



NARUC

National Association of Regulatory Utility Commissioners

NARUC TASK FORCE ON NATURAL GAS RESOURCE PLANNING



**EXPERT LEARNING SERIES:
Emerging Supply- and Demand-
Side Solutions**

April 24, 2024

EXPERT SPEAKER PRESENTATIONS



Natural Gas Utility Innovation

NARUC Task Force on Natural Gas Resource Planning

April 24, 2024



Climate change is a defining challenge

Addressing climate change will require fundamental changes in energy use and reducing greenhouse gas emissions throughout the economy.



**Climate Change
Position Statement**

The American Gas Association is committed to reducing greenhouse gas emissions through smart innovation, new and modernized infrastructure, and advanced technologies that maintain reliable, resilient, and affordable energy service choices for consumers.

America's gas utilities have consistently provided solutions to our nation's most pressing energy needs

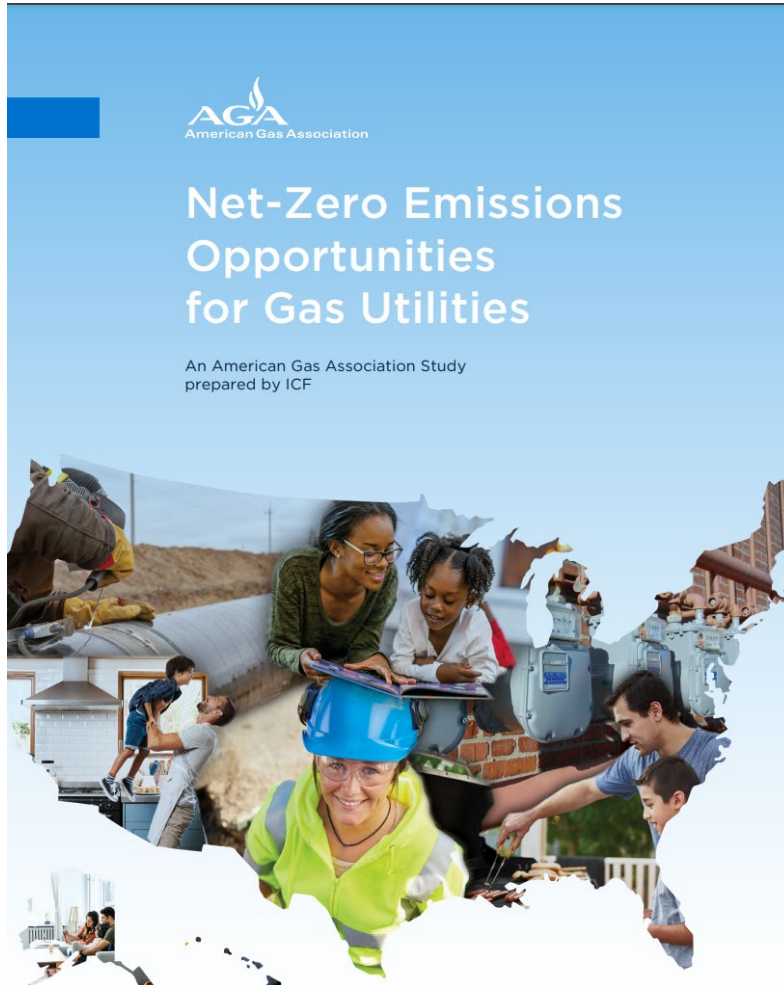
The nation relies on natural gas, especially gas delivery infrastructure, and the path to a safe, reliable, resilient, affordable, and sustainable energy economy flows through it.



Catalysts and policy drivers

- State climate laws and GHG reduction targets
- Future of gas proceedings
- LDC-driven emissions reduction goals
- Gas bans and electrification mandates
- Inflation Reduction Act & Bipartisan Infrastructure law

Net Zero Emissions Opportunities for Gas Utilities

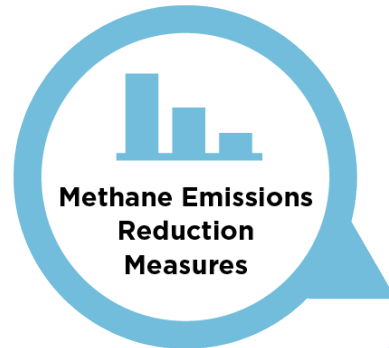


Policy Objectives & Approach:

- Evaluate the wide array of opportunities for gas utilities to achieve net-zero greenhouse gas emissions goals
- Provide in-depth assessment of illustrative pathways to achieve net-zero greenhouse gas emissions for gas utility customers by 2050
- Identify policy and regulatory actions to accelerate net-zero ambitions through gas infrastructure and technologies

Gas utility approaches to reducing emissions

- Differentiated Gas
- Leak Detection and Repair Programs
- More Accurate Emissions Measurement
- Replacement of Higher Emitting Pipe and Equipment
- Operational and Maintenance Measures



- Expansion of Gas Energy Efficiency Programs
- Building Envelope Improvements
- Emerging Highly Efficient Gas Technologies

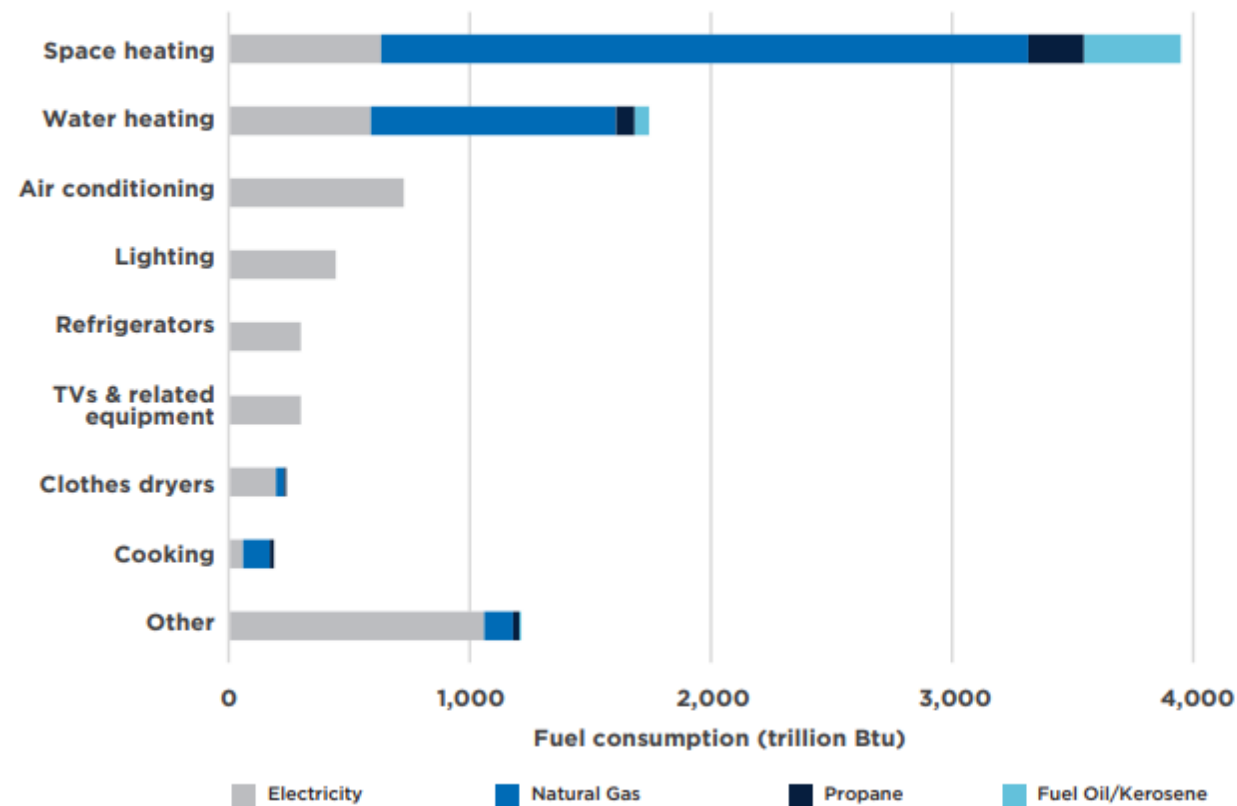
- Carbon Capture and Sequestration
- Direct Air Capture
- Greenhouse Gas Emissions Offsets



- Renewable Natural Gas
- Hydrogen Blending
- Methanated Hydrogen
- Dedicated Hydrogen Infrastructure

End-use Energy Consumption by Fuel

Exhibit E.S. 2 - U.S. Household End-use Energy Consumption by Fuel (trillion Btu)



Source: EIA 2015 Residential Energy Consumption Survey

More than fifty percent of American households currently use natural gas as a heating fuel, and reliance on gas is even higher in colder regions. It is also widely used in commercial and industrial facilities.



“The ability of gas infrastructure to store and transport large amounts of energy to meet seasonal and peak day energy use represents an important and valuable resource that should not be ignored when building pathways to achieve net-zero greenhouse gas emissions goals.”



Supply-Side Solutions

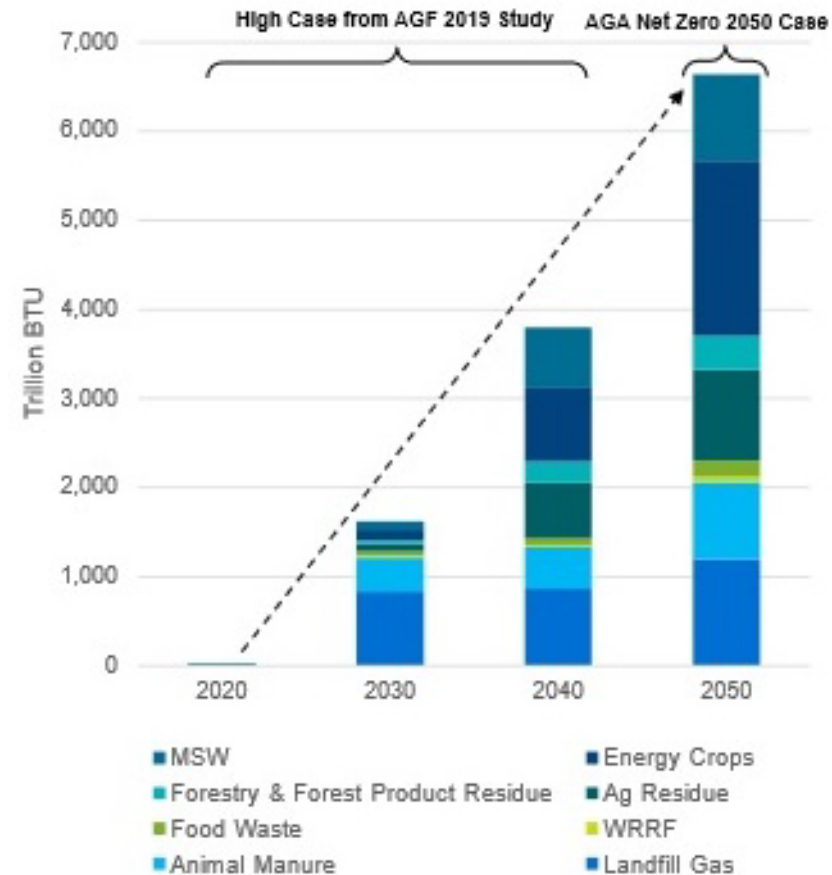


Low-carbon fuels – RNG and H2

All pathways studied incorporate a significant expansion of renewable natural gas (RNG) and hydrogen

- The renewable natural gas and low-carbon supply mix is underpinned by a significant resource potential expansion compared with the American Gas Foundation (2019) study
- Low-carbon fuels technology are evolving rapidly.
- RNG resource development is a key strategy to unlocking gas decarbonization opportunities.

Comparison of 2040 and 2050 Cases for RNG Supply



Certified gas meets environmental standards and helps reduce emissions.

CERTIFIED GAS REDUCES CARBON EMISSIONS



Certified gas has fewer associated greenhouse gas (GHG) emissions. By the end of 2022, around 14 percent of natural gas production will be from certified sources.

BENEFITS OF CERTIFIED GAS MAY INCLUDE:



Reducing upstream GHG emissions



Promoting transparency in emissions reporting



Creating a market for less carbon-intensive natural gas that could reduce economy-wide emissions

Incorporating certified gas will support environmental efforts across the natural gas value chain, including production, transportation and distribution.

Demand-Side Solutions



Energy Efficiency

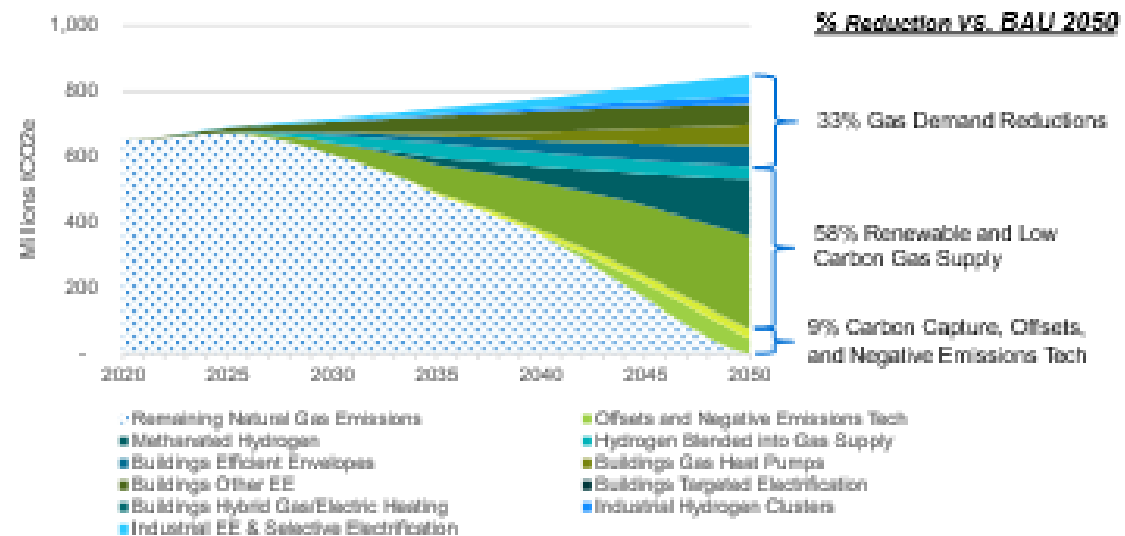
Gas Energy Efficiency Focus

- Gas heat pumps
- Major building shell retrofits
- High-efficiency gas appliances
- Other energy efficiency (E.E.) measures
- RNG & hydrogen blending
- Negative emissions technologies
- Aggressive fuel-neutral building energy codes

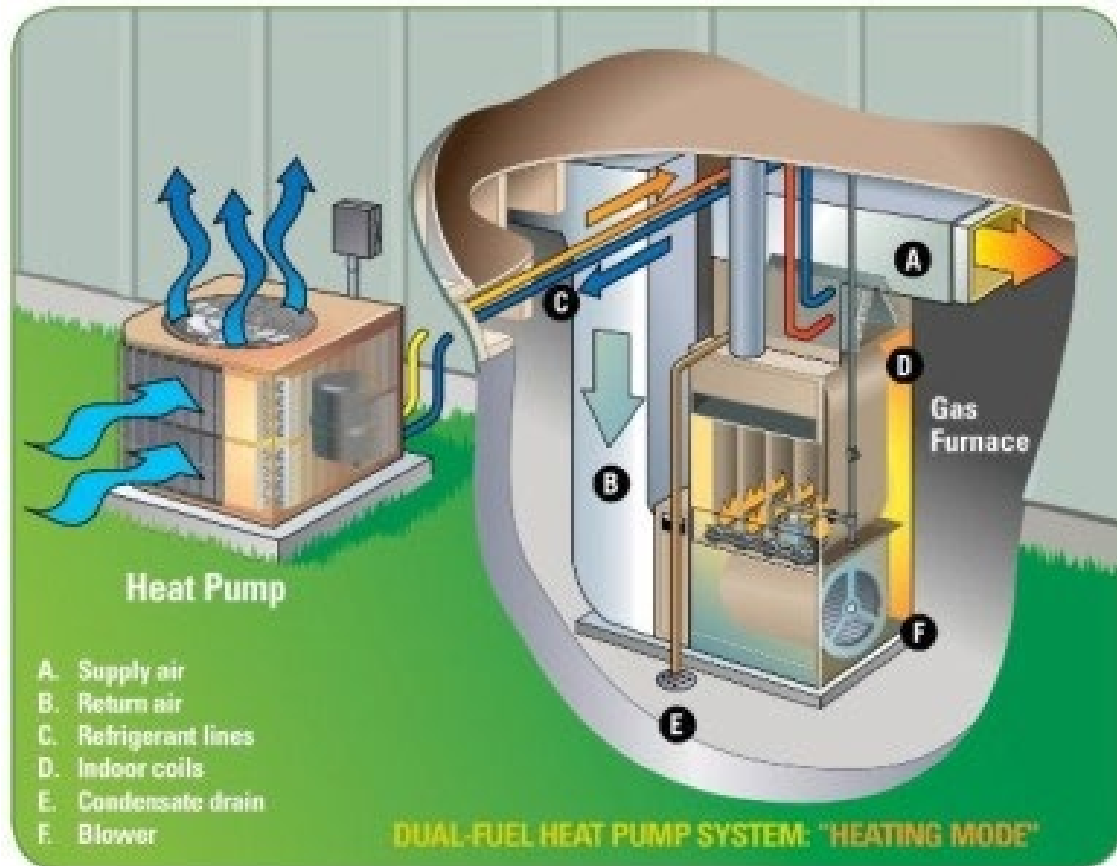
Key Insights

- 24% customer growth over the 30-year period
- The potential of gas heat pumps is significant, but requires technology deployment
- Gas DSM programs and infrastructure can drive emission reductions

Pathway to Net-Zero Customer GHGs (Gas Energy Efficiency Focus)



Dual-Fuel (Hybrid) Systems



- Continued utilization of gas infrastructure can bring flexibility to future energy systems and make net-zero pathways more feasible for the electric grid.
- Hybrid gas-electric heating systems provide space heating through the use of an electric air-source heat pump paired with a natural gas furnace.

Regulatory Considerations



Navigating Primary Barriers to Advancing Low Carbon Resources (LCR)

Navigating Primary Barriers to Advancing LCR

Advancing LCR at scale will require navigating potential barriers, using a host of enabling pathways to alleviate or minimize barriers. In searching for solutions to these barriers, stakeholders should contemplate a range of considerations.



Navigating Primary Barriers to Advancing Low Carbon Resources (LCR)

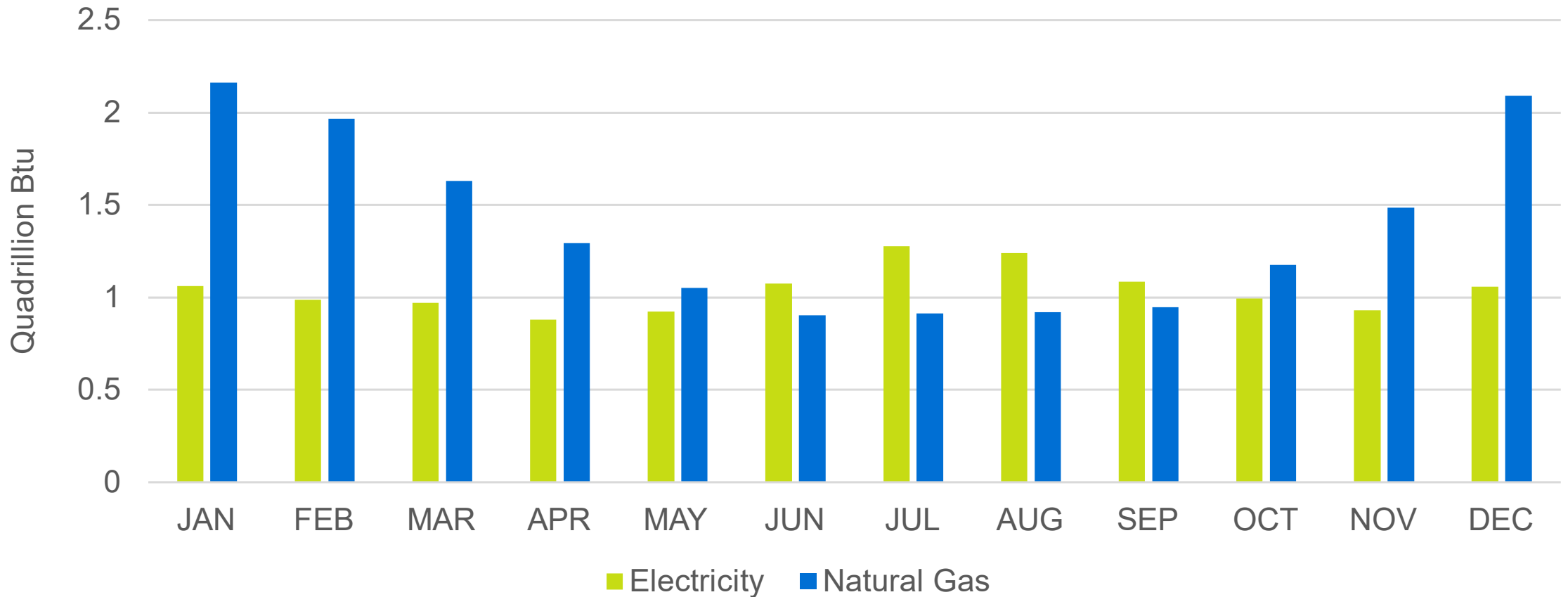
Examples of Overcoming Barriers to Advance LCR

Many gas utilities and stakeholders are working together to address the barriers to advancing LCR in jurisdictions across the United States, Canada and the United Kingdom. The table below provides some examples.

Barrier	Action Taken	Some Jurisdictions of Note
Ambiguous Authority	Explicit Legislative Guidance, Climate Goals and Targets, Gas RPS, Regulatory Authority to Consider Environmental Impacts in Regulatory Decisions	CA, MD, VT
Cost	Relaxing the Least-Cost Mandate, Carbon Pricing	CA, FL, OR, MN
Environmental Concerns and Uncertainty	Education and Outreach	MA, RI, OR
Aligning Utility Incentives with Policy Objectives	Rate Base Investment, Innovation Funding Programs, Pilot Programs, Incentives, Purchased Gas Adjustment (PGA) Mechanisms, Voluntary Green Tariffs	OH, ME, NJ, IL, WA
Cost Causation and Who Should Pay	Utility Rates and Riders, Public/Private Partnerships, Business Alliances, Green and Sustainability Bonds	Canada, United Kingdom
Technical Considerations	Infrastructure Replacement Programs, Rate Base Treatment of Interconnection Costs, Interconnection and Gas Standards	GA, AZ, CT, NY, NC

The ability of gas infrastructure to store and transport large amounts of energy represents an important and valuable resource

2020 U.S. Electric and Natural Gas Consumption Across all Customer Sectors



Other Key Findings



Other Key Findings

- Expanded energy efficiency, renewable fuels, and methane emissions mitigation can achieve significant emissions reductions.
- Large amounts of renewable and low-carbon electricity and gases, and negative emissions technologies, will be required
- Increased RD&D and coordination with the electric sector unlock more decarbonization measures
- Supportive policy and regulatory approval will be essential

The Path Forward

AGA and the natural gas utility industry will enable gas utility emissions reduction solutions through activities and initiatives in seven key areas.



Energy Efficiency and Improved Energy Management



Methane Mitigation Technologies and Strategies



Advanced Gas End-use Technologies



Renewable and Low-Carbon Fuels



Negative Emissions Technologies



Infrastructure Modernization



Workforce Development

Additional AGA Resources

- [A Thoughtful Pathway Towards U.S. Emissions Reductions \(AGA July 2018\)](#)
- [Renewable Sources of Natural Gas \(AGF December 2019\)](#)
- [Natural Gas Utility Efficiency Programs - American Gas Association \(aga.org\)](#)
- [Net Zero Emissions Opportunities for Gas Utilities \(AGA February 2022\)](#)
- [Regulatory Pathways for Advancing Low Carbon Gas Resources \(AGF February 2023\)](#)



Questions?

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Dual-Energy Strategic Initiative

April 24, 2024

Presence in Québec and in the U.S.

Québec



Distribution of **97% of all natural gas** in Québec

Public services regulated by the **Régie de l'énergie**



Network covers more than **340 municipalities**

More than **1,600 employees**



More than **212,000 customers**



25% stake in the Seigneurie de Beaupré **wind farms** in partnership with ÉDI (25%) and Boralex (50%)



Injection of approx. **20 Mm³ of renewable natural gas** into the network in 2023

Vermont

Distribution of **76% of electricity** and **100% of natural gas** in Vermont



Public services regulated by the **Vermont Public Service Board**



More than **200 municipalities** served

More than **650 employees**



More than **328,000 customers**



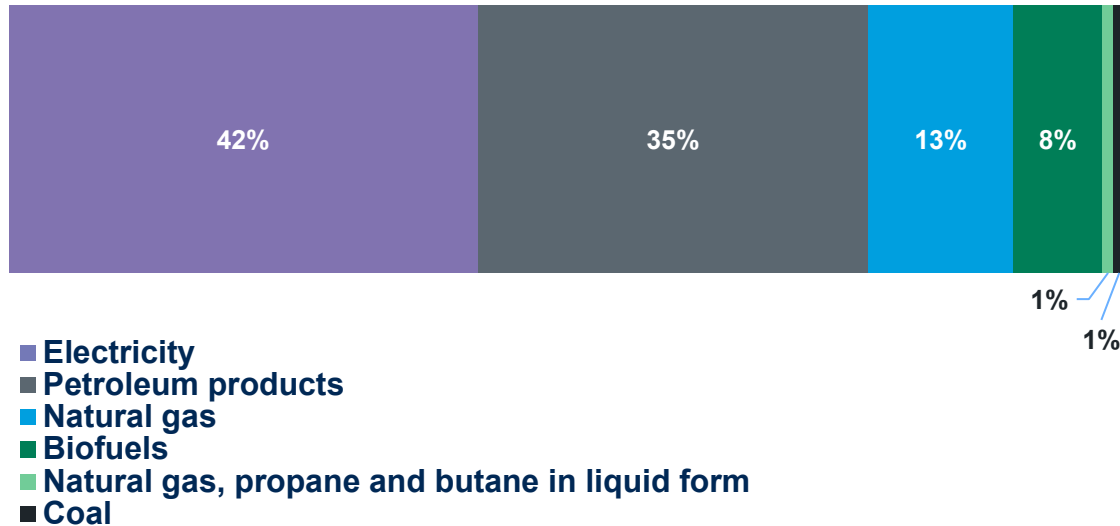
Production of renewable energy: 41 hydroelectric power plants, 2 wind farms and approx. **39 MW of solar energy**



Production of renewable natural gas from cattle manure, which generates **13 M kWh of electricity** annually

Québec: a distinct energy balance

The state of energy in Québec

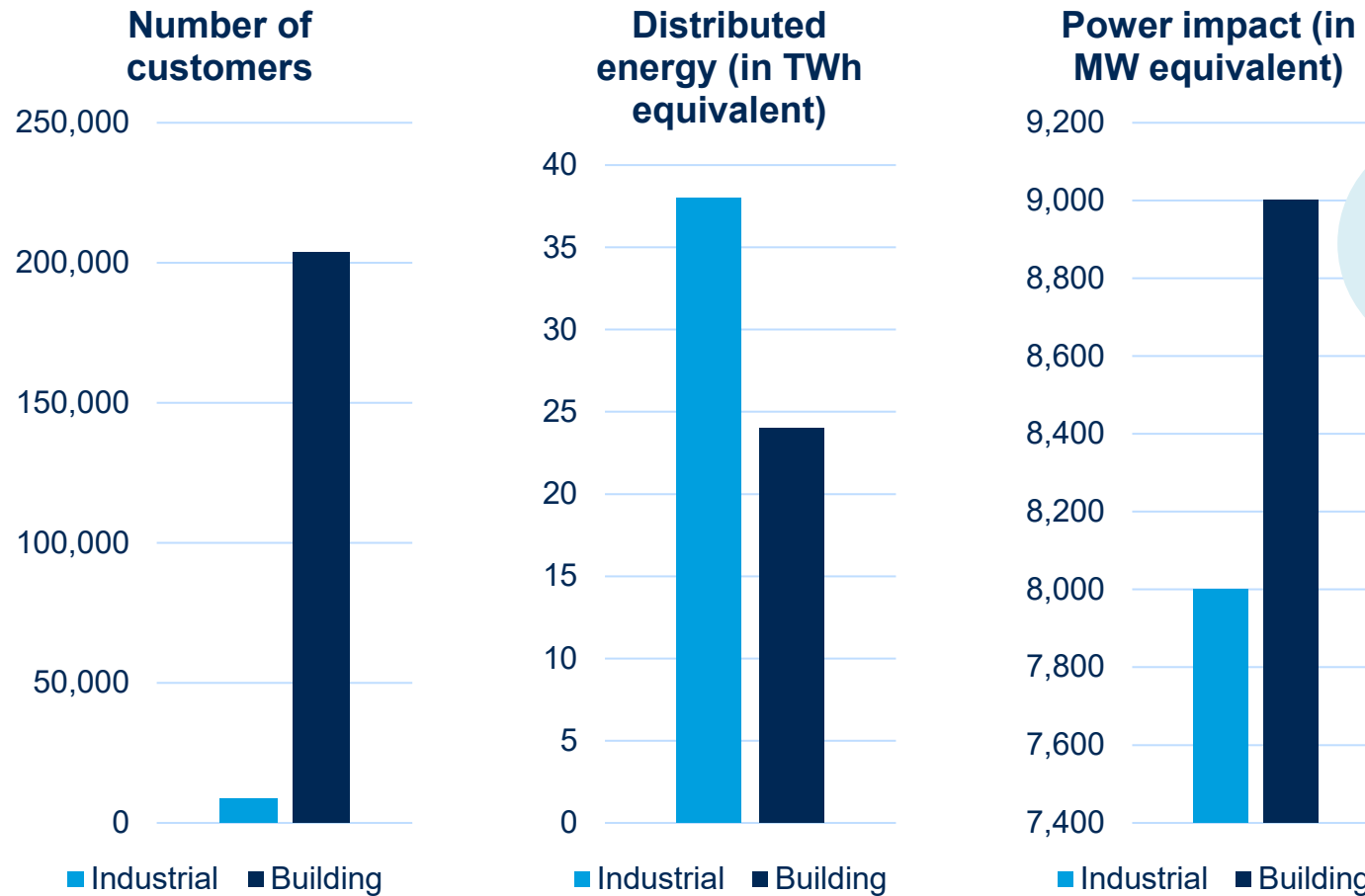


Approximately **6% of Québec's emissions are attributable to natural gas in the building sector**. 60% of greenhouse gases (GHGs) in the building sector come from natural gas.

Approximately **9% of Québec's emissions are attributable to natural gas in the industrial sector**. 28% of greenhouse gases (GHGs) in the industrial sector come from natural gas.

- Electricity occupies a large share of Québec's energy balance, a winning energy choice in Québec.
- In Québec, more than 80% of households use electricity for their main space-heating system
- However, there is tremendous consumption of petroleum products, which are big emitters of greenhouse gases and fine particles.
- By using electricity and natural gas more efficiently, Québec could play an even bigger part in reducing GHG and air pollutant emissions for the entire north-east of the continent.
- In doing so, Québec would reap the economic benefits that natural gas offers compared to other energy sources.

Énergir's Energy



Equivalent to
**10 La
Romaine
complexes**

30%
of energy
distributed
by HQ

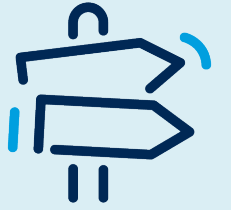
40%
of HQ peak
requirements

Each year, Énergir distributes energy equivalent to 62 TWh. The power impact of converting natural gas uses to electricity is estimated at 17 GW, equivalent to 10 La Romaine complexes.



Notes: Estimated equivalent electrical power/energy based on the natural gas profile of Énergir's customers billed in 2022, taking into account the gains in efficiency from switching from natural gas to electricity.

Énergir has set three main decarbonization targets for all its activities



By 2030

Reduce GHG emissions from energy distributed to our customers in the building sector by 30% compared to 2020

By 2040

Achieve carbon neutrality for energy distributed to all our customers in the building sector

By 2050

Achieve carbon neutrality for energy distributed to all our customers for the entire Énergir Group

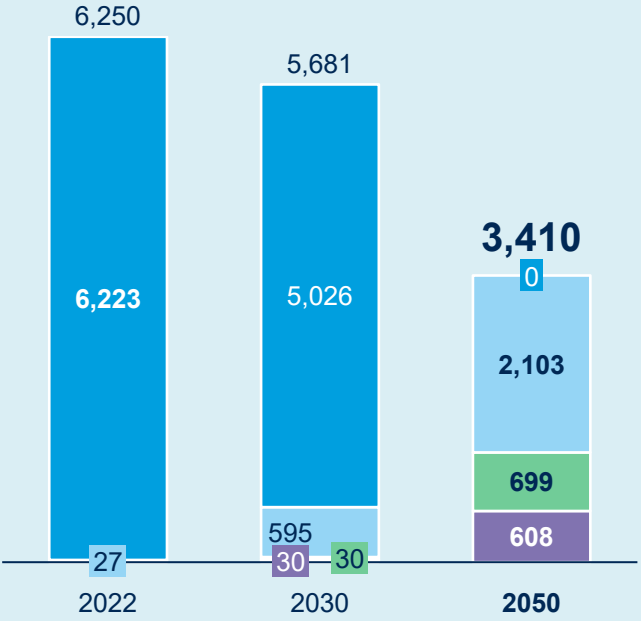
Énergir is a leader among comparable companies for its achievements and decarbonization goals.



Roadmap 2050: A vision of our decarbonized network

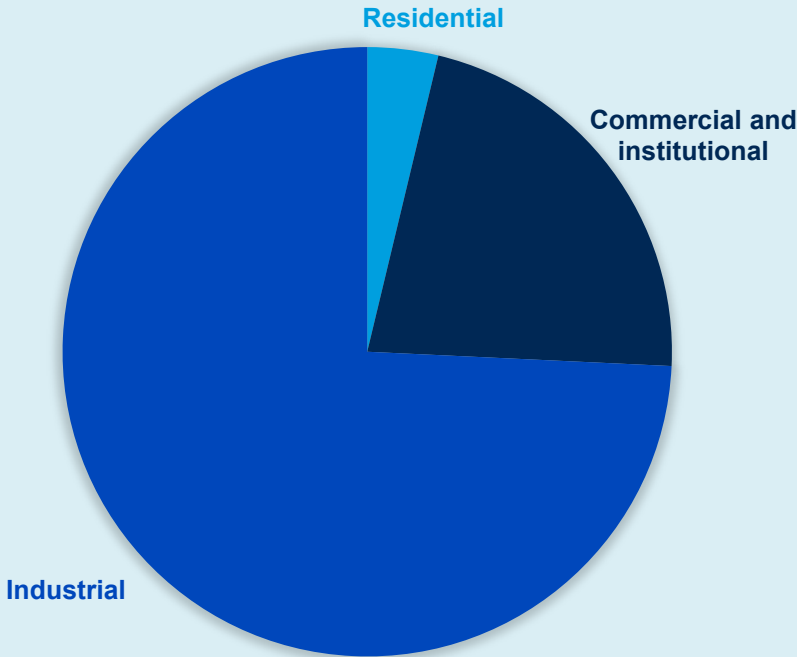
Composition of consumed energy in gaseous form

in distributed Mm³-eq.



- Fossil natural gas
- Renewable natural gas
- Low-carbon hydrogen
- Fossil natural gas with carbon capture

Projected consumption by sector in 2050



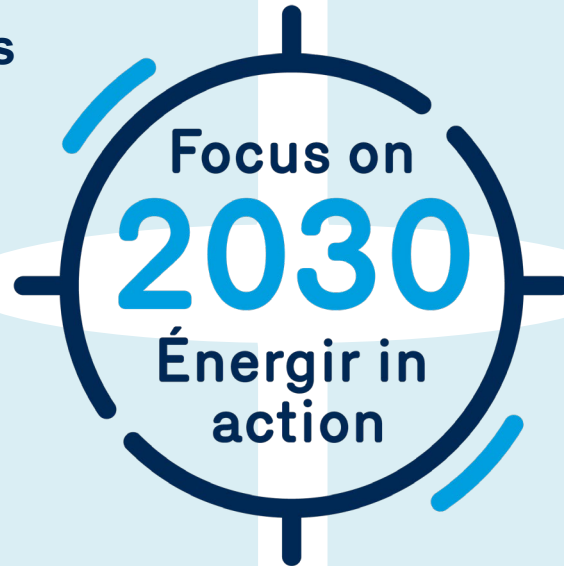
A vision for our natural gas distribution activities in Québec – 4 orientations

Increase our energy efficiency efforts

Develop a strong complementarity between the natural gas and electricity networks

Accelerate the injection of renewable natural gas

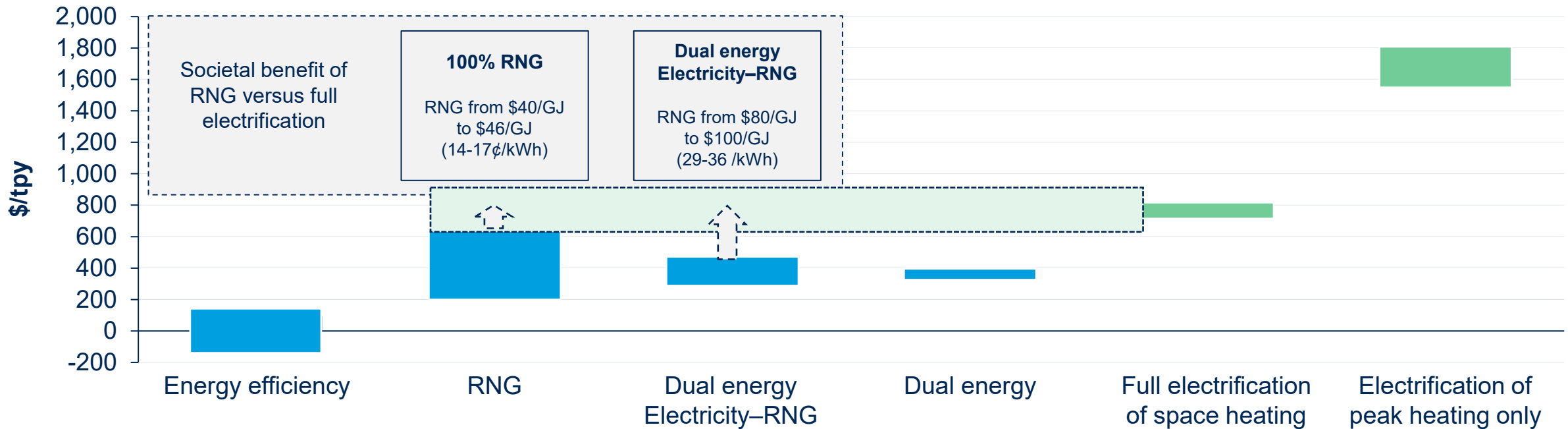
Diversify into new vectors of sustainable growth



The right energy, at the right place, at the right time, and at the best price.

Énergir's decarbonization initiatives are helping to decarbonize the economy at a lower cost than full electrification

Total cost¹ of decarbonization of fossil natural gas uses in \$/tonnes of CO₂-eq. per year (\$/tpy)



For most of the uses to be decarbonized, use of the existing gas network provides significant economic benefits for society

1. All required additional annual expenditures (OPEX + CAPEX) to implement the measure, including energy network requirements, and on Énergir's customers premises. The intervals shown are representative of more than 90% of the GHGs to be moved, for the 2030 projected volumes (existing and new customers). For RNG, an additional cost of \$26/GJ reflecting a price of about \$30/GJ is shown for the upper bound. For electricity, the avoided costs are based on Hydro-Québec's assumptions in the most recent supply plan. For dual energy and full electrification measures, the total decarbonization costs reflect the assessments provided by the firm Dunsky for both existing and new buildings. Excludes geothermal and configuration with NTC.



Increase our energy efficiency efforts

- Energy efficiency is the most economical option for reducing GHG emissions.
- More than **144,000 energy efficiency projects have been completed and 1.5 million tonnes of GHGs have been avoided** since 2001.
- Québec ranks first among Canadian provinces in natural gas savings.¹

By 2030, 1 million more tonnes of GHGs will be avoided through our energy efficiency programs.



¹ <https://electricenergyonline.com/article/energy/category/energy-efficiency/82/867058/quebec-takes-second-place-in-energy-efficiency-ranking-.html>



Accelerate the injection of RNG into our network

- Continue our role as a unifying and mobilizing force to drive the development of the RNG sector.
- Provide our customers a renewable energy that offers a number of benefits for them and for society.
 - For customers:
 - **Economic:** lower costs related to the cap-and-trade program (SPEDE)
 - **A flexible solution** for consumption, in both volume and duration
 - **Rapid:** no investment required in equipment for customers connected to the network
 - **A solution that complements** energy efficiency and dual energy to help reach carbon neutrality.
 - For society: Enables attainment of GHG reduction targets, with potential economic spin-offs in all regions.

By 2030, inject at least 10% renewable natural gas in order to reduce GHG emissions by 1 million tonnes.



New connections using 100% renewable energy

- Starting April 2024, all new connections to Énergir's gas network will be fuelled by 100% renewable energy:
 - 100% RNG or
 - Dual energy: electricity + RNG
- This initiative applies to any building in the residential, commercial and institutional sector.
- It is a concrete, responsible action taken to slow the growing consumption of fossil natural gas in the building sector.



A key initiative for the decarbonization of buildings.



Develop a strong complementarity between natural gas and electricity networks

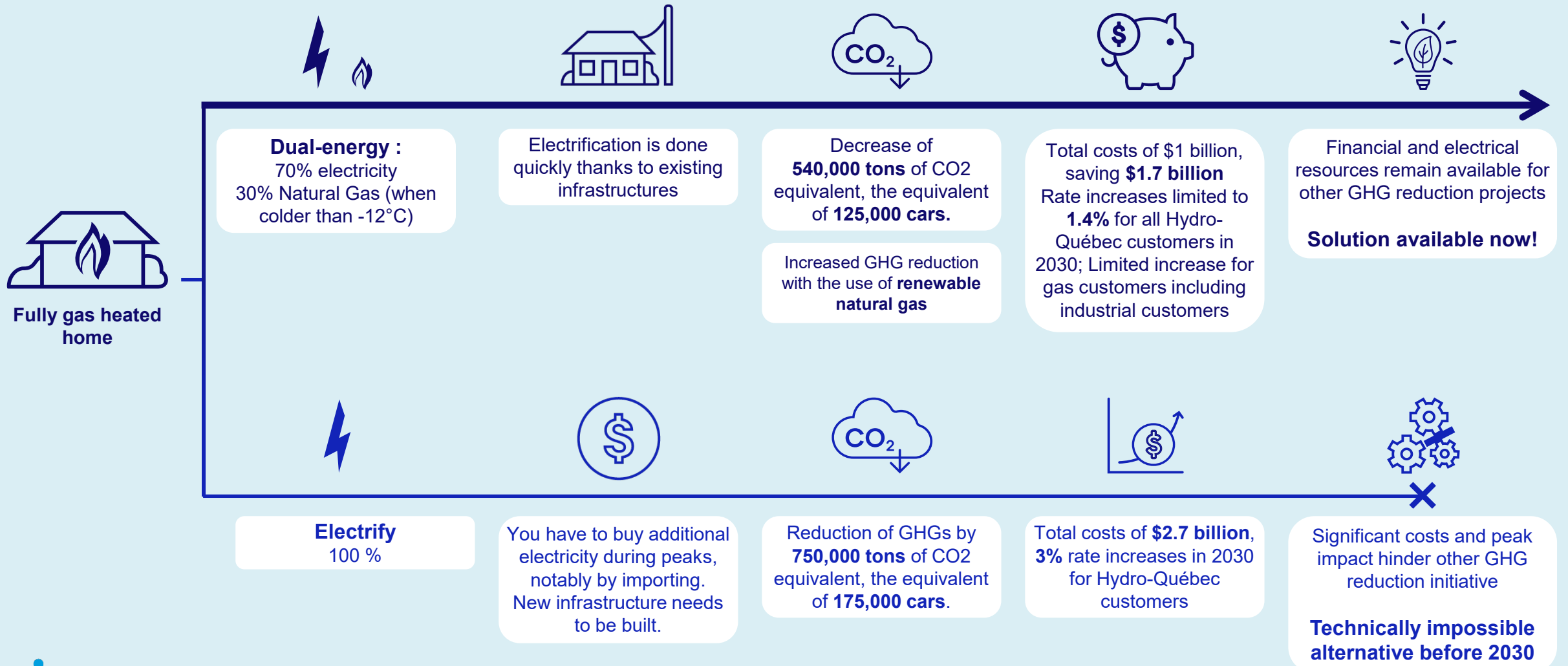
- Recognize capacity challenges and significant costs in the electrification of all uses of natural gas.
- Offer bi-energy solutions in the building sector to generate an electricity peak, at the best social cost, by electrifying a portion of some uses, while keeping natural gas for peak periods.
- Allow maximizing the value of natural gas rather than volumes distributed.

By 2030, reduce GHG emissions by 0.5 million tonnes through complementarity.



Dual energy at a glance

The solution to electrify quickly and at the lowest cost, while allowing other GHG reduction initiatives



Challenge: Finding a balance

Minimize **costs**



1. Cost

Minimize energy costs and ensure equity in sharing the financial burden of decarbonization to encourage behavioural changes

2. Resilience

Guard against climate, physical or human risks with an impact on continuity and service reliability

3. Decarbonization

Minimize GHGs as quickly as possible by minimizing impacts on biodiversity

Ensure the **resilience**
of the energy system



Maximize **decarbonization**



This balance will require the right energy, used in the right way, at the right time and at the best price.

Thank you!





**A Vision for Building California's
Hydrogen Economy**

California's Climate Goals and Policies

CARB Scoping Plan (2022)



“Achieving carbon neutrality must include transitioning away from fossil gas in residential and commercial buildings, and will rely primarily on advancing energy efficiency while replacing gas appliances with non-combustion alternatives . . . **Blending low-carbon fuels such as hydrogen and biomethane into the pipeline further displaces fossil gas.**” (Scoping Plan, p. 212.)

CPUC Hydrogen Blending Impacts Study (2022)

“California is committed to the reduction of GHGs while simultaneously increasing renewables use in the energy sector. **Renewable hydrogen is increasingly expected to play an important role as a renewable fuel in various sectors including transportation and industry also as an energy storage medium** that can help the State transition to a carbon neutral economy.” (CPUC Report, p. 1.)



The CEC Integrated Energy Policy Report (2023)



Concluded that **the agency should support research into clean hydrogen as a potential solution to California's climate challenges, including the blending of hydrogen into the natural gas system.** (Integrated Energy Policy Report, pp. 72, 95.)

2024 Joint Agency Staff Paper: Progress Towards a Gas Transition

The Joint Agency is made up of the California Public Utilities Commission (CPUC), California Energy Commission (CEC), and California Air Resources Board (CARB)

“ Low-carbon fuels can be a complementary pathway to electrification and may be particularly useful for electric generation or for “hard-to-electrify” applications where direct electrification is technically challenging or cost-prohibitive, such as in the industrial sector. **These fuels include biomethane and certain forms of hydrogen, which can be produced through numerous pathways** with differing environmental and public health impacts.” (page 14)

“ Lastly, electrification may require additional electricity generation and delivery infrastructure. **Decarbonization involving hydrogen or CCUS may require construction of pipelines, storage, and other infrastructure.**” (page 22)

“ **Hydrogen can serve as a ‘battery’ that can store electricity and later generate it through a fuel cell via an electrochemical reaction or through hydrogen combustion turbines.** The major gas turbine manufacturers now offer modifications that convert fossil gas turbines to burn a hydrogen and fossil gas blend, and manufacturers are working on designs to run turbines on 100 percent hydrogen fuel.” (page 26)

“ **Hydrogen can be used in nearly all transportation applications, especially those that are difficult to directly electrify** such as long-haul trucking, locomotives, marine transport, heavy equipment, and aviation.” (page 27)

“ **California’s gas system reliability and electric grid reliability are closely entwined;** reliability and cost impacts on one system are tightly linked to the other... For example, gas generation supports the grid during periods of low solar, wind, and hydroelectric generation, and electric grid reliability will only become more critical as large portions of the economy are electrified (see Figure 8). While the State is rapidly adding four-hour duration battery storage, gas generation is still projected to be needed through 2045.” (page 36)

[H₂]

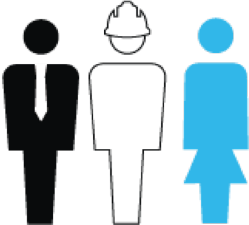
UNIQUE ROLE OF REGULATED UTILITIES SUCH AS SOCALGAS IN HYDROGEN TRANSITION

California has opportunity to leverage existing infrastructure and repurpose natural gas infrastructure to transport clean fuels. Utilizing existing resources, infrastructure and workforce helps make transition more efficient and affordable.

SoCalGas committed partner to supporting California in clean energy transition – bringing unique assets:

Delivering Energy to Southern and Central California for

150+
YEARS



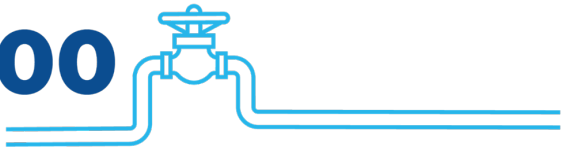
Supplying jobs to
8,700
EMPLOYEES

ASPIRE
2045



Largest gas utility in North America to set a net zero target including scopes 1, 2 and 3 GHG emissions by 2045

100,000
MILES

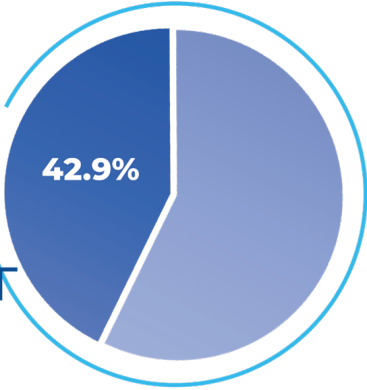


of pipelines & accompanying rights-of-way - Central & Southern California, from Fresno to Mexican border

SUPPLIER DIVERSITY IN 2022

\$2.41 BILLION
TOTAL PROCUREMENT

\$1.03 BILLION
SPENT WITH **DIVERSE FIRMS**



Regulated utilities offer better customer

PROTECTION
ON RATES



Largest natural gas distribution utility in country,¹ powering Southern California with increasingly clean, safe and reliable energy delivered to more than

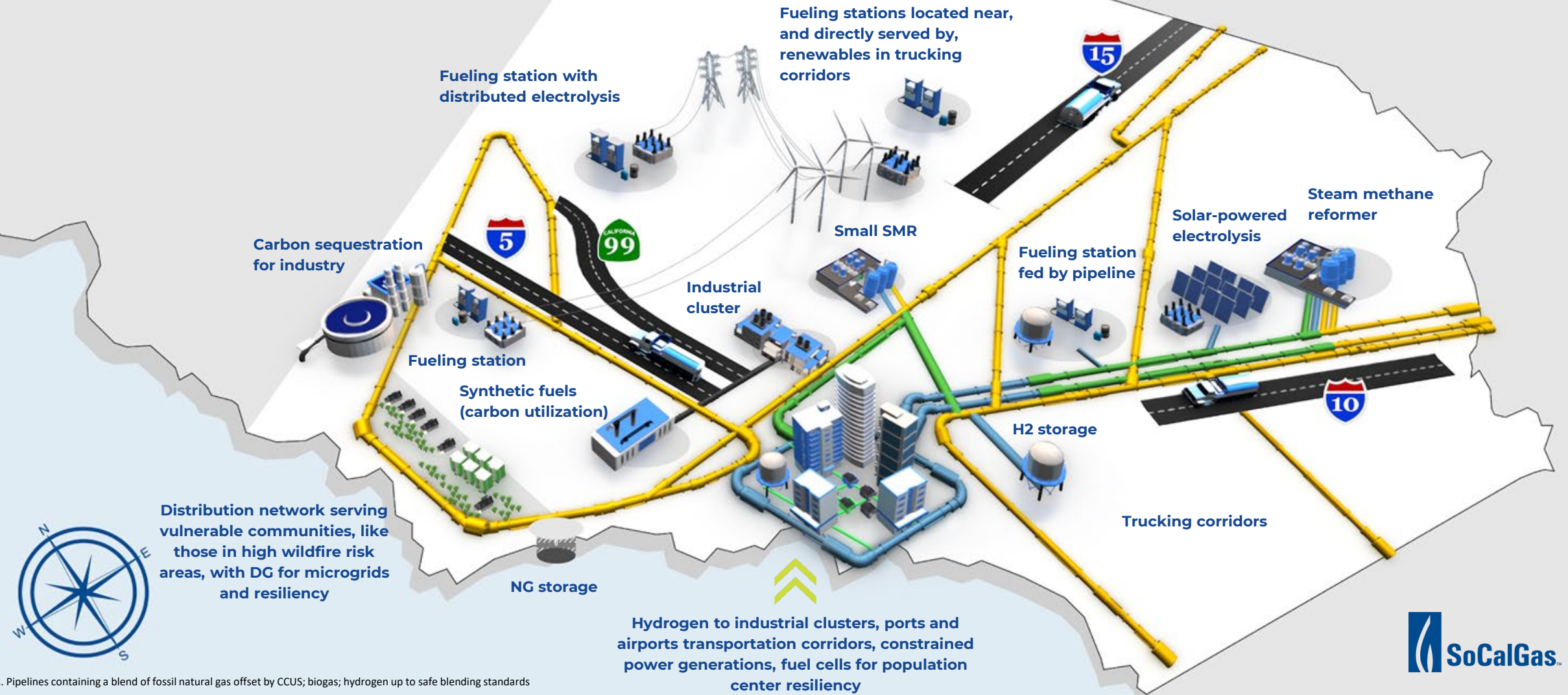
21+ MILLION
CUSTOMERS

¹ based on number of customers and revenue



Clean Fuels Technologies Aligned with Scoping Plan in IEPR

- Existing NG pipeline with blended fuels
- New dedicated H2
- Retrofit NG pipeline for H2 transport
- CO2 pipelines

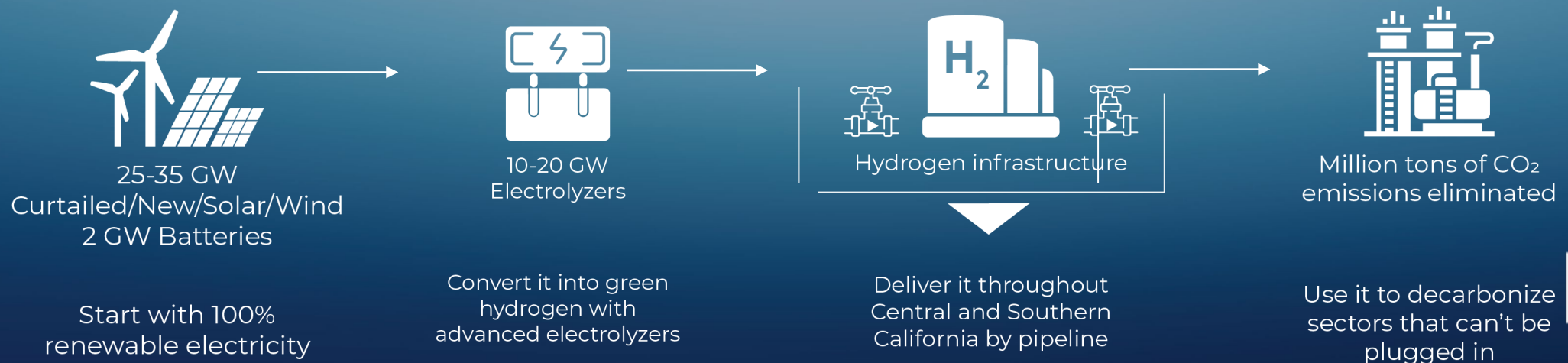


1. Pipelines containing a blend of fossil natural gas offset by CCUS; biogas; hydrogen up to safe blending standards

SOCALGAS ADVANCES ANGELES LINK

As envisioned, Angeles Link could:

- » Be one of the nation's largest clean renewable hydrogen delivery systems
 - Could deliver clean renewable hydrogen in an amount equivalent to ~25% of the natural gas that SoCalGas delivers today, to serve:
 - Clean Electric Generation, including hydrogen microgrids & fuel cells
 - Transportation
 - Manufacturing/Industrial
- » Help reduce natural gas use served by the Aliso Canyon natural gas storage facility and facilitate its ultimate retirement over time and combined with other clean energy projects
- » Deliver decarbonized, reliable, renewable energy to Central and Southern California, including the Los Angeles Basin
 - Could significantly improve regional and local air quality in areas burdened with the worst air quality in the nation, benefitting hundreds of disadvantaged communities
- » SoCalGas' existing infrastructure, skilled workforce, and established regulatory frameworks promote the safest, fastest, and most affordable path to transition essential industries to clean renewable hydrogen



Furthering California's Efforts to Develop Hydrogen Blending Standards

SoCalGas and three other major utilities have filed an amended application with the CPUC to develop a series of projects aimed at demonstrating how blending clean hydrogen into the natural gas system could:

- » Effectively reduce greenhouse gas emissions
- » Improve air quality
- » Scale up hydrogen as outlined in California's climate plan

SoCalGas is proposing 2 demonstration projects -- blending amounts as low as 0.1% hydrogen into isolated sections of the natural gas system.

Hydrogen concentrations can be incrementally increased based on what is learned.

T H R E E M A I N F O C U S E S

Impacts of hydrogen
on polymeric materials

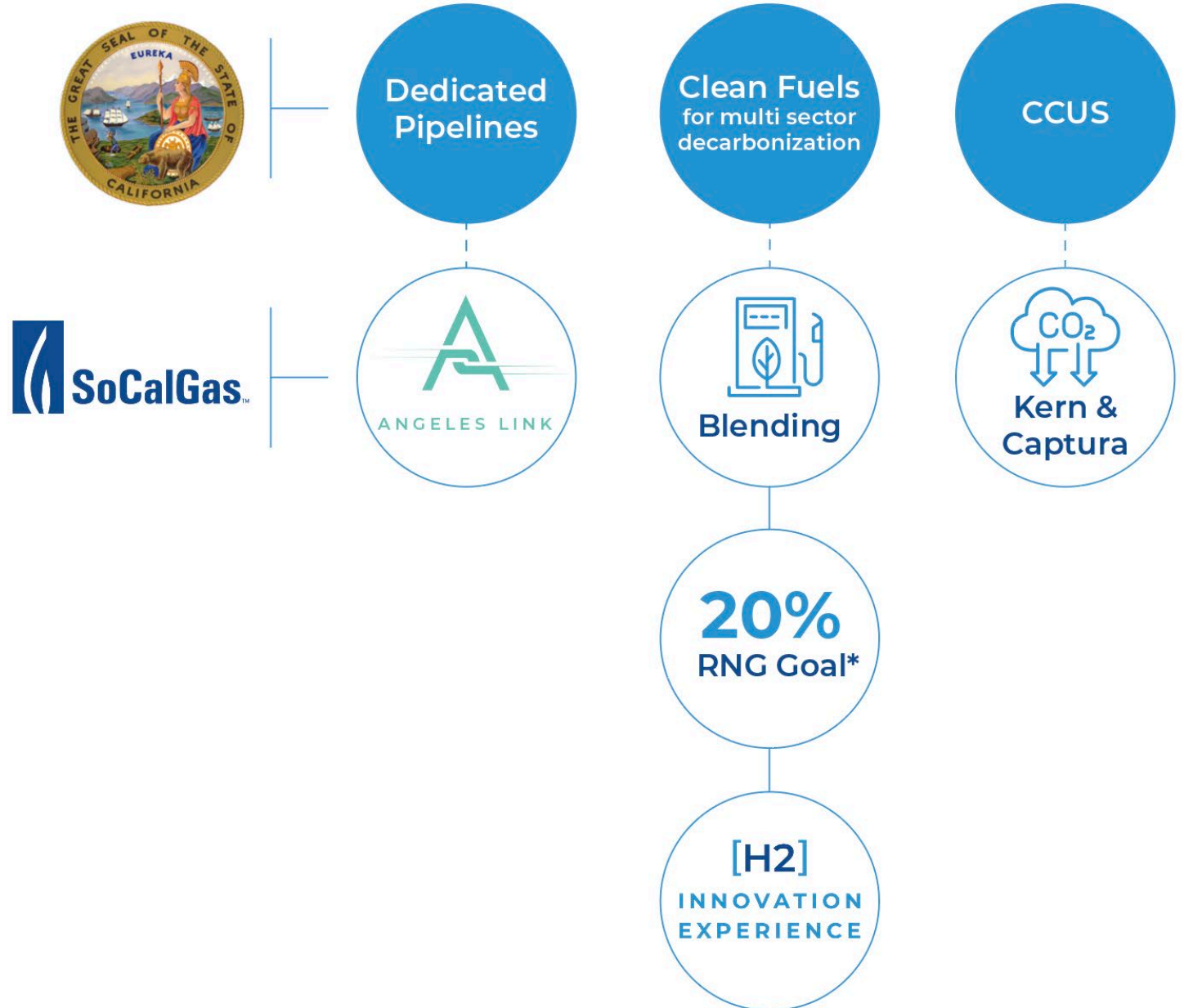
Leakage rates (if any) of methane
and hydrogen blends compared
to 100% methane

Impacts of hydrogen
on metals and alloys

California Goals in Action

“ The path forward is not dependent on one agency, one state, or even one country. It will take action on a global level to address the threat climate change poses. But, the work begins at home. The state can lead by engaging Californians and demonstrating how action at the state, regional, and local levels of government, as well as action at community and individual levels, can contribute to addressing the challenge before us. We must build partnerships with academic institutions, private industry, and others to support and accelerate the transition to carbon neutrality.”

- 2022 CARB Scoping Plan



*As part of SoCalGas' goal of achieving net zero greenhouse gas (GHG) emissions in its operations and delivery of energy by 2045, the utility plans to deliver 20% RNG to core customers by end of 2030 and continues to make significant progress towards reaching its goal.