PERSPECTIVES FROM THE FIELD

The First Fuel

Gregory Ehrendreich

The perspective of policy makers and pundits too often seems to be one of unending growth of energy consumption that must be met through supply-side options. That ignores, however, the very important role of demand-side energy efficiency in the energy markets. Unlike traditional energy conservation (e.g., "Turn down the thermostat and put on a sweater"), energy efficiency is a technology-driven process that seeks to provide the same level of *energy service*—the work, comfort, and functionality we obtain from the use of energy—while using less energy supply (e.g., "Add insulation so the furnace doesn't need to run as often to maintain the same comfort level"). Reducing the quantity of energy demanded by customers over time [kilowatt-hours (kWh)] via energy efficiency is a fast-growing segment of the energy industry and has being embraced by utilities, builders, business and homeowners, politicians, and other stakeholders around the country.

Energy Savings Are Cost Savings

What energy efficiency does, and does very well, is reduce the cost of energy services. Averaging the proven results of efficiency programs around the United States (US), the cost of saving electricity averages about $0.025/kWh (Friedrich et al., 2009) [or $25.00/megawatt-hour (MWh)], less than even the cheapest and dirtiest traditional options on the supply side ($100.40/MWh for conventional coal by US government estimates) and far less than expensive new technologies for renewable energy ($149.30/MWh for wind, or $369.10/MWh for solar photovoltaic), advanced fossil fuels ($129.30/MWh for advanced coal with carbon capture and sequestration), or new nuclear power ($119.00/MWh) (Energy Information Administration, 2009). As efficiency professionals know, the cheapest watt is the one you don't need to generate. Similar economies exist for natural gas, with efficiency costing less per therm/Btu than supplied gas.

From the utility perspective, adding energy efficiency capacity is much cheaper than adding generating capacity, so it should make business sense to reach for all cost-effective energy efficiency as a means of meeting customer demand. Of course, the utility is traditionally in the business of selling energy and makes its primary revenue from the volume of sales, so this puts economic barriers in place that limit the achievable efficiency savings. The severing of this link between revenue and throughput by various regulatory mechanisms establishing revenue targets and true-up mechanisms for lost revenue recovery is known as *decoupling* (Keogh, 2007). Decoupling helps move the utility from being a seller of energy to become a seller of energy service and thus capable of fully embracing energy efficiency as its first energy resource.

From the customer perspective, efficiency is also a win. Energy efficiency improvements not only begin reducing customer energy bills as soon as they are in place, they also continue to produce savings over subsequent years. In many cases, this means the savings pay off the cost of the improvement over a short period, putting it into a position of zero or even negative net cost over the measure lifetime. The problem for customers is often the relatively high fixed cost of implementing efficiency measures. A successful financing model called Property Assessed Clean Energy (PACE) can ease the burden of the first cost of efficiency and clean-energy improvements by providing up-front state or municipal funding that is paid off over time with a lien assessed on the property's taxes.

Reduction on the demand side can also benefit customers and utilities by shifting the demand curve, leading to lower market prices for energy in a textbook case of supply and demand. One estimate is that a 1.0% reduction in natural gas consumption across the midwestern US could lead to a 13% reduction in wholesale natural gas prices (Kushler, York, and Witte, 2005).

Energy Saving Equals Greenhouse Gas Reduction

The generation costs previously discussed represent the status quo in the US, where pollution control has long been required for criteria pollutants under the Clean Air Act, but there is yet no nationwide mandate for greenhouse gas mitigation. The economics change, favoring carbon-free renewable energy and nuclear supply options over carbon-intensive fossil fuels, when you put a price on carbon emissions. Efficiency comes out a winner even in a carbon-cost scenario. In fact, it does even better.

Just like megawatts, not every *negawatt* (a watt of energy efficiency savings) is created equal in terms of carbon. A pivotal 2007 report from McKinsey & Company (Enkvist, Nauclér, and Rosander, 2007) gave us a clearer look at the cost of emission reduction measures with their greenhouse gas abatement cost curve. A follow-up in 2009 expanded both the breadth of abatement options considered and the depth of analysis (McKinsey & Company, 2009). Essentially, the abatement cost curve shows cost per ton of carbon reduction versus the gigatons of carbon the measure has the potential to mitigate annually. A large number of measures—most of them energy efficiency options such as residential lighting upgrades from incandescent lamps to compact fluorescent lamps (CFLs) or light-

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emitting diodes (LEDs); residential appliances and electronics; commercial and residential heating, ventilation, and air-conditioning (HVAC); and industrial motor and systems improvements—show a negative abatement cost; they essentially cost nothing or less than nothing to achieve their greenhouse gas savings. Supply-side options, like nuclear and renewables, come in above the line with a positive cost per ton of carbon reduction. A market price for greenhouse gas emissions, via cap and trade or another pricing mechanism for carbon, would raise that baseline, making more measures come in at a negative net abatement cost.

Energy Savings Require Political Action

State legislatures around the country have passed energy efficiency resource standards (EERS) and renewable energy standards (RES) mandating that utilities achieve energy efficiency savings goals and generate a portion of their supply with renewable energy. In the thirteen midwestern US states overseen by the Midwest Energy Efficiency Alliance (MEEA) (Figure 1), EERS have been established in six states and have been proposed in at least one more, and another state has long-term energy efficiency funding. The typical path to an EERS, a legislative approach, took place in Minnesota, Illinois, Michigan, and Ohio over the past several years. In Missouri, a proposed EERS bill did not pass in the 2010 legislative session. In some cases, notably Indiana and Iowa in the Midwest, energy efficiency standards came to be as the result of a regulatory commission order that utilities should pursue cost-effective energy efficiency as their first resource for meeting future energy needs. (Though established by regulation, legislation in Iowa extended its standard to cooperative and municipal utilities not included in the regulatory order.) Wisconsin has a long-standing funding-based statewide energy efficiency program, rather than a savings goal–based EERS, and regulatory efforts to change to a savings-based model in late 2010 were overturned early in the 2011 legislative session.

The experience of the energy efficiency industry around the US has shown that the 1.0%–2.0% of electric supply and 0.75%–1.5% of natural gas supply that forward-thinking states like these have targeted for energy efficiency [26 states nationwide at the time of this writing have either an EERS or a combined RES-EERS (Sciortino and Watson, 2011)] are both technically and economically achievable. The Midwestern Governors Association (MGA, 2009) set a goal in their *Energy Roadmap* of reaching 2.0% of electricity and 1.5% of natural gas needs through efficiency throughout the region, though, out of 10 MGA states, 7 governors were replaced and 5 states switched party control of the governors office in the 2010 election, so it has been interesting to see how the new officeholders are taking up the energy plans of their predecessors.

Establishing a price on carbon would change the game even further by creating a level playing field for alternative energy resources to compete economically in the market and enhancing the cost-effectiveness of even deeper energy efficiency measures.

Over the past several years, members of both parties in the US Congress have proposed an assortment of climate and energy bills, some of which would have created nationwide RES and EERS mandates and established nationwide carbon-trading markets. These markets would bring to scale

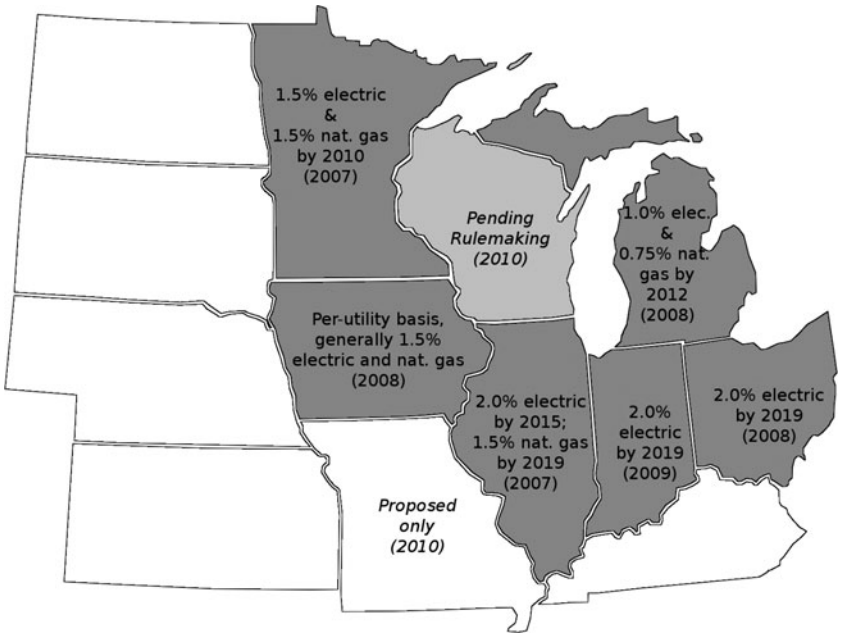

Figure 1. Energy efficiency resource standards (EERS) in the midwestern US, with year adopted. Utilities in *shaded states* must meet a percentage of customer energy needs with energy efficiency rather than supply (nat. gas, natural gas).

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the models and best practices developed in the successful regional-scale carbon markets developed by New England's Regional Greenhouse Gas Initiative (RGGI) and the Western Governors Association, as well as the international carbon-trading systems implemented under the Chicago Climate Exchange (CCX), the Kyoto Protocol, and in the European Union Emission Trading Scheme. Unfortunately, neither the Senate nor the House of Representatives has been able to garner support for a comprehensive package to enact a national climate bill.

An additional challenge has arisen in that new energy efficiency financing programs are not being supported by key stakeholders. In spite of broad support at the state level and from the US Department of Energy, PACE financing for energy efficiency and renewable energy improvements has recently come under fire from the Federal Housing Finance Authority (FHFA) and Fannie Mae/Freddie Mac. FHFA objects to PACE because the PACE lien has priority over a mortgage in foreclosure. A bill (HR 5766; US House of Representatives, 2010) has been introduced in the House to remedy this situation by requiring FHFA to adopt underwriting principles that would support PACE financing.

The bright spot politically has been the American Recovery and Reinvestment Act (ARRA), which has provided a massive short-term influx of funding at the state and municipal levels to pay for energy efficiency programs and for the training and development needed to build the skilled workforce that the growing clean-energy industry needs.

If we want a national energy and climate policy, the greatest opportunity to act is now. To achieve success, it will require congressional action on energy legislation, federal support for clean-energy financing, and continued workforce development in energy efficiency and renewable energy sectors. It will benefit all classes of energy customers with long-term bill savings and create incentives for utilities to grow their efficiency portfolio. If not, energy efficiency will continue to be advanced in the states and regions that recognize the value and benefits, for consumers, businesses, and the environment as a whole.

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