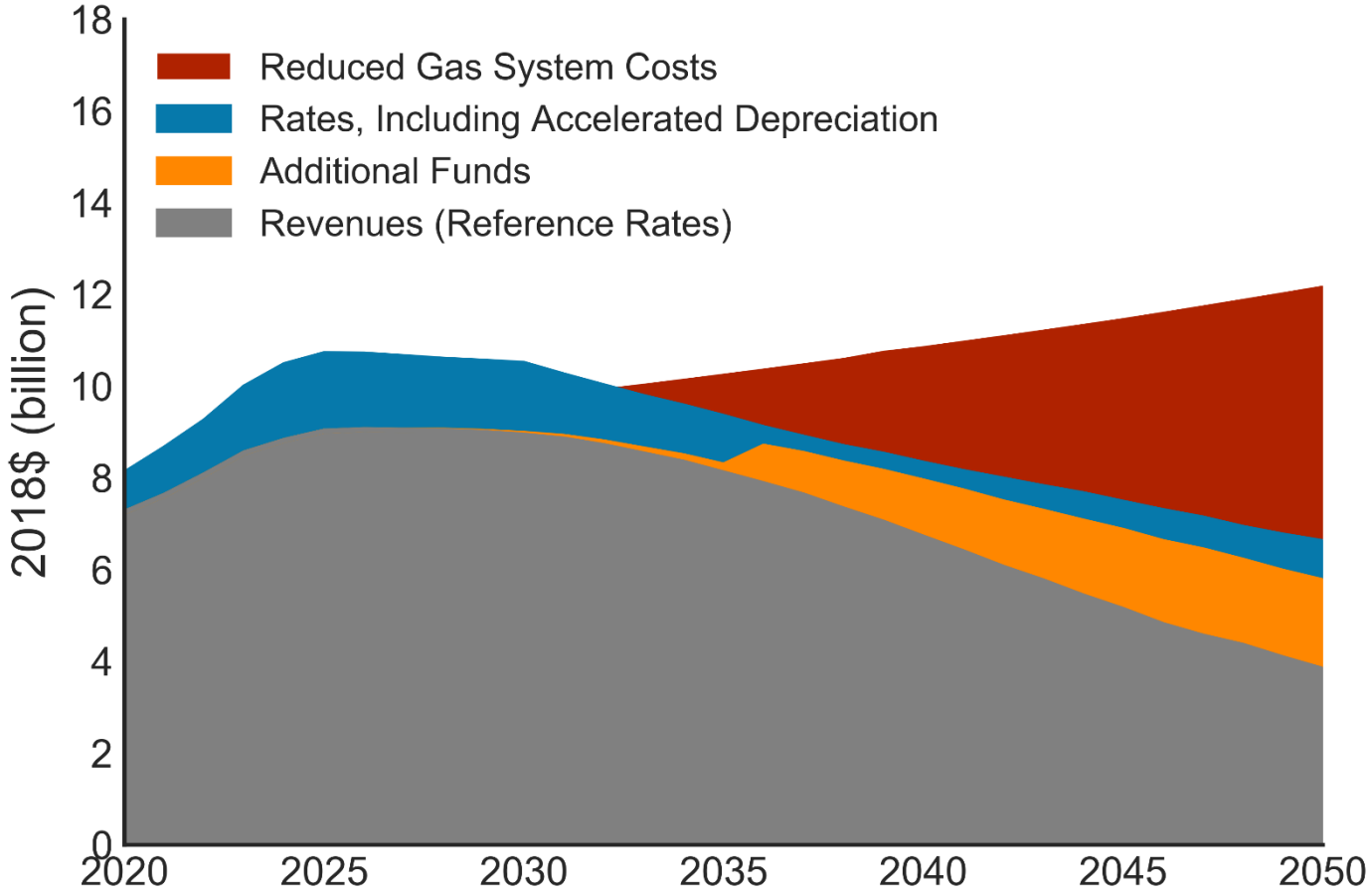
This scenario assumes no economic electrification, an unlikely outcome given the difference in bills

The Challenge of Retail Gas in California's Low Carbon Future



Gas Transition Strategy

An example gas transition strategy



Our work in California identifys a need for the state to start exploring gas transition strategies. Strategies might include

- **+ Gas system cost reductions**
- **+ Accelerated deprecation and other changes to rates**
- **+ Infusion of funds from either electric ratepayers, the state general fund, or via securitization**

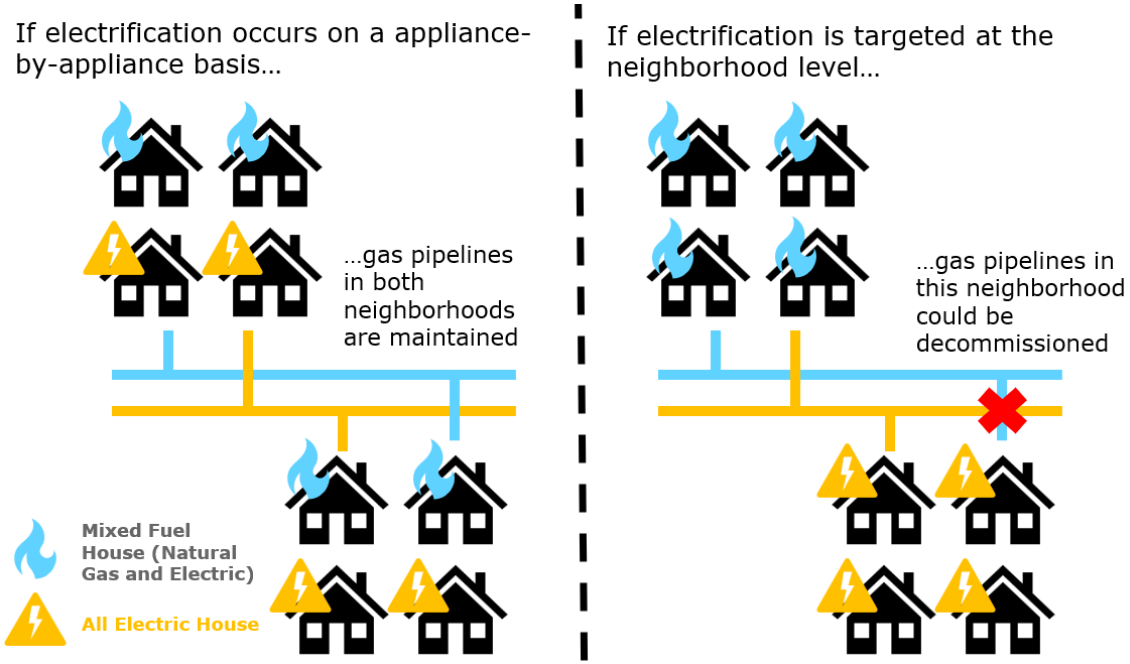
Key Conclusions

- **Building electrification is likely to be a lower-cost, lower-risk long-term strategy compared to renewable natural gas in California**
  - Building electrification lowers the total societal cost of meeting California's long-term climate goals & uses technology that is available today.
  - A key uncertainty is whether consumers will adopt electrification technologies at scale, regardless of their cost-effectiveness.
- **Gas demand decreases in all of the GHG mitigation scenarios. As gas demand falls, average costs for remaining customers will increase**
- **A gas transition strategy is needed to reduce the costs of the gas system and protect low-income & vulnerable consumers**

A (small sample) of remaining open questions

- **In our work, we hypothesized that targeted electrification could reduce gas system costs**
  - How technically or programmatically achievable is such an effort in practice?
  - How can gas system cost reductions be balanced against reliability and, most importantly, safety imperatives?

- **If gas system cost reductions alone are insufficient to ensure a managed transition, what next?**
  - Who will pay remaining cost impacts and over what timeframe?
  - What role could tools like securitization have in smoothing cost impacts?



Energy+Environmental Economics

Thank you!

dan@ethree.com

October 21, 2020

CALIFORNIA'S GAS SYSTEM IN TRANSITION

EQUITABLE, AFFORDABLE, DECARBONIZED AND SMALLER

GRIDWORKS

CONTRIBUTING GAS SYSTEM STAKEHOLDERS

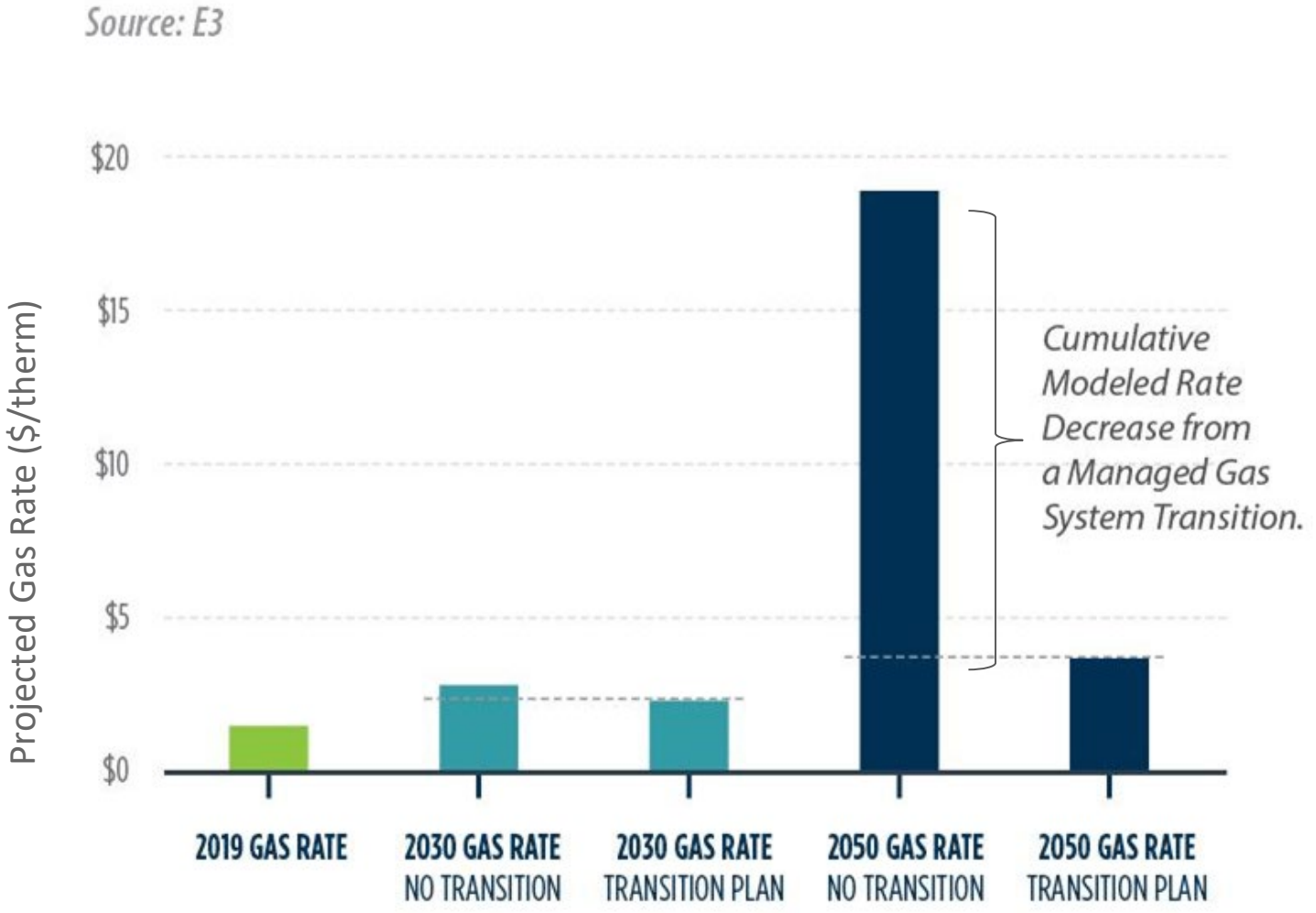
LOWEST SOCIETAL COST PATH TO 2030 AND 2050 GHG GOALS IS MOST EXPENSIVE FOR GAS CUSTOMERS

SCENARIO	ACHIEVES 2030 AND 2050 GHG REDUCTION GOALS	ELECTRIC HEAT PUMP TECHNOLOGY IN BUILDINGS	RENEWABLE GAS USE	TRANSPORTATION ELECTRIFICATION	2050 ANNUAL INCREMENTAL SOCIETAL COST RELATIVE TO REFERENCE SCENARIO	PG&E 2050 AVERAGE RESIDENTIAL GAS RATE PER THERM (2018 $)
Current Policy Reference Scenario[41]	NO	limited	limited	5M vehicles by 2030	N/A	$3
High Building Electrification (no transition strategy)	YES	50% of sales by 2030, 100% by 2040	Biomethane and liquid biofuels primarily serve industry and compressed gas trucks	High electrification of Light Duty Vehicles (LDV)	+$13B	$19
Slower Building Electrification	YES	20% of sales by 2030, 68% by 2050	All available biomethane and hydrogen blend	LDV plus medium- and heavy-duty trucks	+$18B	$5.70
No Building Electrification	YES	none	All biomethane, hydrogen blend, synthetic gas, and 56% fossil blend in pipeline	LDV and more zero emission trucks	Ranges from +$19B to +$32B depending on Renewable Gas cost assumed	$5.50

Source: E3

INITIATING A LONG-TERM GAS TRANSITION PLAN IS IMPERATIVE

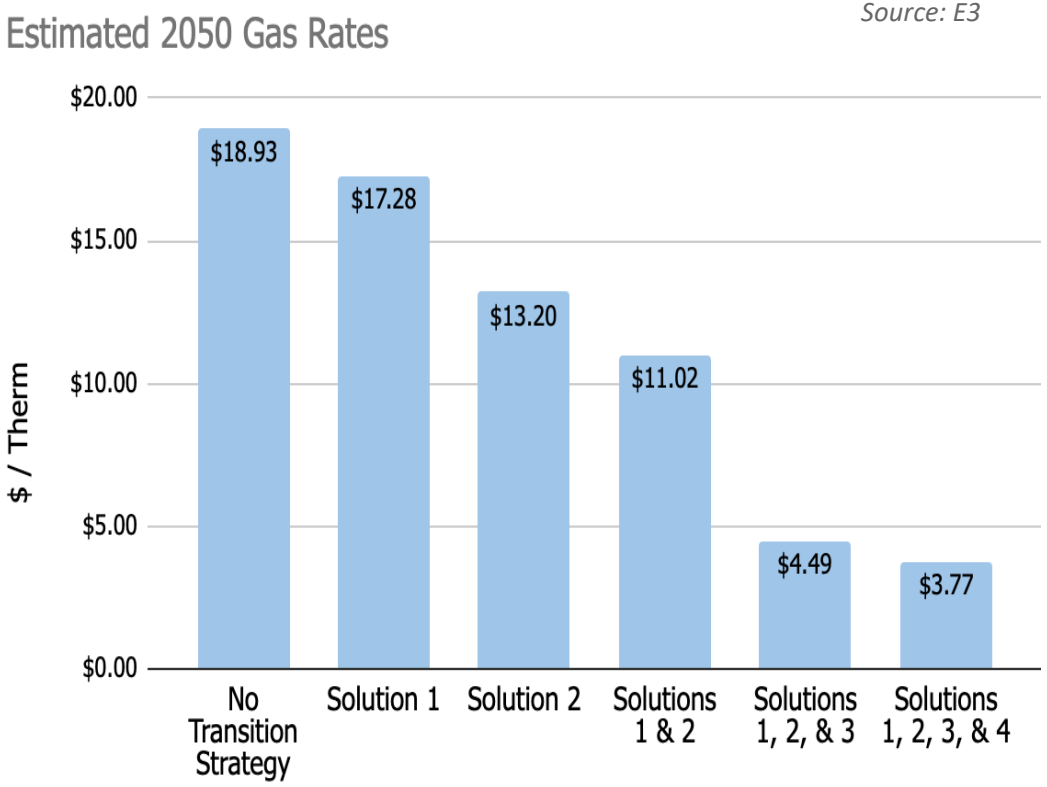
Without a managed gas transition, gas rates in 2050 are 5x more than they could be with a managed transition plan



A COMBINATION OF SOLUTIONS SHOULD BE APPLIED

0. Stop hooking up **new** buildings to gas
1. Consider **aligning financial recovery** of new gas infrastructure investments with the time horizons determined in the integrated long-term gas infrastructure plan.
2. Identify **alternatives to significant new investments** in the gas delivery system.
3. Consider **ratemaking adjustments** to cushion the impact of the transition on customers.
4. Explore **external funding** sources to recover gas transition costs from sources beyond gas utility customers.

Source: E3



BALANCE CONSTITUENCIES' NEEDS IN AN INTEGRATED PLAN

Gas System

Needs continued investment and trained workforce to ensure safety and reliability

The Gas Workforce

Needs a predictable and long-term transition to allow retirements and retraining

Customers

Need affordable rates, which could include bill protections for low-income customers

Environment

Needs a clear strategy to reduce methane leaks and carbon emissions

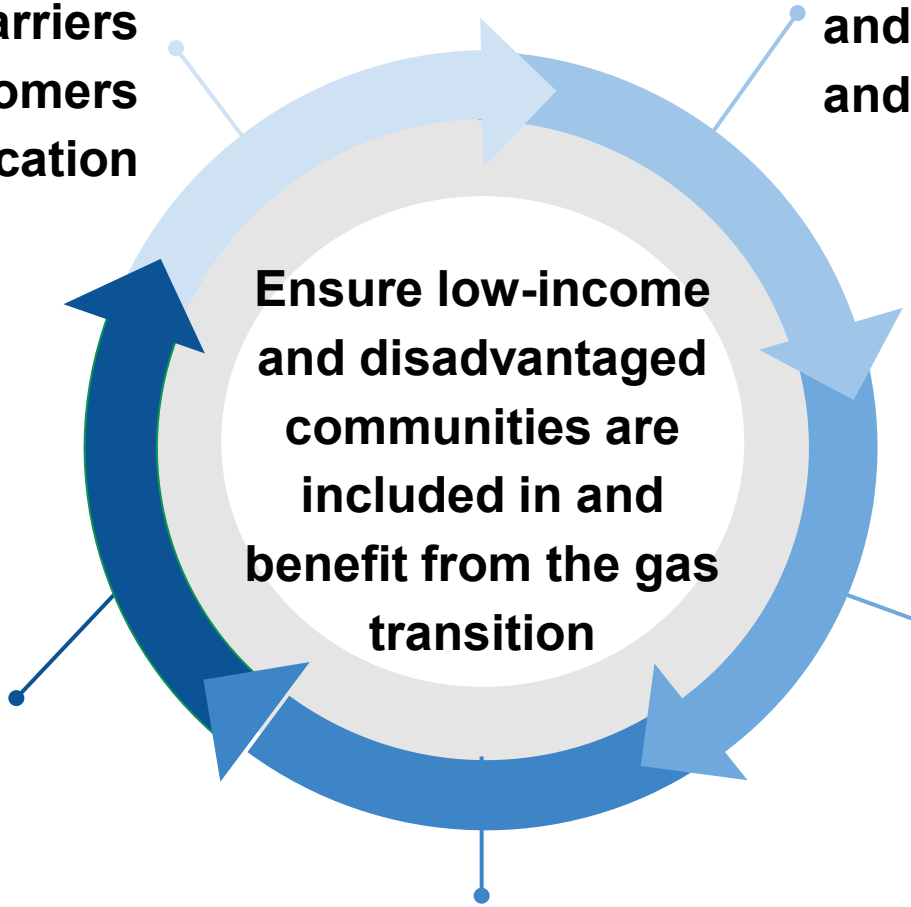
Integrated, Interagency Gas System Transition Plan, which includes:

- Improved demand forecasting analysis
- Detailed maps of existing infrastructure
- Identification of system assets where targeted electrification is more economical than traditional investments

DEVELOP AND IMPLEMENT INCLUSIVE COMMUNITY STRATEGIES

Produce a study on the barriers preventing low-income customers from end use electrification

Conduct meaningful engagement and involvement of low-income and disadvantaged communities



Create a one-stop shop for low-income and disadvantaged communities to combine programmatic offerings with energy efficiency, weatherization, and solar and storage installation

Develop programs and resources to enable communities to electrify

Design bill protections for all low-income customers

ORGANIZE A JUST TRANSITION FOR GAS SYSTEM WORKERS

RETRAIN

- Establish a cross crafting committee to clarify necessary roles and responsibilities
- Guarantee positions in dual fuel utilities
- Provide preferential training and re-training for displaced workers
- Provide wage protection

RELOCATE

- Provide moving allowances and housing per diems
- Provide preferential transfer/bidding rights for displaced workers
- Offer energy and/or water utilities cost recovery for hiring displaced workers

RETIRE

- Establish bridge or buyout programs
- Establish creative severance packages
- Provide funding for workers to leave the gas business and be re-trained in other crafts

R.20-01-007: Long-Term Gas Planning Proceeding

The Proceeding Consists of Three Tracks

1A	1B	2
System Reliability Standards	Market Structure and Regulations	Long-Term Natural Gas Policy and Planning
Establish minimum system requirements and ensure gas utilities consistently meet those standards and provide reliable gas service	Mitigate the risk that gas supply shortages pose to gas and electric reliability and prices	Ensure safe, reliable, and affordable energy in a time of declining fossil gas throughput

Track 2

- Track 2 will focus on affordability, reliability, and safety in the context of declining gas throughput.
- The Scoping Memo has not been issued yet.
- The Scoping Memo *may* cover questions such as:
  - How much gas transmission and storage infrastructure is needed in 2030, 2040, and beyond to ensure reliability?
  - How do we balance the need to repair or replace old infrastructure to ensure safety and reliability with the need to avoid stranded costs?
  - How do we "prune" the gas system in the most cost-effective way?
  - How do we protect the remaining gas consumers from paying exorbitant rates?

Credit: Slide screen shots taken from Simon Baker's 10/14/20 BDC presentation

A (small sample) of remaining open questions

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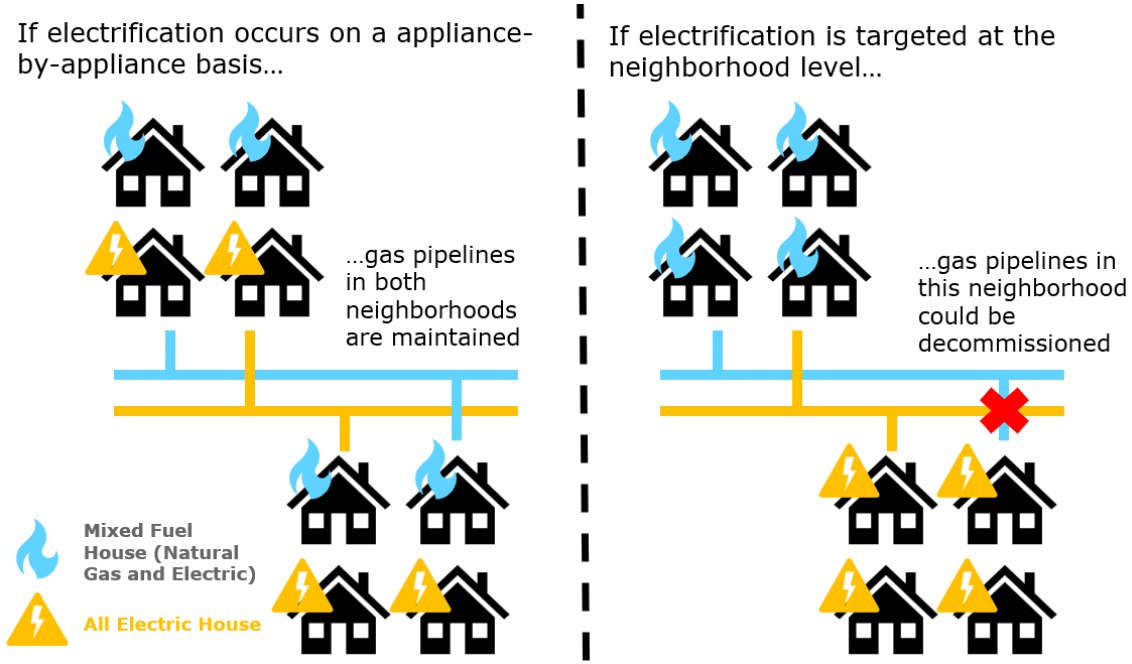

Contact

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Learn more about the series and BDC's advocacy action plan for the Gas Proceeding

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Learn about membership with the BDC

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