



Electrification provides utilities with ways to enhance revenue, reduce emissions, and strengthen customer relationships—if it's done right. Learn 6 strategies you can apply today.

Why electrification benefits cities, states, and the grid—and how utilities can lead the way

By David Pickles

Overview

Beneficial electrification offers a new way for electric utilities to enhance revenue, reduce emissions, deepen customer relationships, and put downward pressure on rates. The concept also opens a path for cities and states to reduce carbon emissions, one that lessens the burden on public budgets. Electrification can align the economic and environmental interest of utilities, city and state governments, and their constituents.

However, to fully realize the promise of beneficial electrification, several important issues need to be addressed. Most notably, regulatory limitations on fuel switching, the appropriate scope and scale of electrification, realization of the benefits through lower rates, and the impact on natural gas utilities.

In this paper, we examine electrification as a system efficiency and decarbonization program, and identify opportunities for electric utilities, cities, and regulators to support targeted expansion of electrification while addressing impacts on competing fuels.

What is beneficial electrification?

Electrification programs provide incentives for switching from fossil fuels to electricity as an end-use energy source. The concept has gained traction in recent years with the transition to light-duty electric vehicles, the largest electrification effort now underway. But forward-thinking utilities also focus

on non-road opportunities for their customers and are electrifying building space and water heating, industrial processes, and material handling end-uses, to name just a few.

“Beneficial” electrification requires that we benefit the environment, ratepayers, and the participant. As utility generation becomes cleaner and more renewable, the benefit of an electrification program grows – up to a point. Consideration of a push to full electrification requires a careful balancing of the incremental costs of supply against its benefits, recognition of an inflection point beyond which electrification may not be desirable or may be risky, and analysis of the benefits of maintaining natural gas supply. Pushing a locality to 100% end-use electrification could, for example, increase peak electric loads and associated distribution system costs; in such cases, maintaining fuel systems for winter peak heating could help manage peak loads and control electric system costs.

Beneficial electrification has the potential to significantly offset the decline in load growth experienced by many electric utilities. Full electrification of the U.S. transportation, commercial, and residential sectors would double electricity use by 2050, according to the [Environmental and Energy Study Institute \(EESI\)](#). ICF has found that for a typical utility beneficial electrification can grow system energy sales by 0.75% per year and put significant downward pressure on electric rates by spreading fixed costs over greater sales.

Further, certain electrification technologies create flexible load that utilities can use to better manage grid peaks via demand response, load management, managed charging, and vehicle-to-grid programs. Gaining better control over the grid’s ‘peaky-ness’ addresses another problem — the difficulty of integrating renewable energy because of its variability. Combining peak management with off-peak usage or charging, flattens the [duck curve](#), improves system efficiency, and makes the grid better able to incorporate additional renewables.

Participants in an electrification program may experience other benefits too, such as lower bills, reduced maintenance costs, quieter operations, improved ability to control temperature, and increased operational precision. Participants may also see their on-site carbon and other pollutant emissions steeply reduced, and net emissions — which take into account carbon emitted in generating power — fall by as much as 85% when selected equipment undergoes electrification, according to ICF’s findings.

The role of cities

Cities are beginning to take notice of these findings as they struggle to meet carbon reduction goals. More than [10,000 cities](#) worldwide have made commitments to reduce carbon emissions. In the United States, most major cities and many smaller ones have either climate or clean energy



plans or specific carbon reduction goals. Many of these plans focus on increasing the efficiency of buildings, expanding electric space and water heating, tightening building codes, creating benchmarking and disclosure requirements, electrifying municipal and school fleets, installing EV charging infrastructure, electrifying ports and airports, and expanding renewable and distributed energy. Forty-nine cities have community-wide climate goals, but only **11 cities** are on track to achieve their goals. A major problem? Funding. Unless they raise taxes or otherwise facilitate financing of the programs, many cities do not have the resources to push ahead to meet goals.

That's where energy efficiency and electrification as forms of decarbonization come into play. Many utilities have mechanisms to pay for energy efficiency programs and a proven delivery infrastructure. System benefits charges, state and federal funding, and proceeds from programs like the Regional Greenhouse Gas Initiative have significantly boosted energy efficiency. In 2018 alone, utilities spent **\$8 billion** on energy efficiency, saving 27.1 million MWh of electricity and over 19 million tons of carbon dioxide. And many of these programs are very similar to those envisioned by city climate action plans.

In addition, at least 40 U.S. **utilities have EV programs** underway and 18 have non-road electrification programs. Many municipal fleets, buildings, and operations would qualify for incentives under these programs. Some utilities are recovering the cost of these programs through rates — some through base rates, others through surcharges or deferral to a regulatory account and then amortization after a future rate case. Others are funded by utility shareholders.

An opportunity now presents itself for cities and utilities to work together to expand funding for both energy efficiency and electrification programs – which typically requires authorization by the state utility regulator. Cities can help by supporting utilities before their regulators when they apply to increase program funding or relax prohibitions on fuel switching. Cities may also want to consider leveraging utilities' considerable experience and infrastructure associated with delivering carbon reduction programs.

Who's pursuing electrification?

While many utilities offer programs supporting light-duty vehicles or heat pumps for space and water heating, two of the most innovative programs focus on non-road technologies and were featured in an ICF webinar. One offered by Entergy, which operates power companies in Arkansas, Louisiana, Mississippi, and Texas; and another by JEA, a municipal utility that serves Jacksonville, Fla. ICF designed and administers both programs.

- Entergy began its program in 2014, first by converting agricultural irrigation pumps to electricity. The utility covered costs for line extensions to the farms. The program converted 3,000 motors.



In 2017, Entergy expanded its electrification program to forklifts, digital billboards, and truck stops, offering both cash incentives and agricultural line extensions. Designed to increase load or revenue, the program achieved a compound annual growth rate of 55% for 2018 and exceeded its goals by 20%. The company also found in a survey that the effort increased its overall customer satisfaction rating. Entergy is now adding an EV charging program and electrification for truck refrigeration, fleets, and ports.

- JEA, a municipal utility that serves Jacksonville, Florida, also launched its electrification initiative in 2014 to increase its financial and environmental goals and boost community economic development. The utility is pursuing both on-road and non-road electrification. The utility is now launching development of charging networks with strategic partners to reduce range anxiety.

Its non-road program converts commercial and industrial equipment, such as forklifts, airport ground support baggage and handling equipment, and cranes and welders. The equipment used propane or diesel fuel before being converted to electricity. The program has an annual budget of \$900,000 and brings in \$9 million in annual revenue.

JEA is now looking at a range of other potential electrification opportunities, among them: ports, super cranes, refrigerated trucks, infrared painting equipment, floor scrubbers, conveyors, onshore generation for dock shipping, welding equipment, robots, data centers, tugboats and ferries, indoor agriculture, and airport ground and baggage carts.

Other utilities with beneficial electrification programs include: Salt River Project, Sacramento Municipal Utility District, CenterPoint Energy, Southern California Edison, Pacific Gas and Electric, San Diego Gas and Electric, Austin Energy, Georgia Power, TVA, Con Edison, Central Hudson Gas and Electric, and Green Mountain Power – with many more considering or developing their own initiatives.

Making the case for electrification

Expanding utility funding for electrification will require support from regulators. To garner that support, utilities should consider the following:

1. Fuel Switching Precedent

State regulations discouraging utility promotion of fuel switching were established in an era of rapid utility growth and before decarbonization became the priority it is today – yet they are often still in effect. Some of these regulations may no longer be appropriate, given today's slow or negative load growth, the need to embrace renewables, the desire to mitigate rate increases, and the drive for emissions reductions. Utilities

will need to demonstrate that the benefits of electrification outweigh the costs and make it clear that those benefits will accrue not only to utility shareholders, but also to customers – especially those with low incomes.

2. Fears of power scarcity

In some cases public utility commissions worry that electrification will cause a supply crunch or necessitate increased distribution system investment. This is less of a concern when the scale of electrification is modest. But policies that require electricity as the only fuel for space and water heating may, over time, require significant investment in new infrastructure. Utilities should analyze the impact of proposed electrification programs on the grid and be prepared to demonstrate the cost-effectiveness of those programs at varying scale.

3. Stranded costs

To the extent that electricity displaces natural gas, the cost of the natural gas system will be spread over fewer sales and, ultimately, could lead to a stranding of investments in the gas system. While this concern is sensitive to the scale of electrification and the nature of the gas system and customer base, electric utilities seeking approval of electrification programs should be prepared to analyze the impact on the gas system, and consider issues such as the role of renewable natural gas, hydrogen, and the value of fuel diversity.

4. Free riders and competitive markets

As was the case before utilities widely offered energy efficiency programs, some stakeholders may argue that free markets should determine the appropriate level of electrification and utilities should not interfere. And as was necessary with energy efficiency, utilities will need to demonstrate that utility intervention is essential to ensure the public good. Utilities also will need to take steps to limit participation by free riders (those who would have electrified even in the absence of the program).

5. The cost of inaction

To the extent that change introduces risk, regulators may be hesitant to move as quickly as utilities may like. However, inaction poses very real risks including climate change, rate increases, inability to integrate renewables, failure to support state and local decarbonization policy, and lost opportunities to shape the way that unmanaged electrification will impose costs on the grid. Utilities should be prepared to elucidate these risks, and where full-scale programs are not feasible, start their initiatives with modest or pilot scale programs.

6. Coalitions

The benefits of electrification accrue to a broad constituency, including



customers, environmental advocates, supporters of renewable energy, advocates of low rates, and cities/states needing to fund decarbonization. Utilities should consider working with such groups (especially cities) to build support for electrification proposals.

Taking the first step

Given the wide range of opportunities, it's sometimes challenging to decide where to start. Some utilities have forged ahead with large on-road programs, while others started with smaller non-road programs or pilots that later scaled into fully featured offerings. Seek outside guidance as you create your programs. While electric utilities are accustomed to modeling their own systems, making the case for electrification may encompass unfamiliar technologies and market dynamics, competing fuels, the concepts of dynamic and locational incremental costs, climate policy, regulatory and stakeholder strategy, and other analytics that may require outside expertise.

ICF has provided electrification potential studies, program designs, regulatory testimony, and/or implementation services to more than 20 utilities in the U.S. For more information, view our webinar: [Using electrification to add beneficial load to your grid](#).

About the Author



David Pickles joined ICF in 2004, and currently leads strategy and sales for ICF's Commercial Energy business. David has almost 30 years of experience in utility resource planning, energy efficiency and demand-side management, non-traditional product and service development, and operations of unregulated utility subsidiaries.

He previously held leadership roles at Navigant Consulting (Director of Market Strategy), PHI Consulting/Honeywell (CTO of the energy information business), CSW (now AEP, Vice President of Marketing, Development, and Operations of the energy services business), and Synergic Resources Corporation (Director of Pricing and Product Development).

David is a previous board member of the North American Energy Standards Board and the Dallas Chapter of the Product Development and Management Association. He has testified as an expert witness on more than 25 occasions, and is a frequent presenter on utility energy efficiency programs and policies, innovative new business opportunities for utilities, regulation, and beneficial electrification.

David has a master's degree in public utility economics, and a bachelor's degree in economics, both from the University of Wyoming.



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