

# A clean energy future

## Is residential electrification the answer?

By Tonya McMurray

**M**ore than 30 U.S. states have adopted plans aimed at reducing greenhouse gases and producing a cleaner energy future, according to the Center for Climate and Energy Solutions. Several other states are still seeking a greener energy supply approach.

One proposal to meet those goals is residential electrification, which seeks to achieve ambitious greenhouse gas emission reductions by generating electricity only from renewable resources and then converting all household energy use to electricity.

That proposal, however, is costly and may ultimately not achieve the hoped-for emissions reductions, said Rick Murphy, managing director, energy markets, American Gas Association.

“We appreciate the need for reducing greenhouse gas emissions and mitigating the impacts of climate change,” he said. “But the studies promoting this idea of electrification are not looking at all the implications, including overall costs to consumers.”

AGA contracted ICF to conduct an in-depth study of the benefits and costs of mandated residential electrification. The July 2018 report, titled “Implications of Policy-Driven Residential Electrification,” assesses what would be required for the electric grid to handle the incremental load associated with converting all fossil fuel residential applications to electricity, as well as estimating the ultimate costs to consumers.

### EXPANDING THE ELECTRIC GRID

The ICF report projects that electrifying the entire residential sector would increase electric system demand so much that it could require the size of the U.S. power generation system to almost double by 2035.

“That would result in significant incremental capital costs which eventually have to be passed along to the consumer,” Murphy said. “In addition, you also have the costs associated with actually replacing all of the natural gas heating and water heating systems in homes with electric systems. And, there are actual operating cost differentials for a gas system versus an electric heating system. Those are extensive cost increases for consumers.”

ICF estimates that the total costs to residential consumers and incremental power generation and transmission would range from \$590 billion to \$1.2 trillion by 2035. Allocating these costs out to the effected households would result in an average increase in annual energy costs of between \$1,060 and \$1,420 per household.

The ICF study also concludes that policy-driven residential electrification would reduce greenhouse gas emissions by between 1 percent

and 1.5 percent in 2035. Based on those estimates, the cost of reducing greenhouse gas emissions through policy-driven residential electrification would be substantially higher than the estimated cost of other options for reducing emissions, according to the report.

### DECARBONIZING THE ELECTRIC GRID

Even without policy-driven electrification initiatives, the electric grid is already becoming less carbon intensive. The U.S. Energy Information Administration reports that 17 percent of 2017 electricity generation came from renewable resources, and projects that share will grow to 27 percent by 2035. In addition, natural gas has become a bigger source for electricity generation. The EIA forecast projects the power grid will continue to become less carbon intensive over time.

Natural gas delivers almost as much energy as electricity to the residential sector while accounting for fewer greenhouse gas emissions, according to the ICF report.

“Natural gas has been one of the largest contributors to the country’s recent reductions in greenhouse gas emissions,” Murphy said. “Having more natural gas in power-generating facilities has displaced much dirtier coal generation. In the Northeast and the Midwest, natural gas has also displaced fuel oil in homes and businesses, which is significantly more harmful to the environment. We have a proven track record of helping to achieve emissions reductions, and we have the ability to provide a more cost-effective approach going forward.”

The natural gas industry has historically looked to increase energy efficiency. Murphy said natural gas utility companies invest nearly \$2 billion a year in energy-efficiency programs. The success of such programs has resulted in stable residential demand for natural gas over the last 50 years while the number of customers has grown more than 70 percent. The industry’s investments in energy-efficiency programs have also resulted in a decrease of carbon dioxide emissions per household by nearly 50 percent.

Through a combination of more efficient natural gas appliances and new technologies that create renewable natural gas from landfills or sewage treatment facilities, the natural gas industry can continue to offer innovative and cost-effective ways to reduce emissions.

Murphy said the best approach for achieving emissions reductions in a cost-effective manner is through the continued investment in energy technology development for all energy sources.

“Don’t eliminate any option that could ultimately achieve the objective,” he said. “Let the consumer make the decision on what option best meets their needs.” ■

# Study Results

Overall, the residential electrification policy assessed in this study would result in the conversion of between 37.3 and 56.3 million households from natural gas, propane and fuel oil space and water heating to electricity between 2023 and 2035. This represents about 60 percent of the total non-electric households in each region where the policy is implemented. This table summarizes the results of the residential electrification cases relative to the reference case.

## SUMMARY OF RESULTS<sup>2</sup>

	RENEWABLES-ONLY CASE	MARKET-BASED GENERATION CASE
U.S. Greenhouse Gas Emissions	Annual U.S. GHG emissions reduced by 93 million metric tons of CO <sub>2</sub> by 2035 (1.5 percent)	Annual U.S. GHG emissions reduced by 65 million metric tons of CO <sub>2</sub> by 2035 (1 percent)
Residential Households	56.3 million households converted to electricity \$760 billion in energy & equipment costs Direct consumer annual cost increase of \$910 per household	37.3 million households converted to electricity \$415 billion in energy & equipment costs Direct consumer annual cost increase of \$750 per household
Power Sector	320 GW of incremental generation capacity required at a cost of \$319 billion \$107 billion of associated transmission system upgrades	132 GW of incremental generation capacity required at a cost of \$102 billion \$53 billion of associated transmission system upgrades
Total Cost of Policy-Driven Residential Electrification	Total energy costs increase by \$1.19 trillion \$21,140 average per converted household \$1,420 per year per converted household increase in energy costs	Total energy costs increase by \$590 billion \$15,830 average per converted household \$1,060 per year per converted household increase in energy costs
Cost of Emission Reductions	\$806 per metric ton of CO <sub>2</sub> reduction	\$572 per metric ton of CO <sub>2</sub> reduction

COURTESY OF ICF AND AMERICAN GAS ASSOCIATION

<sup>2</sup>These cost numbers do not include all costs associated with these policies. These costs do not include the cost of local electric distribution system upgrades, do not consider potential natural gas distribution company rate increases on remaining gas customers as the number of natural gas customers declines, or the decrease in natural gas commodity prices that would be expected if total natural gas demand decreases.