



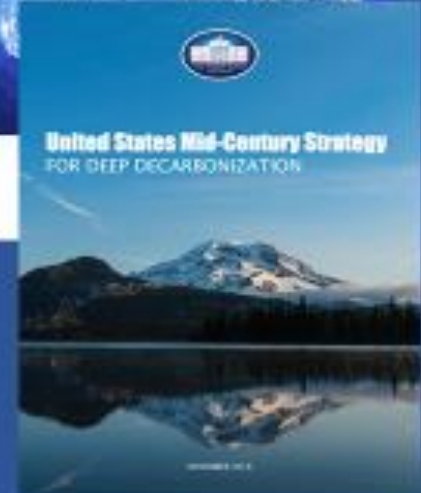
Implications of Electrification and Natural Gas Pathways Towards U.S. Emissions Reductions

Northeast Gas Association Sales & Marketing Conference
March 28, 2019



Proposals to reduce greenhouse gas emissions take many forms

Studies referencing electrification of building energy loads to achieve deep decarbonization goals

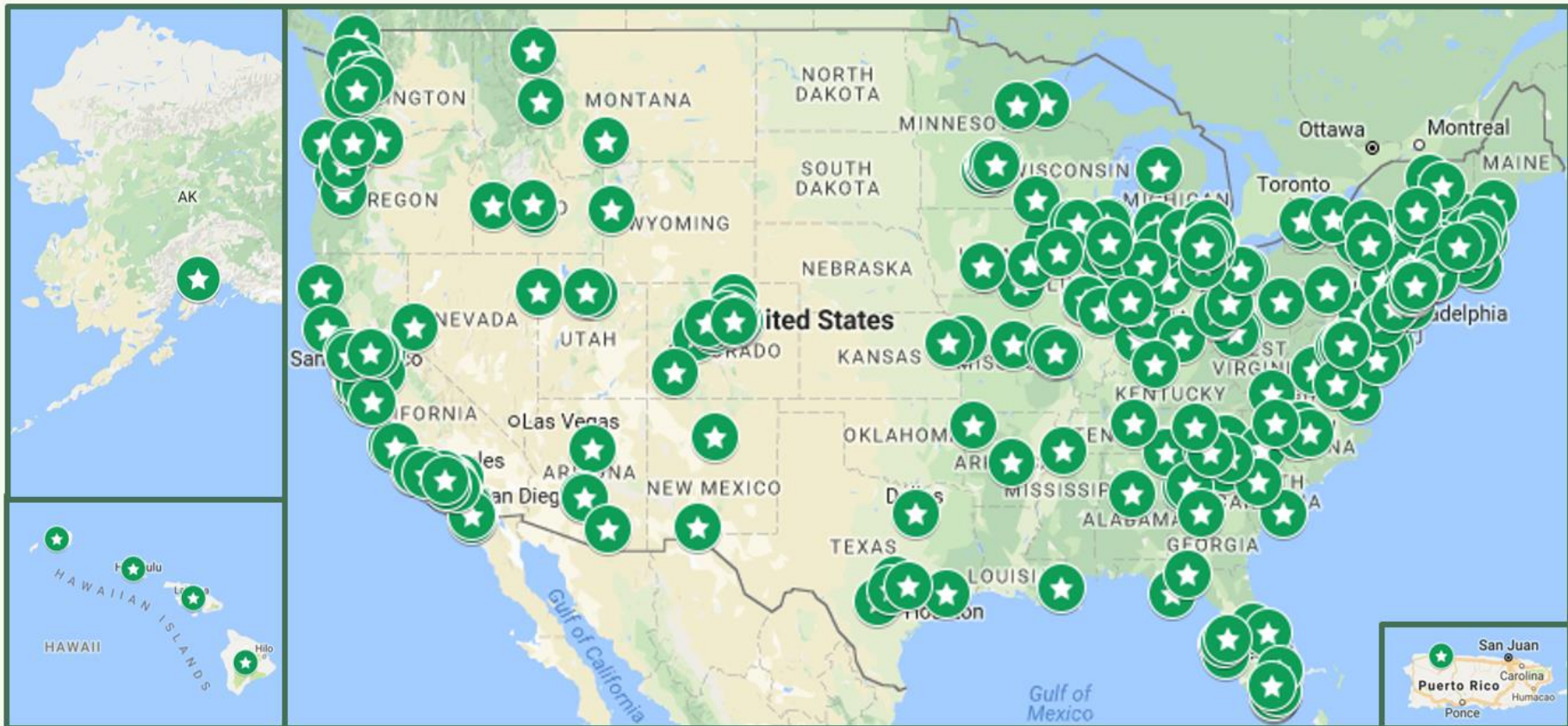


States and municipalities committing to pursue clean energy goals

381 US #ClimateMayors, representing 67.9 million Americans, have committed to adopt, honor and uphold the climate goals of the Paris Agreement



CLIMATEMAYORS.ORG



The Clean Energy Debate is Back in D.C.

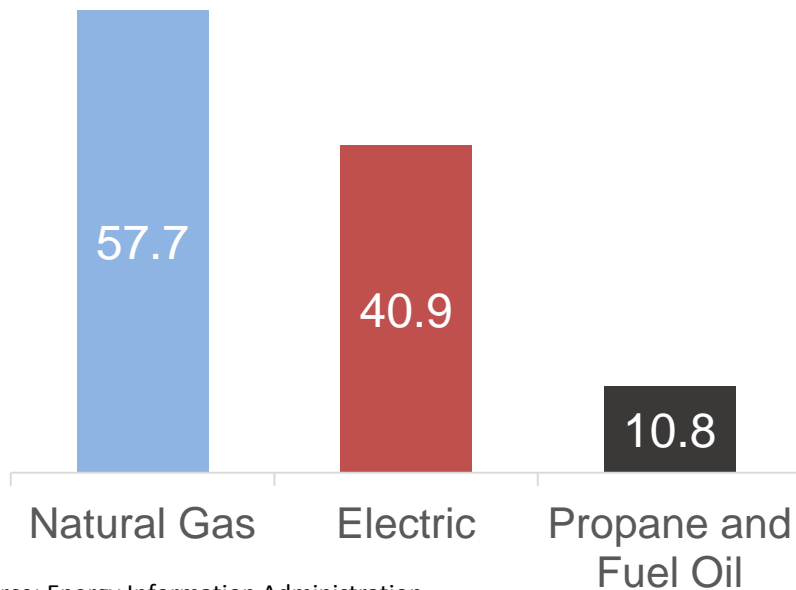


A Closer Look at the Residential Market

Natural gas is the primary source for heating homes

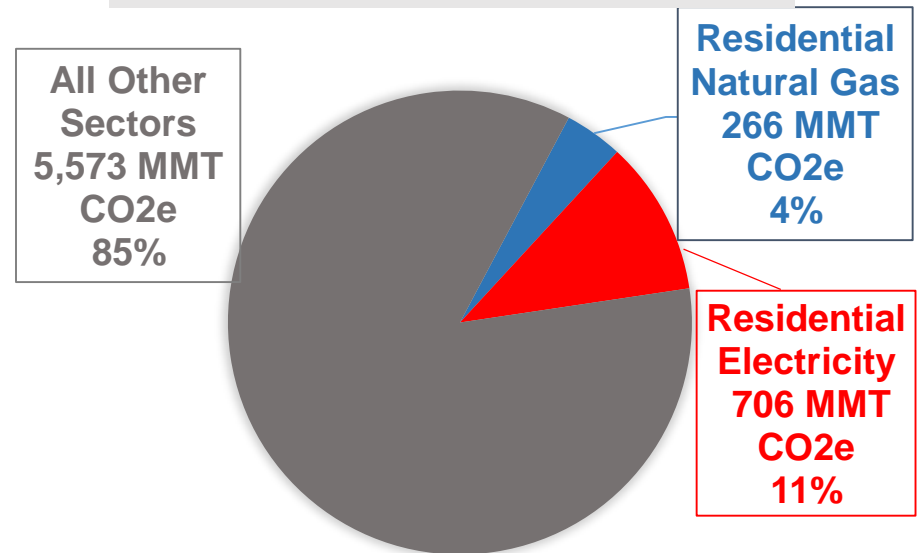
Residential natural gas use accounts for only 4% of U.S. greenhouse gas emissions.

US Heating Systems by Fuel
(Millions of Housing Units)



Source: Energy Information Administration

Share of U.S. GHG Gas Emissions (MMT = Million Metric Tons)

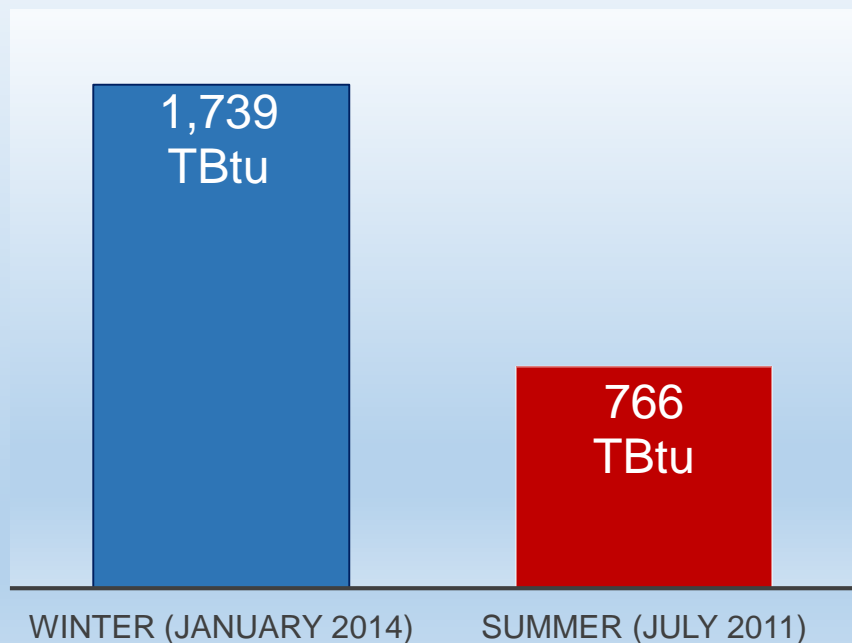


EPA Inventory of Greenhouse Gas Emissions & Sinks 2018 draft, data for 2016
Residential gas methane share based on gas consumption
Residential electricity methane share based on gas for electricity consumption & residential electricity

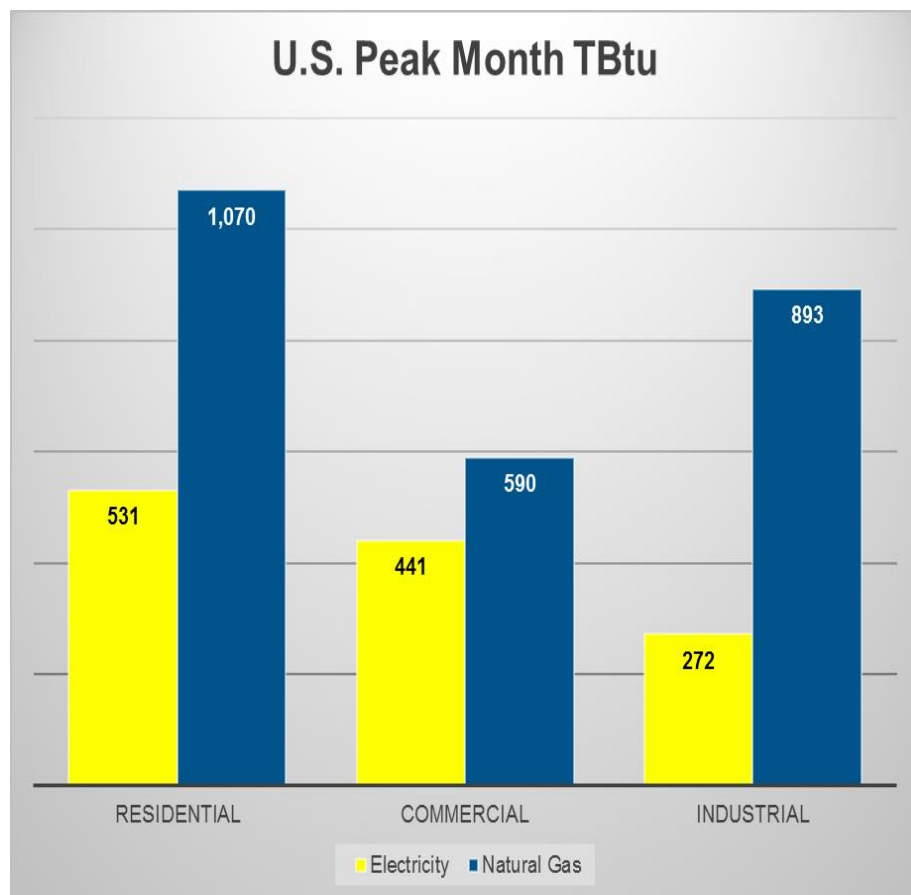
Foundational Energy Facts Impacting Electrification Pathways for Decarbonization

- Winter generally requires much more energy than summer
- Peak energy requirements drives infrastructure planning

U.S. Peak Monthly Residential Energy Usage
(2010 – 2016)



U.S. Peak Month TBtu





Implications of **Policy-Driven Residential Electrification**

An American Gas Association Study
prepared by ICF

July 2018

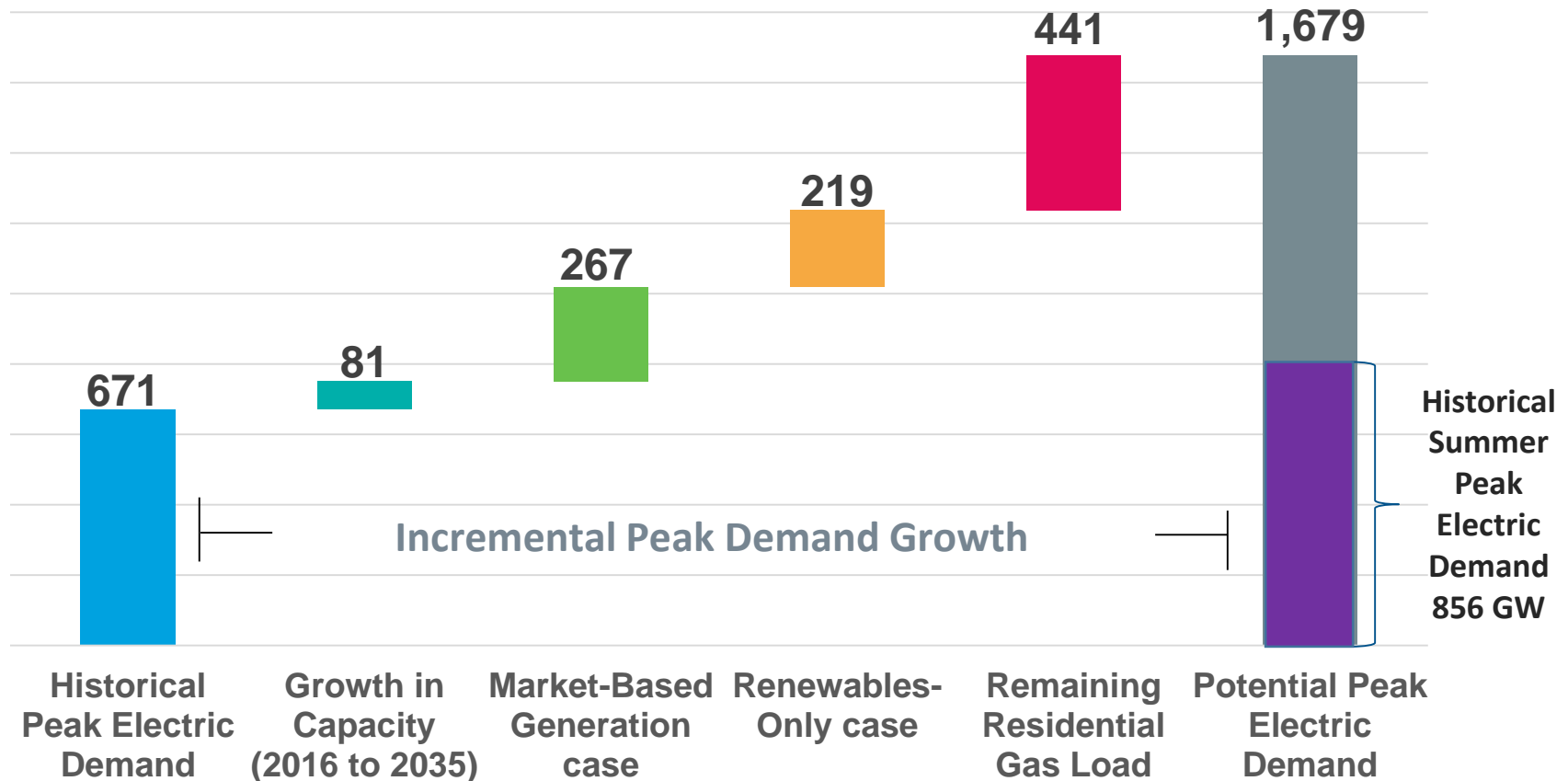
ENERGY

Main Questions the Study Addresses

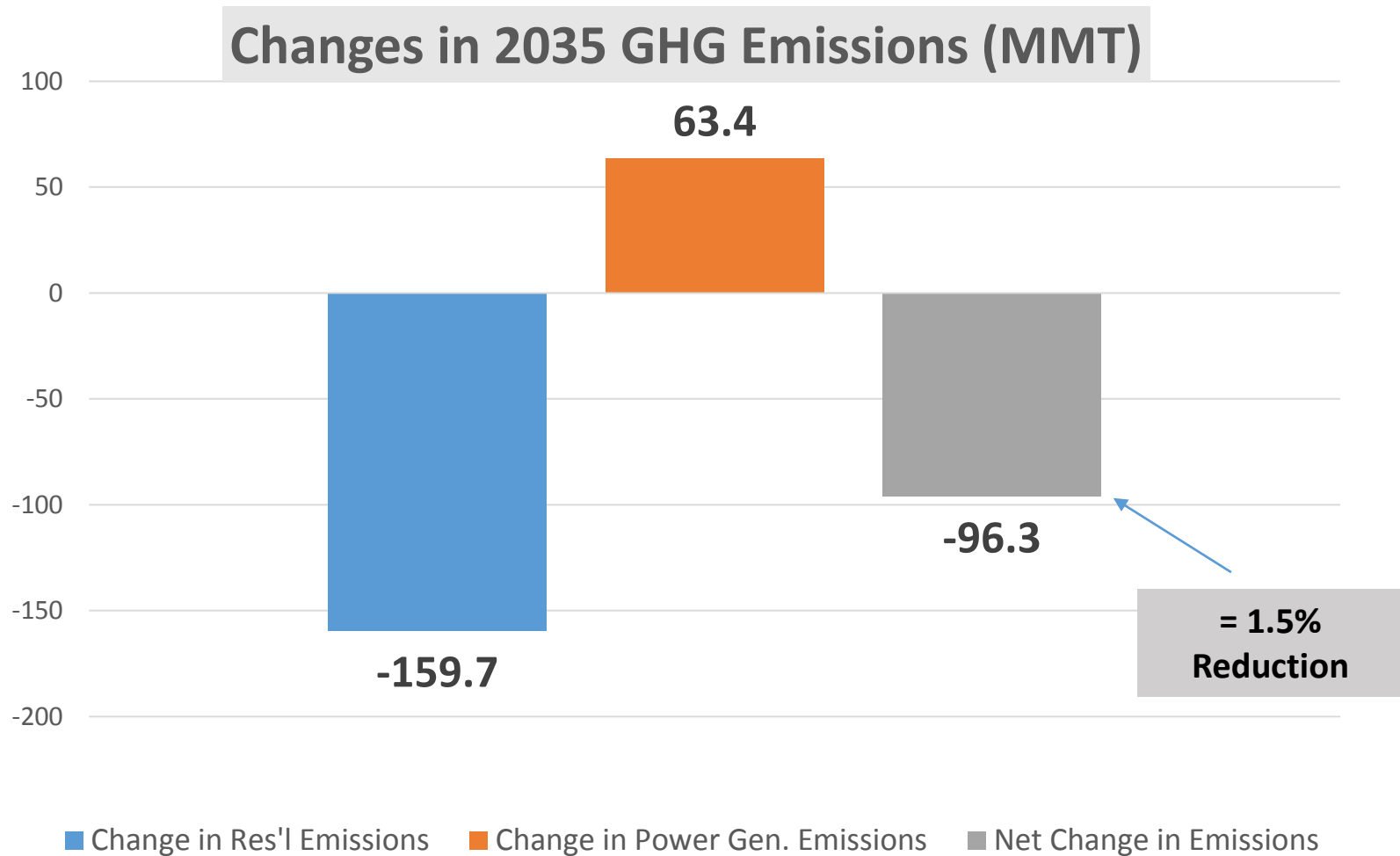
1. What are the impacts on the Power Generation and Transmission infrastructure?
2. Will policy-driven residential electrification actually reduce greenhouse gas emissions?
3. How will policy-driven residential electrification impact natural gas utility customers?
4. What would be the overall cost of policy-driven residential electrification?
5. How do the costs of policy-driven residential electrification compare to other approaches to reduce greenhouse gas emissions?

Electrifying the entire residential sector would nearly double the U.S. electric grid's peak hourly demand.

Impact of Residential Electrification on Peak Winter Hourly Demand (GW)

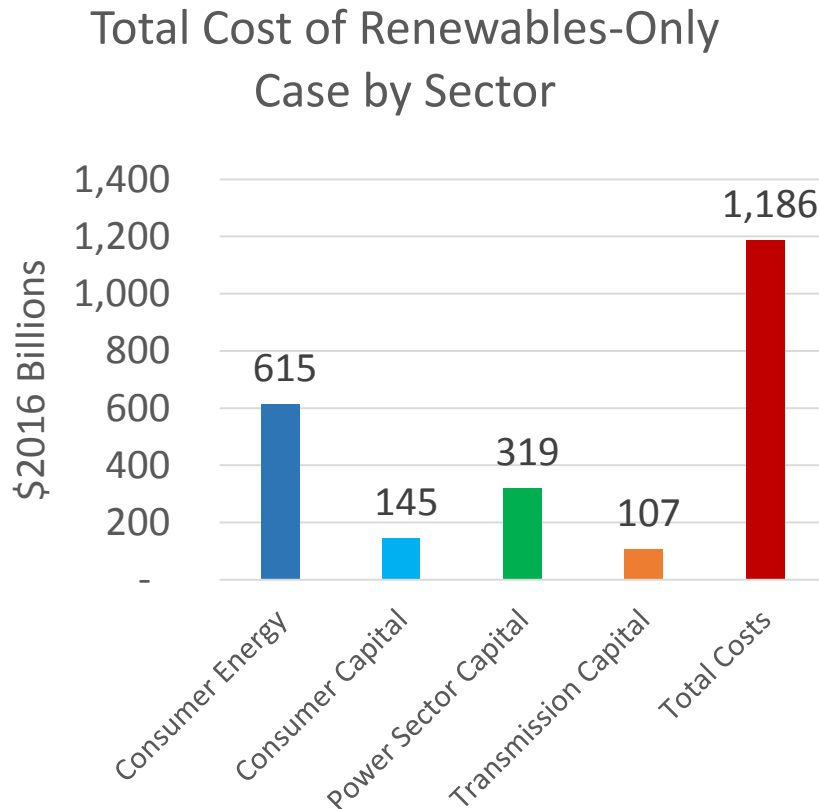


Total GHG reduction potential from policy-driven residential electrification is small.

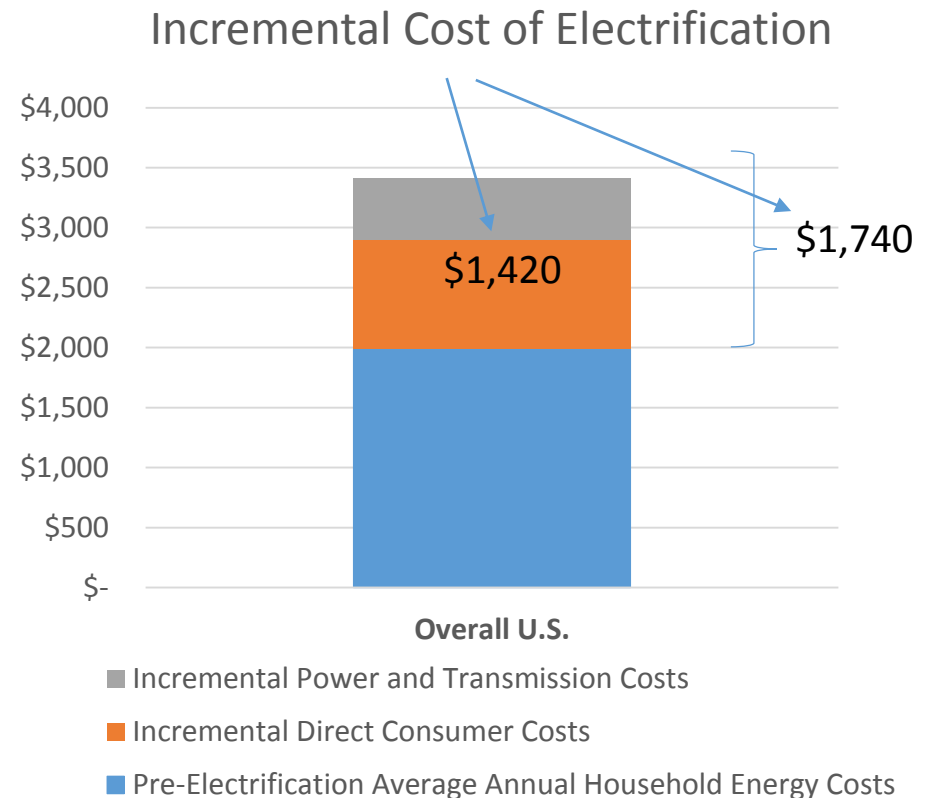


GHG reduction potential is small and cost to consumers is high.

GHG Emissions Reduction Potential from Residential Electrification

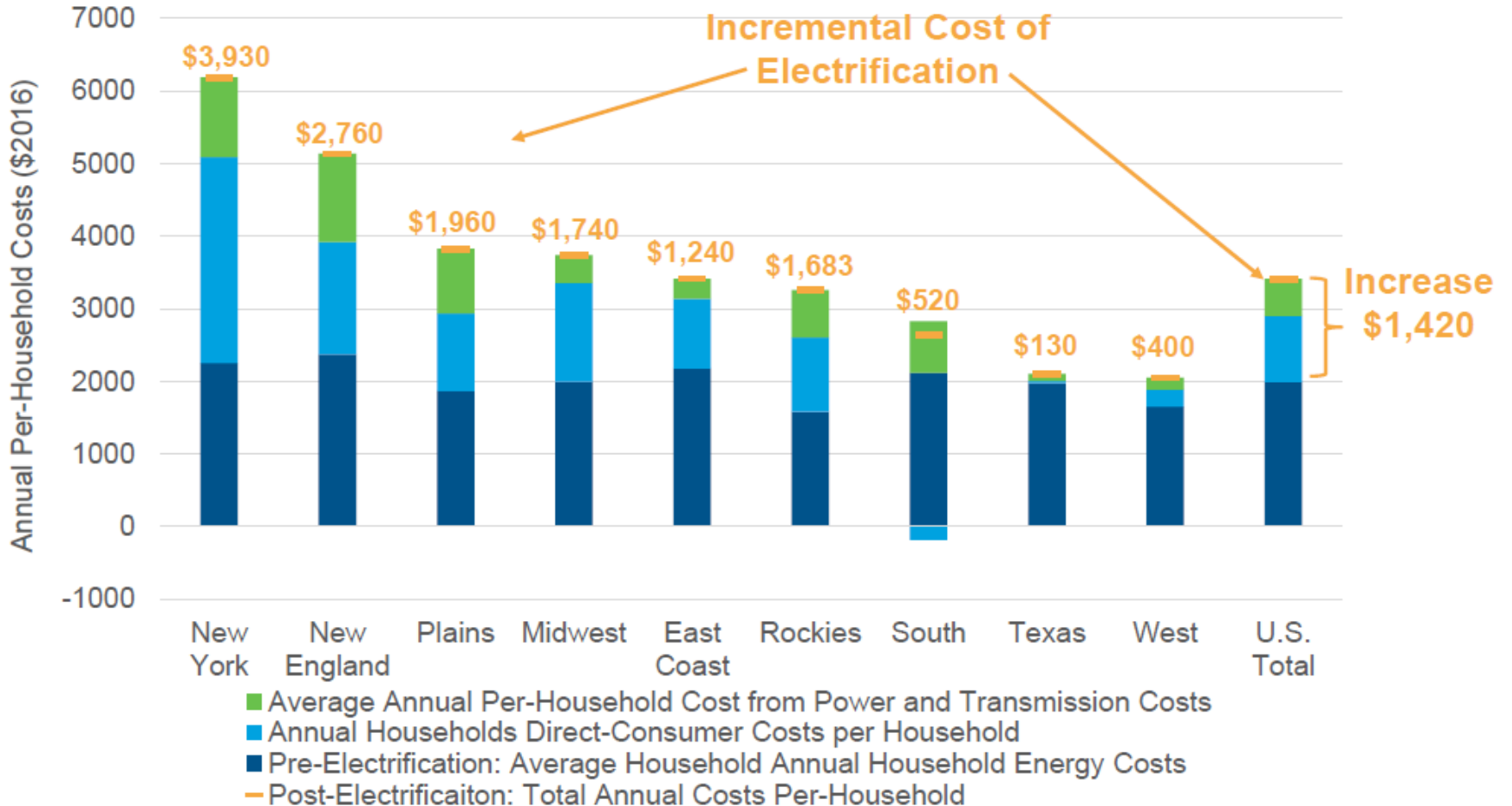


Annual Per Household Cost of Electrification Policy



Regional Breakdown of Consumer Impacts

Annual Per-Household Cost of Electrification Policy (Renewables-Only)



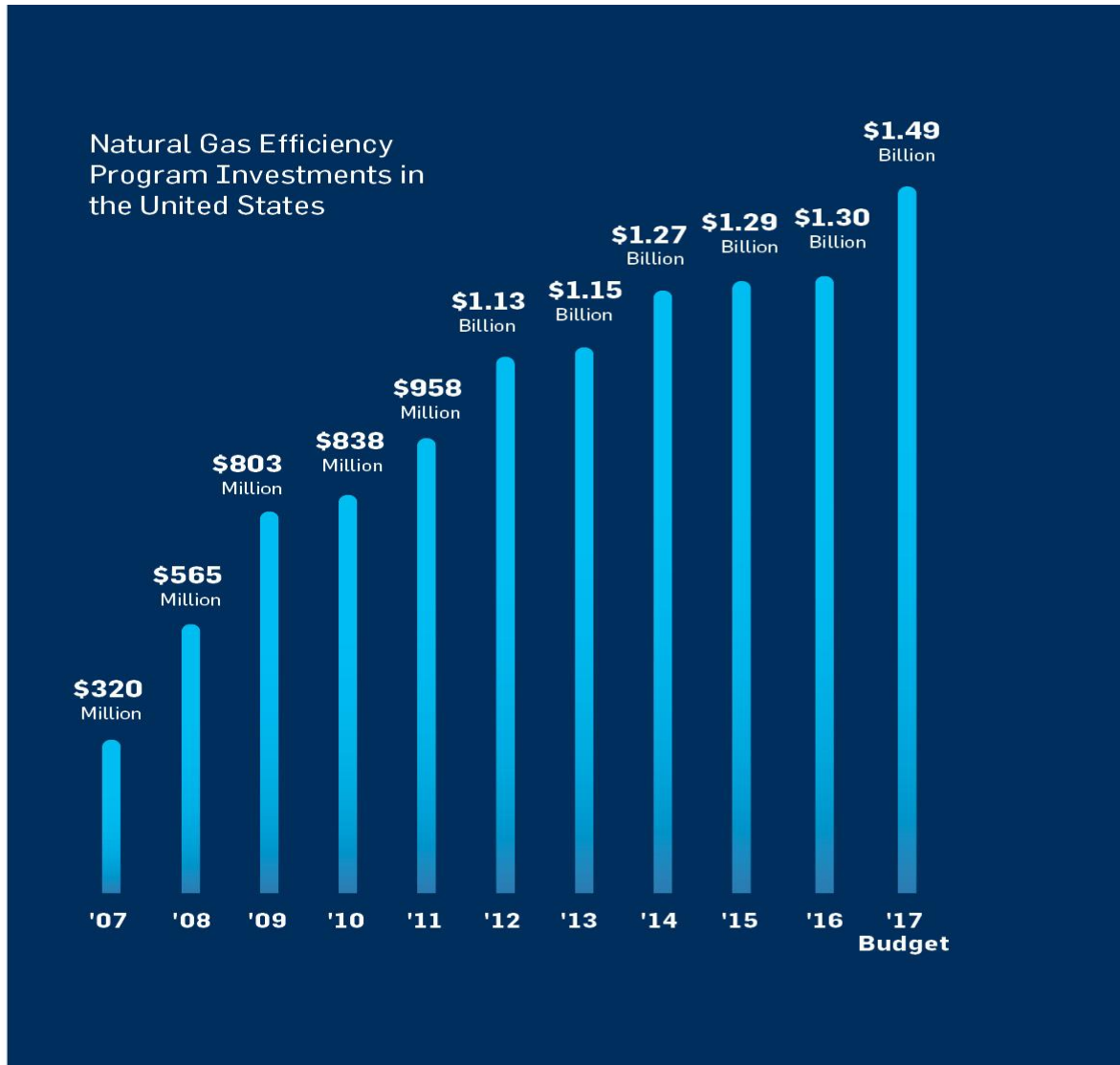
Source: Implications of Policy-Driven Residential Electrification, 2018

Future Natural Gas Pathways for Reducing GHG Emissions

Continued Commitment to Energy Efficiency Programs

Natural gas utilities in the U.S. invest \$4 million in energy efficiency programs every day.

These investments have helped reduce residential household GHG emissions by 50% since 1970.



Developing and Deploying Energy Efficient Technologies in Homes and Buildings

Space Cooling, up to 45%
Space Heating, up to 40%

- Gas heat pump



Building Efficiency, 10-45%

- IoT based thermostat
- Building Envelope



Water heating, up to 55%

- Absorption heat pump

Cooking, minimal change

- Gas stove
- Gas oven



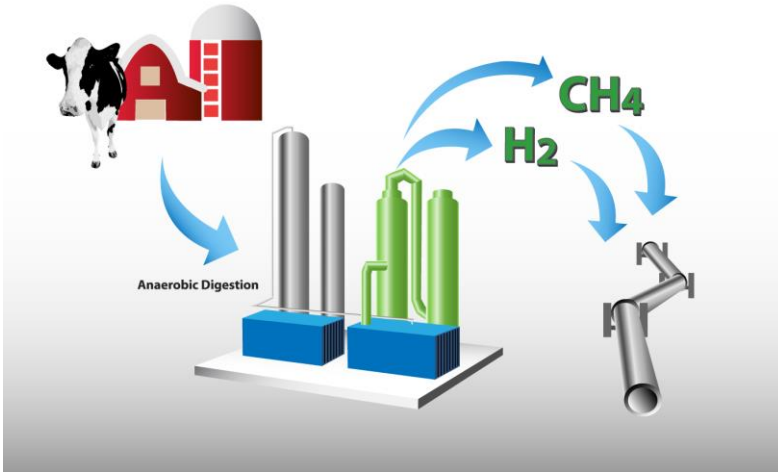
Laundry, 55%

- Gas dryer
- Ozone washing

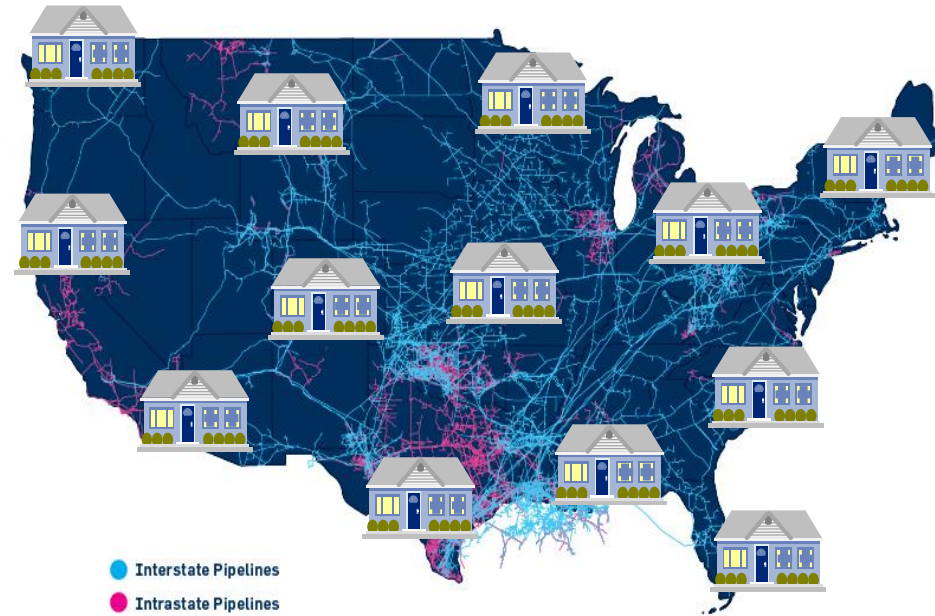
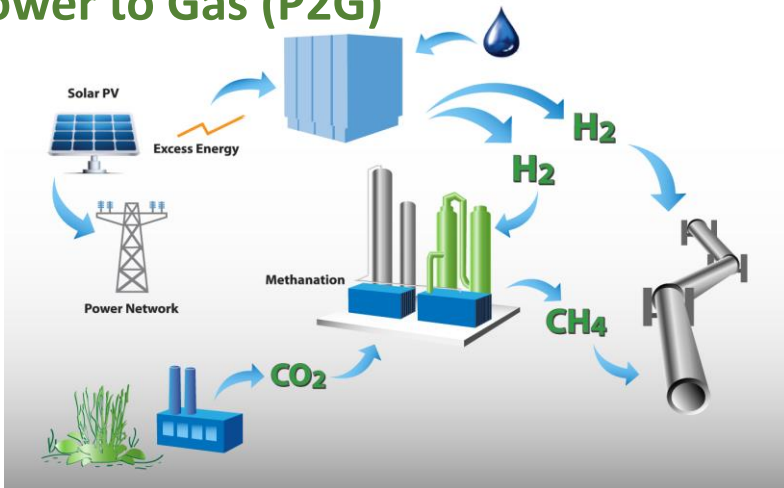
25-40% GHG reduction potential on a customer basis

Advancing Renewable Sources of Supply

Renewable Natural Gas (RNG)



Power to Gas (P2G)



Thank you!

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