



Renewable Natural Gas

Committee of Chief Risk Officers Quarterly Meeting

March 28, 2018

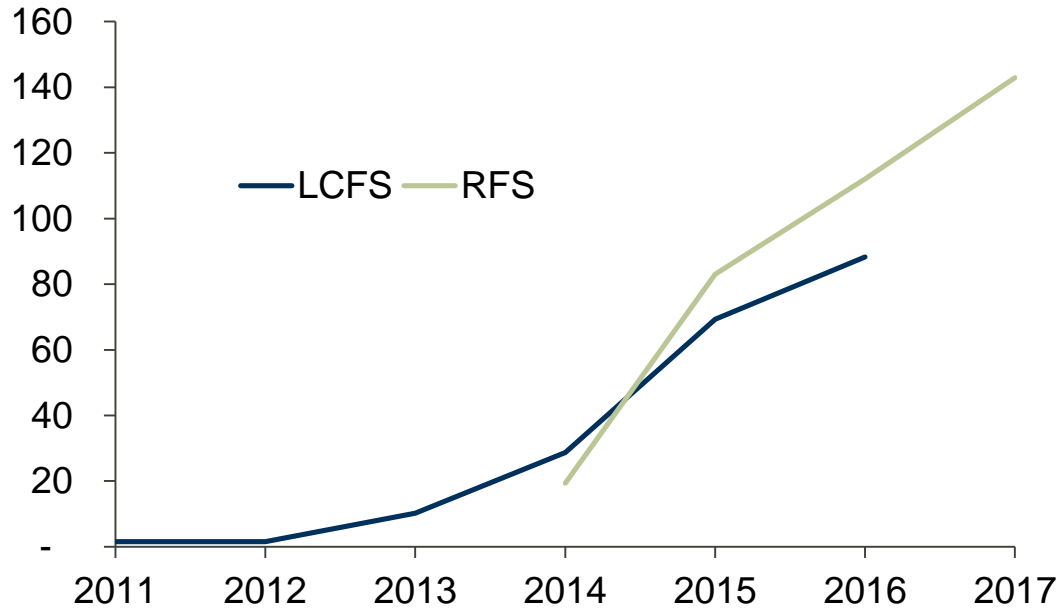
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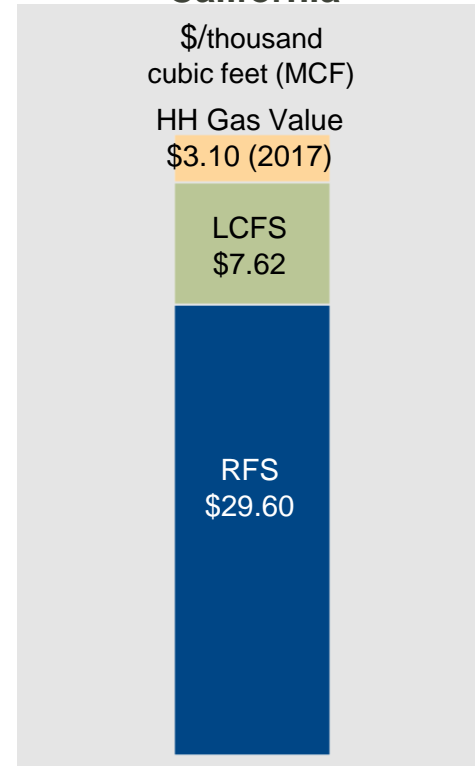
Renewable Natural Gas (RNG) and Transportation Fuels

RNG Use for U.S. and California Fuel Standards

million gallon diesel equivalent



Potential Value of RNG in California



Note: The Renewable Fuel Standard (RFS) is a national policy requiring a certain volume of renewable fuel to replace or reduce the quantity of petroleum-based transportation fuel, heating oil or jet fuel. California's Low Carbon Fuel Standard (LCFS) requires producers of petroleum-based fuels serving the California market to reduce the carbon intensity of their products.

Drivers for Low-Carbon Energy

197 Countries reaffirm commitment to Paris Climate Agreement

- China, India, EU demonstrate leadership

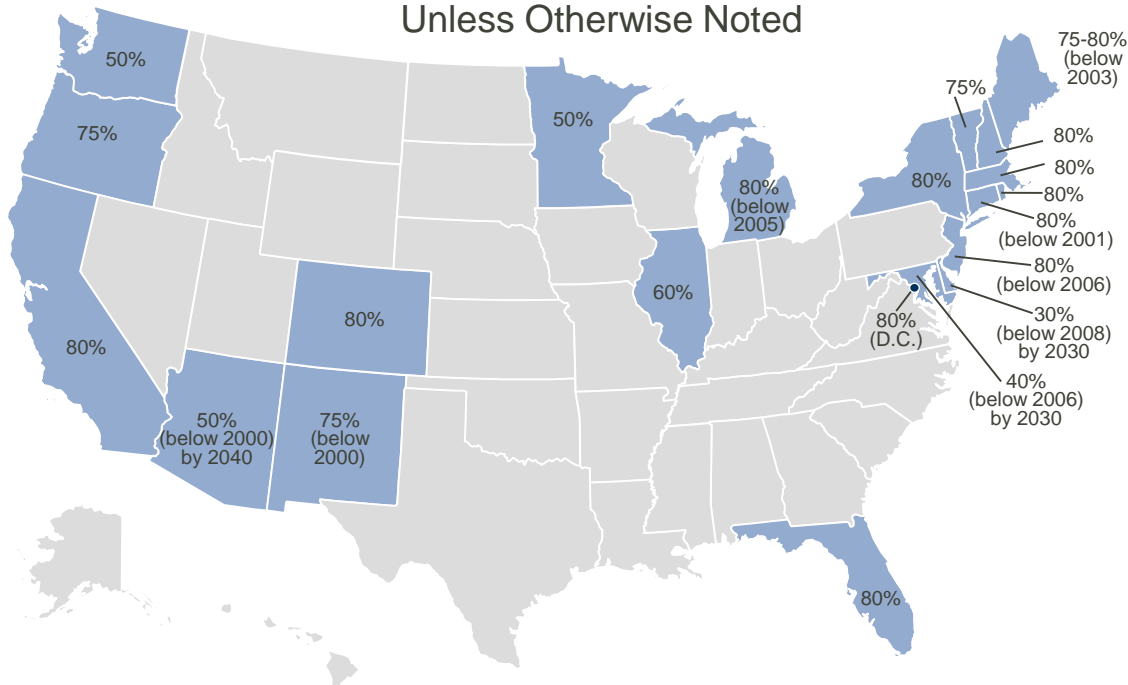
Non-federal U.S. climate pledges to achieve Paris climate goals¹:

- U.S. Climate Alliance. 14 states and Puerto Rico representing 36 percent of U.S. population.
- We Are Still In. 2,320 states, cities, businesses, and universities representing 40 percent of U.S. population.
- U.S. Climate Mayors. Mayors of 383 mayors representing 23 percent of U.S. population.

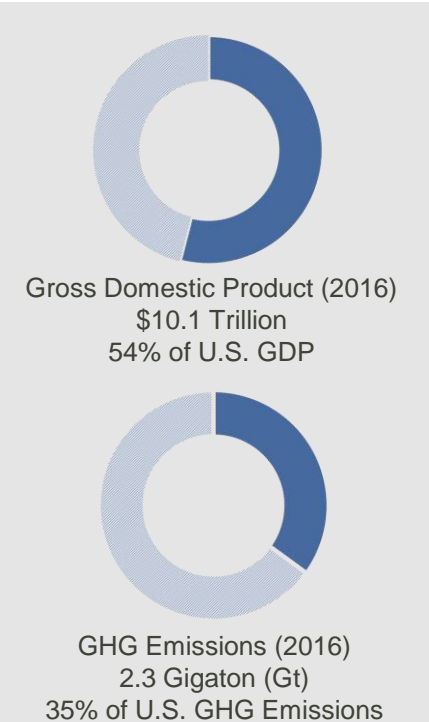
¹ there is overlap of population percentages across each group

2050 GHG Reduction Targets From 1990 Baseline

Unless Otherwise Noted



GDP and GHG emissions of states and cities supporting the Paris Agreement

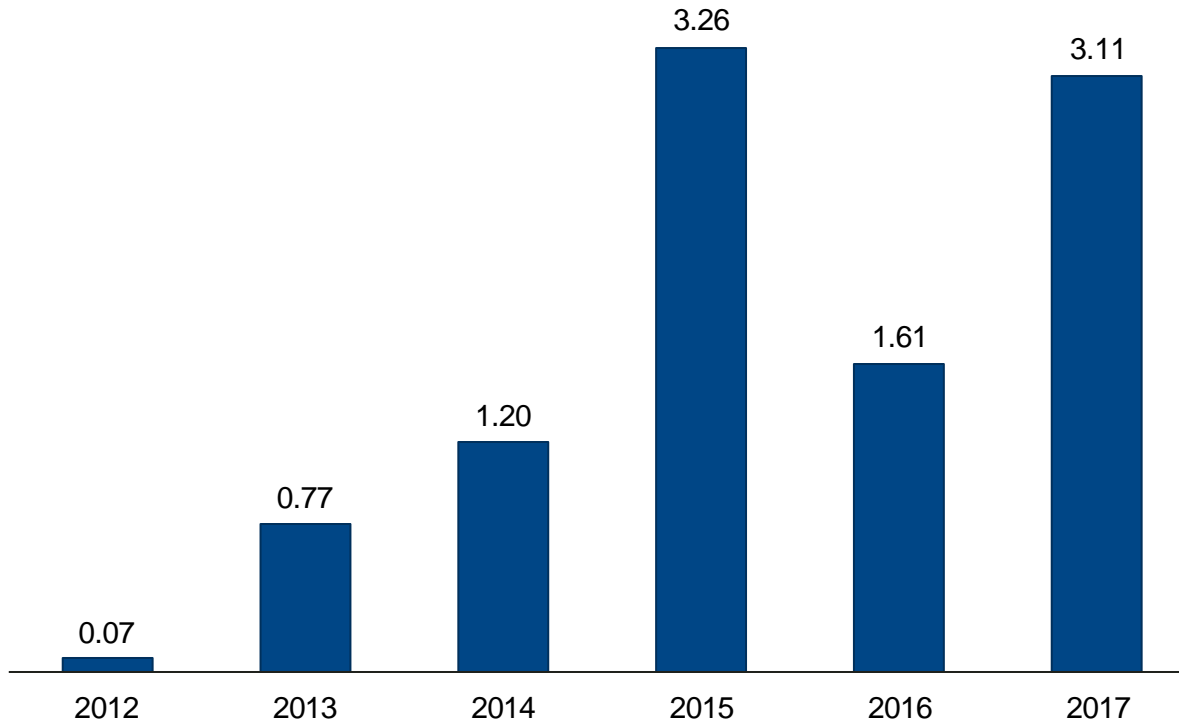


Source: America's Pledge

Corporate Sustainability Initiatives

Increased Corporate and Non-Utility Renewable Procurement

Renewable Electricity Demand (gigawatt)



Source: Rocky Mountain Institute, MJB&A analysis

RE 100

130 companies committed to 100% renewable electricity

 RENEWABLE THERMAL COLLABORATIVE

 Cargill

 GM

 Kimberly-Clark

 MARS Incorporated

 P&G

 City of Philadelphia

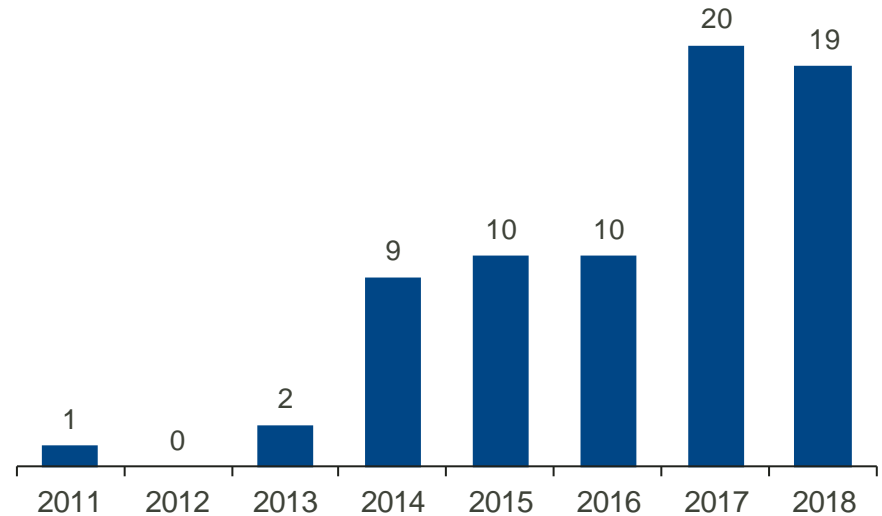
Expanding renewable energy use beyond electricity to include natural gas consumption.

Investor Interest in Climate Strategies



The Financial Stability Board created the **Task Force for Climate-Related Financial Disclosures (TCFD)** to develop guidelines for companies to assess and report climate-related risks in financial-disclosure documents. TCFD published its final recommendations in June 2017.

Number of 2-Degree Resolutions Filed



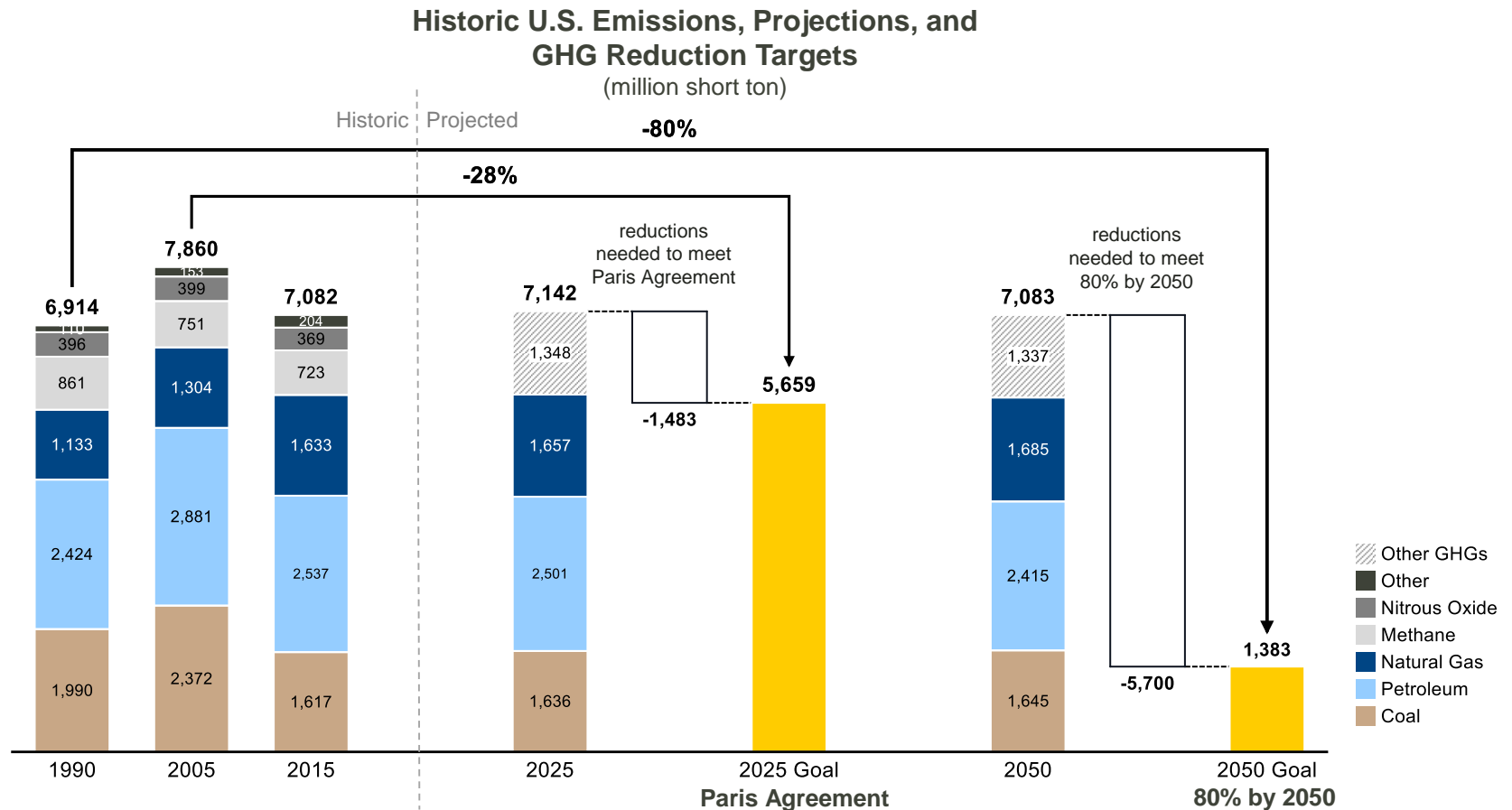
Source: Ceres Engagement Tracker

Note: Resolutions seek assessments of the “risks and opportunities” associated with a 2-Degree target (greenhouse gas (GHG) emissions reductions that are consistent with limiting global temperature rise to 2 degrees Celsius)



In April, Ceres will release a climate assessment framework developed by MJB&A for electric power companies. The framework provides specific guidance for assessing climate change-related risks and opportunities for U.S. electric companies.

Emissions Sources and Goals



Sources: U.S. Energy Information Administration historic and projected CO₂ emissions from fossil fuel consumption; EPA GHG Inventory; MJB&A analysis

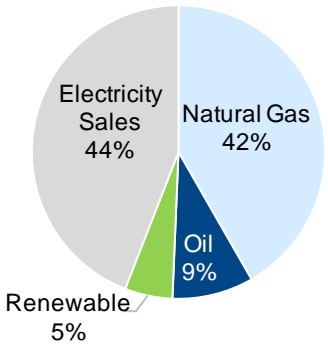
Notes:

1. CO₂ emissions from fossil fuel consumption shown by fuel type, which represents roughly 82% of total emissions
2. "Other" includes emissions from HFCs, PFCs, SF₆, NF₃
3. "Other GHGs" estimated using EPA GHG Inventory historic 2015 non-CO₂ emissions' share of total GHG emissions
4. 2025 and 2050 projections based on U.S. Energy Information Administration Annual Energy Outlook 2017

2016 Total Energy Consumption by End Use Sector

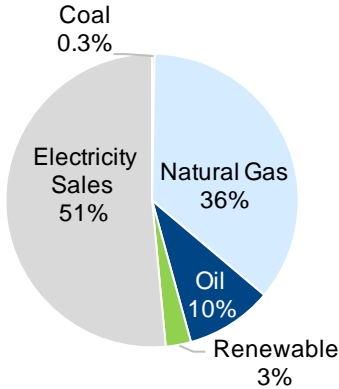
Energy consumption totals highlight emissions reduction opportunities by sector: decarbonize electricity and address emissions from natural gas and oil end uses

Residential



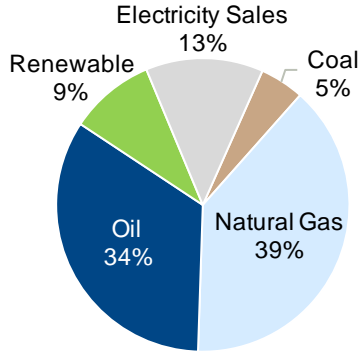
10.9 Quadrillion Btu

Commercial



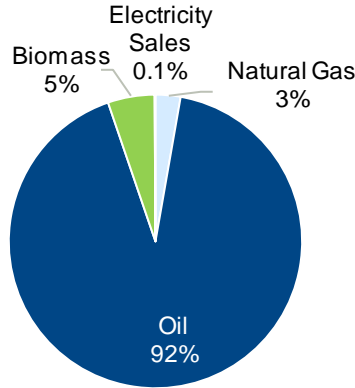
9.0 Quadrillion Btu

Industrial



24.7 Quadrillion Btu

Transportation

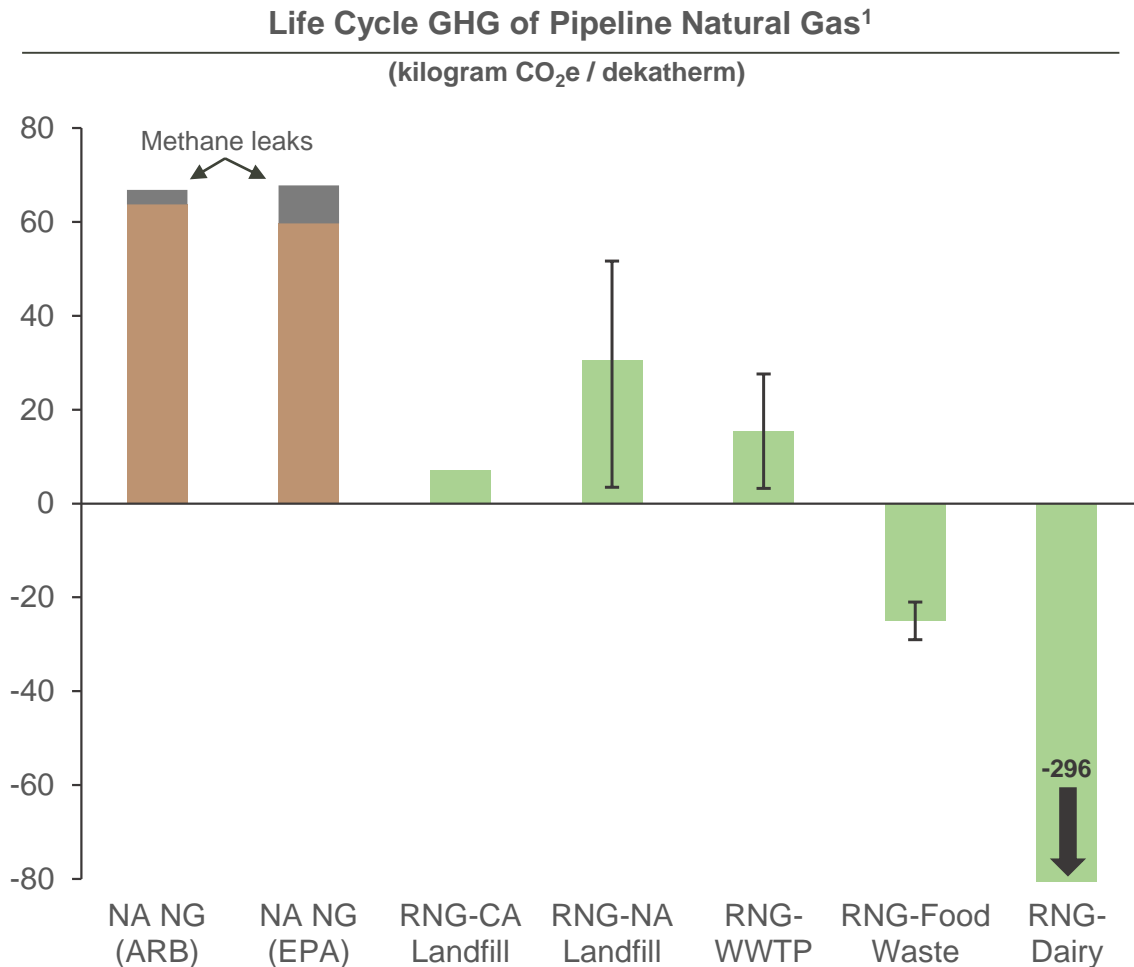


27.8 Quadrillion Btu

Note: Does not include electrical system energy losses

Source: EIA, Monthly Energy Review

RNG GHG Benefits



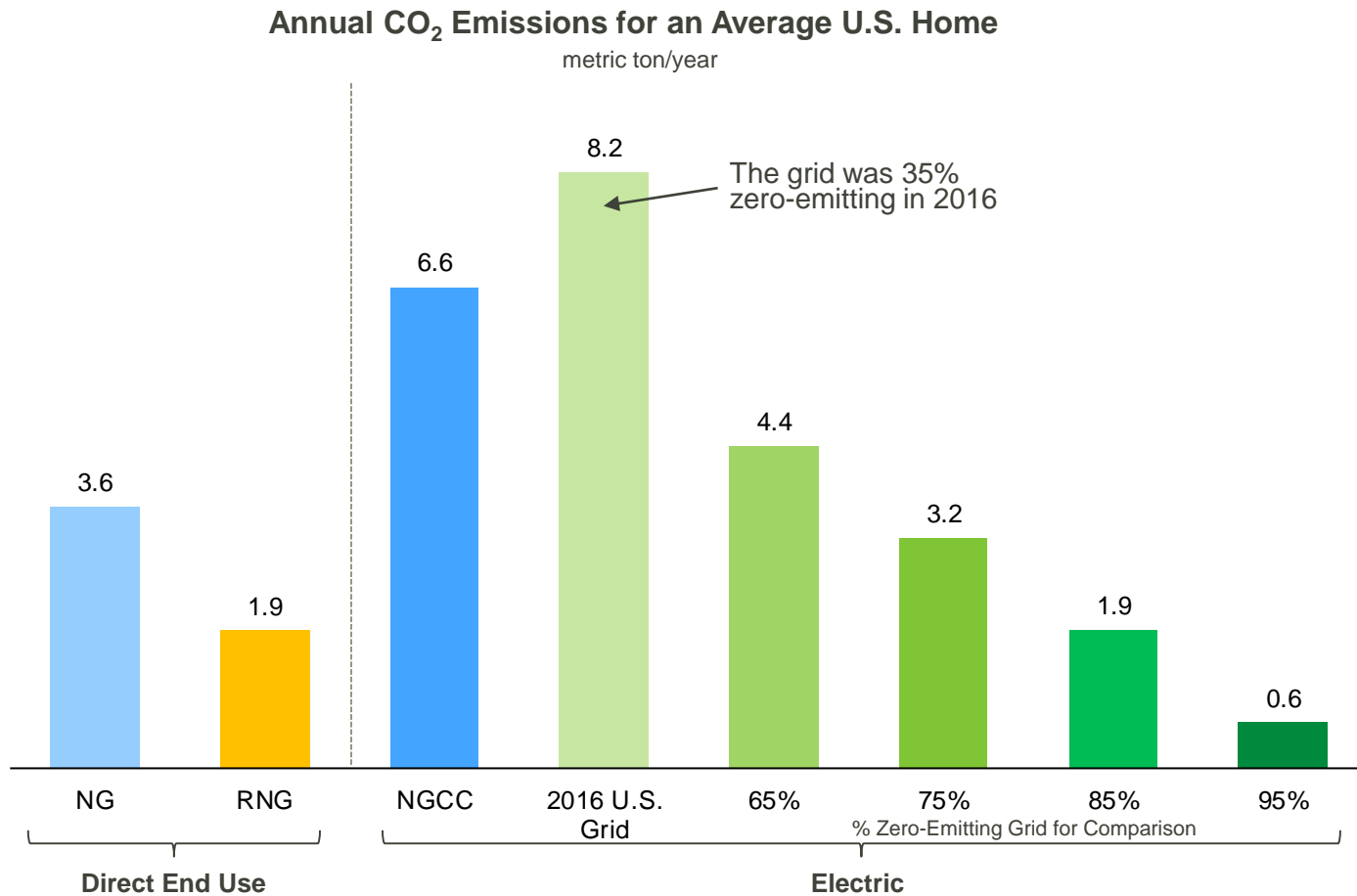
¹Based on California LCFS. Error bars show range of approved pathways for commercial fuels. EPA values for North American natural gas based on EPA GHG Inventory.

Other RNG Benefits

- Generates local economic activity and job creation
- Local gas supply enhances fuel diversity
- Local air quality improvements (elimination of flaring and onsite combustion of biogas)
- Uses existing infrastructure to deliver renewable energy
- Beneficial use of a waste stream
- More efficient use of energy (compared to onsite electric generation)

Residential Emissions Comparisons

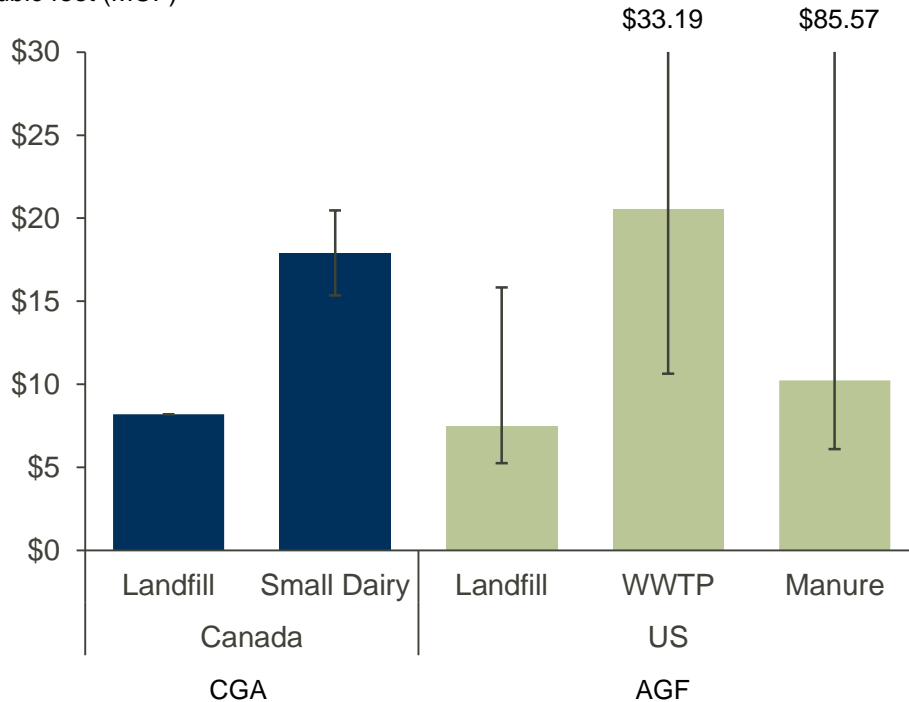
Comparison of CO₂ emissions profiles for natural gas, RNG, and electricity serving residential end uses.



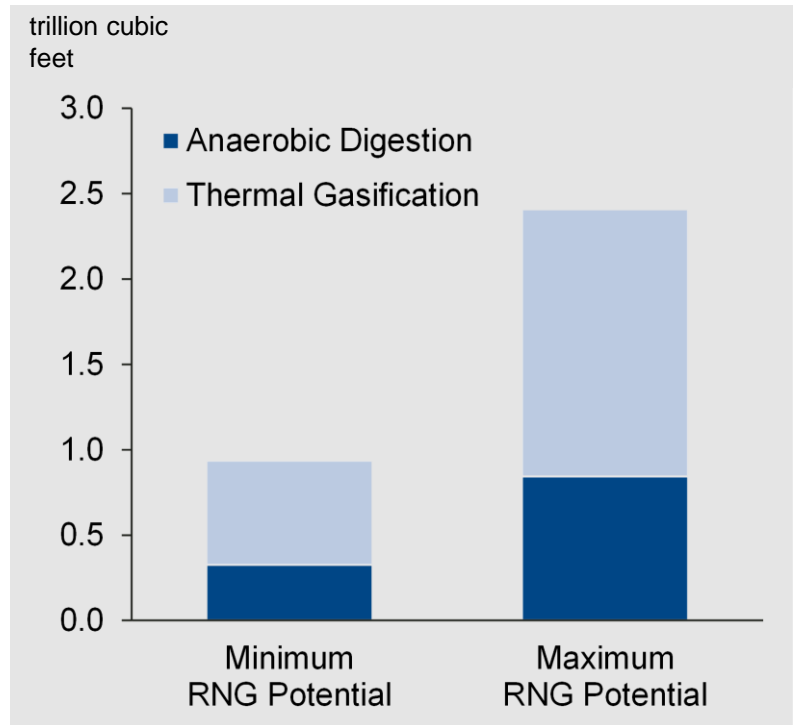
RNG Costs and Potential Supply

RNG Cost Estimates from Various Feedstocks

2017\$/thousand cubic feet (MCF)



American Gas Foundation Estimates RNG has Potential to meet 10% of U.S. Natural Gas Demand



Sources: Canadian Gas Association (2014), American Gas Foundation (2011), MJB&A Analysis.

RNG Barriers

Regulatory

Natural gas LDCs (local distribution companies) are subject to least-cost requirements. Costs for RNG can be challenging to approve. Most regulators do not consider climate targets in cost analyses.

Financial

A biogas collection system, RNG processing facility, and gas pipeline interconnection and lateral can cost tens of millions of dollars.

Market

Current primary demand drivers are the transportation and electric power sectors. RNG customers must be willing to pay higher prices to justify investments.

Technical

Uniform gas quality and interconnection standards are key to providing certainty to both RNG producers and the LDCs accepting RNG into their systems.

Voluntary RNG Offerings



FORTIS BC™

- Launched in 2011, program offers customers RNG blends of 5%, 10%, 25%, 50%, or 100%.
- Majority of costs covered by participating customers; remaining costs shared across non-participating customers.
- Current/future suppliers include digesters and landfills, and wastewater treatment plants. Current annual supply is (~280,000 MCF).



Vermont Gas

- Approved in Fall 2017, program offers customers RNG blends of 10%, 25%, 50%, or 100%.
- Developed in response to customer demand – survey found 85% of customers willing to pay 10% more for a renewable product.
- VGS expects demand for 100,000-200,000 MCF in first year.
- Pricing structure not yet finalized; expected in early 2018.

DTE Energy®



- Launched as pilot in 2012 and became permanent in 2015.
- Participating customers pay \$2.50 a month; no rate impact on other customers.
- No RNG blend percentages; participation supports ongoing utilization of RNG in DTE's system.
- RNG comes from a landfill. Producer responsible for upgrading while DTE built lateral and metering station.

Advancing Renewable Natural Gas Opportunities

Private-Public Partnerships



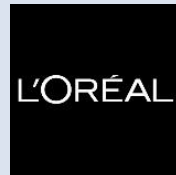
Partnerships to build RNG production facilities and associated infrastructure

RNG Upgrading Tariffs



New tariffs help to address some of the high, upfront costs for producers

Customer Demand



L'Oréal USA recently announced carbon neutrality plan using RNG for 21 U.S. facilities

Power to Gas Pilots



New tariffs help to address some of the high, upfront costs for producers



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