



Ohio's Clean Energy Report Card Year 2

**Wind, Solar, and Energy
Efficiency on the Rise**



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Rob Kerth
Frontier Group

Julian Boggs
Environment Ohio
Research & Policy Center

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Executive Summary

In 2009, Ohio received 84 percent of its electricity from coal, the dirtiest fuel used to generate electricity. Over the last few years, however, Ohio has begun to develop alternatives to reduce our reliance on coal and other fossil fuels, cutting air pollution and reducing the state's contribution to global warming.

Ohio's Clean Energy Law, passed in 2008 to promote the development of homegrown alternatives to fossil fuels, has now been in effect for more than three years. In that time, the state has taken important strides toward a clean energy future, including the development of several major renewable energy facilities.

Between January 2009, when the law took effect, and January 2011, Ohio's four largest utilities implemented energy efficiency programs that will save 1.6 million megawatt-hours (MWh) of electricity annually, enough electricity to power 141,000 homes. After a burst of renewable energy construction triggered by the new law, Ohio's wind and solar facilities are now providing as much power as 29,000 homes use in a year.

The Clean Energy Law has started Ohio on the road to a new energy future—one in which dirty and harmful energy sources are replaced with homegrown energy used efficiently—at great benefit to public health and the environment. Still, Ohioans will only receive the full benefits of the law if the state's major utilities commit to taking full advantage of renewable energy and energy efficiency opportunities. Several utilities have moved quickly to embrace clean energy, while others are lagging behind and will need to improve their efforts in future years.

Ohio is moving quickly to adopt clean energy.

- Since 2009, two major solar energy facilities have opened in Ohio, and a third will begin construction in 2012. The largest currently operating facility is a 12 MW facility in the town of Wyandot.
- In 2011, a 99 megawatt (MW) wind farm, the state's largest, opened in Paulding County. The wind farm was built after American Electric Power

signed a long-term contract to purchase electricity from its developer in order to meet their Clean Energy Law targets for renewable energy generation.

- Utility-funded energy efficiency programs carried out under Ohio's Clean Energy Law in 2009 and 2010 have reduced electricity consumption by 1.6 million megawatt-hours (MWh). Peak demand at those utilities has declined by over 1.7 GW—equivalent to the capacity of three mid-sized coal plants.
- Ohio now has a total of 17 MW of solar panels in operation and 110 MW of wind turbines—enough to generate as much power as 29,000 average homes use in a year.

While several of Ohio's utilities have forged ahead with clean energy programs, others are dragging their heels, as reflected by the grades issued on our scorecard for their 2010 performance.

- **American Electric Power received an A** for significantly exceeding its energy efficiency target and leading the way on renewable energy by signing contracts to support the construction of Ohio's largest solar facility and largest wind farm.
- **Dayton Power & Light received an A** for exceeding its energy efficiency targets and meeting its renewable energy targets, in part by developing the only major utility-owned solar facility in the state.
- **Duke Energy received a C-**; the utility has been the strongest performer in developing energy efficiency as a resource, but has failed to meet its renewable energy targets, instead

applying repeatedly to the Public Utilities Commission to lower its target.

- **First Energy received a D-**. Ohio's largest utility has underperformed for several years, failing to obtain as much solar energy as the law calls for or to develop effective energy efficiency programs.

Ohio has only begun to tap its potential for energy efficiency and renewable energy.

- The American Council for an Energy Efficient Economy (ACEEE) estimates that Ohio could reduce its energy consumption by 33 percent by 2025 through cost-effective efficiency measures.
- Energy efficiency is the lowest-cost energy resource available to Ohio.
- Ambitious energy efficiency efforts have been shown to deliver greater benefits at lower costs to consumers than more modest efforts.
- Ohio has the potential to generate 288,000 gigawatt-hours (GWh) of electricity from wind turbines throughout the state and in Lake Erie, and 34,000 GWh from solar energy. Combined, Ohio's solar and wind resource could generate almost six times as much power annually as is consumed by all the state's homes.

Public officials should ensure that Ohio achieves its potential for renewable energy and energy efficiency.

- The Public Utilities Commission should **hold utilities accountable** for hitting their requirements under the Clean Energy Law. After issuing waivers to utilities that fell short of

their goals in 2009, the PUC needs hold utilities to the requirements of the law by enforcing fines on utilities that did not meet their targets in 2010.

- Ohio should **expand and strengthen its renewable energy and energy efficiency policies** to match policies adopted by leading states.

- Ohio should **adopt a suite of clean energy policies to support the Clean Energy Law**, enabling low-cost financing for clean energy projects and strengthening the state's building energy codes.

Introduction

Clean energy is springing up all over Ohio.

More than two years after the state's Clean Energy Law took effect, Ohio is seeing rapid clean energy development all across the state. Since early 2010, the state has seen major renewable energy facilities announced or completed almost every few months. In 2010, for instance, the state's largest solar facility opened in Wyandot County; in late 2011, the state's largest wind farm began producing electricity near the Indiana border in Paulding County.

At the same time, clean energy is integrating into Ohio's economy from the bottom up. The effects of Ohio's ongoing transition to clean energy are evident in the aisles of hardware stores around the state, where energy efficient products offer Ohioans a cost-saving alternative to conventional appliances, in businesses where efficient machinery is reducing power bills, and on rooftops and fields across Ohio where renewable electricity is being generated.

Ohioans are reaping the benefits of clean energy in countless other ways as well. For example, more than 100 different local landowners signed agreements with the

developer of the Paulding County wind farm to allow a turbine to be built on their property. For those residents, clean energy means new income from renting out their fields for wind power—as well as new jobs in their community for workers involved in building and operating the turbines.

Families installing solar panels on their houses are gaining security against electricity price increases for decades, while helping shift Ohio's electricity grid away from massive, dirty coal plants and towards decentralized clean energy. Households installing energy efficient refrigerators, air conditioners, or televisions are getting products that are just as good as less-efficient models, but paying lower electricity bills at the end of every month.

The change to clean energy doesn't come all at once. But one solar panel, wind turbine, and efficient air conditioner at a time, Ohio is moving from an economy in which residents draw vast amounts of electricity from dirty power plants to one in which we use energy more efficiently, draw more of it from solar and wind panels scattered across the state, and reap the financial and environmental benefits of the change.

Clean Energy Can Reduce Fossil Fuel Use in Ohio

Burning fossil fuels to generate electricity threatens the economy, the environment and public health in Ohio. Fortunately, Ohio has the potential to replace dirty energy with energy efficiency and renewable energy, cutting pollution while creating clean energy jobs here in our state.

Fossil Fuels Threaten Ohio's Economy, Health and Environment

Most of Ohio's electricity is generated by burning coal, the dirtiest source of electric power. Coal accounted for 84 percent of Ohio's electric generation in 2009.¹ That heavy coal dependence makes Ohio a leading source of global warming pollution, as well as the pollutants that cause smog and acid rain. It also comes at an economic cost; in 2008, Ohio imported, on net, 32.7 million short tons of coal from other states, at a cost of \$1.5 billion.²

Fossil fuels also harm public health and the environment.

- In 2009, the most recent year for which data are available, Ohio's electric power sector ranked fifth in the nation for the emission of nitrogen oxides, a major component of smog, emitting 110,000 metric tons of those pollutants.³ Low levels of smog inhaled over the long term can cause and aggravate a host of health problems, especially lung problems and cancer, while inhalation of high levels can damage lungs and send vulnerable people to the emergency room with breathing difficulties.⁴
- Ohio's power plants emitted over 4,200 pounds of airborne mercury in 2010, the second most of any state.⁵ Mercury is a powerful developmental toxicant, which can produce lasting mental impairments in children who are exposed to it *in utero*.⁶ Nationwide, one in ten women of childbearing age has enough mercury in her bloodstreams to put her children at risk if she becomes pregnant.⁷
- Ohio's power sector emitted 624,000 metric tons of sulfur dioxide, the

primary component of acid rain, in 2009—the second highest amount of any state.⁸ Acid rain can devastate forests and lakes, and sulfur dioxide in fine particulate form can threaten human health.

- Ohio’s power sector is a significant emitter of global warming pollution. In 2009, power plants in Ohio released 1.8 million metric tons of carbon dioxide—the third most of any state.⁹

Renewable Energy and Energy Efficiency Are Good Solutions for Ohio

Rather than relying on dirty imported fuels for electricity, Ohio can turn to clean energy resources available right here in our state. We can generate clean electricity through renewable energy, and reduce our energy needs by taking advantage of energy efficiency opportunities.

Ohio Has Excellent Renewable Electricity Potential

Ohio has 4,240 square miles of land outside of developed or ecologically sensitive areas suitable for wind energy development with current technology.¹⁰ That land could host up to 54 GW of wind energy capacity—providing over two and a half times as much electricity annually as all of Ohio’s homes consume in a year.¹¹ In addition, Ohio has the potential to install more than 45 GW of wind capacity offshore in Lake Erie—enough to power all the state’s homes an additional two and a half times over.¹²

Solar energy can also help to power Ohio’s future. Photovoltaic cells can be deployed directly on homes and commercial buildings, or as part of larger solar power facilities. When placed on homes and businesses, solar panels help cut transmission losses in the electrical system by producing power close to where it is consumed.

A 2008 study conducted for the National Renewable Energy Laboratory concluded that by 2015, Ohio would have the potential to install more than 26 GW of solar

Capacity and Quantity

At various times in this report, electricity supply and consumption are discussed in terms of generating capacity and actual electricity produced (or saved). Renewable energy installations’ *capacity*, measured in kilowatts, megawatts, or gigawatts, is the greatest level of electricity production they can achieve at any one time. Expected *savings* from an efficiency measure, or expected *production* from a renewable generation facility, measured in kilowatt-hours, megawatt-hours, or gigawatt-hours, is the total amount of electricity they will produce or save in any particular year.

Capacity is most relevant at times when demand for electricity is highest—most often during hot summer days when air conditioners are being widely used. In order to produce enough electricity during those times, states need to have sufficient generating capacity available. Electricity production and savings, by contrast, are the most relevant information for estimating the impact of clean energy measures on a state’s emissions of pollutants, or its dependence on fossil fuels.

generating capacity just on residential and commercial rooftops.¹³ Those panels could produce 34,000 gigawatt-hours (GWh) of electricity annually, more than half the amount of electricity consumed by Ohio's homes in a year.¹⁴ Dedicated solar fields—like the Wyandot power station already operating in Upper Sandusky—could produce even more energy. Ohio's solar resource is significantly better than that of Germany, the world's leading country for solar electricity generation, and Ohio receives only slightly less sunlight than New Jersey, the nation's second-largest producer of solar energy.¹⁵ States such as New Jersey have more solar power than Ohio not because they are appreciably better suited for solar energy, but rather because they have pursued solar development more aggressively.

Combining the three generation options discussed above, Ohio has the potential to produce 212,000 GWh of wind and solar electricity annually (even before adding in the state's potential solar capacity from utility-scale solar facilities), almost six times as much electricity as the state's homes consumed in 2010.

Ohio's Clean Energy Law also allows utilities to develop sources of electricity other than wind and solar to meet their renewable energy requirements. These include landfill gas combustion, biomass combustion, and small-scale hydroelectric generation. Done properly, each of these can be a valuable clean energy resource, but all of them (and biomass in particular) can also have detrimental impacts on the environment.

Ohio Can Benefit from Energy Efficiency

One of the easiest ways for Ohio to cut its dependence on fossil fuels is for the state to take advantage of readily available opportunities to save electricity through efficiency measures. A 2009 survey by the American

Council for an Energy Efficient Economy (ACEEE) determined that Ohio could reduce its projected electricity consumption in 2025 by 33 percent through cost-effective energy efficiency measures—a reduction of more than 64,000 GWh from projected consumption without efficiency measures.¹⁶

Ohio's energy efficiency potential is distributed throughout the economy in a way that ensures the vast majority of electricity customers can participate in and benefit from efficiency policies. Across the state, efficiency opportunities are available in homes, businesses and factories. The ACEEE estimates that residential customers could reduce their 2025 electricity consumption by 34 percent through efficiency measures, while commercial and industrial customers could reduce their consumption by 27 percent and 23 percent, respectively.¹⁷ American Electric Power (AEP), analyzing energy savings potential in its own service territory, has reached similar findings; the utility estimates that it would be economically viable to save as much as 29 percent of overall sales through efficiency measures by 2031, and expects to actually achieve savings of between 19 and 22 percent.¹⁸ Additionally, using combined heat and power technology (which uses the waste heat from electricity generation to heat buildings or provide industrial process heat) in the commercial and industrial sectors could produce savings equivalent to reducing the combined power consumption of those two sectors by 8 percent.¹⁹

Energy Efficiency is the Cheapest Energy Solution for Ohio

While buying a more efficient piece of equipment or retrofitting a home to be more energy efficient requires an initial investment, energy efficiency saves consumers money in the long run by cutting their electricity consumption and power bills.

Across the country, the average cost of

energy saved through efficiency improvements is 2.5 cents per kWh.²⁰ Among the utility-operated energy efficiency programs in 16 states, outlays by utilities ranged from 1.6 cents per kWh to 4.4 cents per kWh (not counting the share of costs paid for by consumers). Ohio can save electricity at a fraction of the cost of generating that electricity. In 2008, the average price of electricity in Ohio was 8.39 cents per kWh.²¹ By contrast, the ACEEE found that Ohio could meet the savings goals of the Clean Energy Law with efficiency programs costing 3 cents per kWh saved or less.²²

Contrary to conventional wisdom, which holds that cost increases as energy efficiency measures are strengthened, research suggests that aggressive actions to promote efficiency can actually deliver the cheapest benefits to customers. An analysis by Synapse Energy Economics of energy

efficiency programs in other states suggests that more ambitious and larger energy efficiency programs obtain savings at a lower cost per kWh than do more modestly sized endeavors.²³ In other words, when utilities “go big” on energy efficiency, they can deliver greater savings more cost-effectively. The authors of the study suggest that this effect may result from decreased per-unit administrative costs when programs are more ambitious, and possibly also from economies of scale in implementing the programs.

Investments in energy efficiency also avoid the need for expensive infrastructure upgrades paid for by all consumers. Constructing a new power plant or power line can cost billions of dollars. Incremental investments in energy efficiency, renewable power and peak demand reduction can render unnecessary the construction of expensive new power plants.



Steve Stockdale of Venture Lighting, a Solon, Ohio company, holds up a 50-watt metal halide bulb that uses half as much energy as an equally bright incandescent bulb. Photo Credit: Lauren Kubiak

Types of Energy Efficiency Programs

Utilities can utilize a number of different strategies to help their customers take advantage of efficiency opportunities. Among the programs with a track record of success that have been employed here and in other states are the following:

- **Residential appliance, HVAC, and light bulb incentives** encourage residential customers to replace older, inefficient appliances, light bulbs, boilers, and other equipment with newer and more efficient versions. The U.S. Department of Energy's Energy Star program identifies high-performance appliances, allowing utilities to design incentive programs that promote the use of those appliances relatively easily.
- **Residential home retrofit** programs provide financial assistance to homeowners seeking to improve their homes' energy performance. Home retrofit programs often offer free or discounted home energy audits to utility customers to help them identify efficiency opportunities. Financial incentives then help homeowners cover the cost of implementing the cost-effective efficiency measures identified in the audit. Home retrofit programs also make the process of retrofitting easier for homeowners by providing guidance and helping to identify contractors.
- **Residential low-income** programs provide free or heavily discounted energy audits and weatherization services to low-income utility customers, who may otherwise be unable to take advantage of efficiency programs due to the cost.
- **New home energy efficiency** programs subsidize the construction or purchase of more efficient new homes,

frequently using the Department of Energy's Energy Star standard for new homes as a benchmark.

- **Commercial and industrial prescriptive incentive** programs offer incentives for purchasing selected efficient appliances, HVAC equipment, and other machinery. They also help ensure that efficient options are available on the market when machinery needs to be replaced on short notice by creating a stable market for efficient machinery, which encourages suppliers to stock those items.
- **Commercial and industrial custom incentive** programs allow large-scale energy consumers to work with utility representatives to design an efficiency program specific to their own energy needs. These programs allow utilities to work with customers to pursue the most effective efficiency strategies for their businesses, and to incentivize the purchase of efficient equipment more specific in purpose than that covered by broad programs such as Energy Star. Custom incentive programs can also take advantage of large-scale savings opportunities such as reworking an entire industrial process chain for greater efficiency.
- **Commercial and industrial retrofit** programs incentivize energy efficiency building retrofits for commercial and industrial customers.
- **Commercial and industrial new building** programs subsidize the construction of energy-efficient buildings for commercial and industrial utility customers, and educate designers about opportunities for energy savings.
- **Commercial and industrial energy management** programs help

businesses reduce energy use over time by instituting a “continuous improvement” process to drive down energy and resource consumption.

- **Commercial and industrial self-directed** programs provide large-scale commercial and industrial customers with credit for energy efficiency programs carried out at their own initiative, without the utility’s direct involvement or supervision.
- **Transmission and distribution system** improvements decrease electricity losses in power lines and other utility hardware, allowing a higher percentage of the electricity produced at power plants to reach customers.

In addition to energy efficiency, which reduces both overall demand for electricity and peak energy demand, utilities can save money that would otherwise be spent on costly generation and transmission equipment through **demand response** programs, which shift demand away from peak load times. Typically, the design of these programs calls for customers who opt in to allow the utility to temporarily switch off energy-intensive equipment like air conditioners, clothes dryers, or large-scale commercial or industrial machinery. Demand response programs meet a different need than energy efficiency—they do not, most importantly, aim to reduce electricity use—but they can help states avoid having to build expensive new power plants by capturing potential demand savings beyond those delivered by efficiency programs.

Self-Directed Efficiency Programs

Among the efficiency programs recognized under Ohio’s Clean Energy Law are “self-directed” programs, under which large utility customers apply for reductions in their energy bills to finance energy efficiency measures that they carry out on their own. Carried out properly, programs of this sort can allow utilities to support large-scale efficiency measures that are specific to the unique setup of a factory or other large business.

Ohio’s law allows utilities to count not only new efficiency measures, but also improvements undertaken as far back as 2006 as self-directed efficiency savings.²⁴ This raises the risk that funds intended for the creation of new efficiency measures will be diverted to paying for improvements already undertaken on their own merits in the past. Money disbursed to companies for historical programs and money spent on verifying and improving those programs could—and should—instead be used for programs that result in new energy savings.

Ohio's Clean Energy Law Puts Our State on the Path to a Clean Energy Future

In 2008, Ohio passed Senate Bill 221 (also known as the Clean Energy Law), which committed the state to using large amounts of renewable electricity and energy efficiency to meet future energy needs. The law sets requirements for renewable energy and energy efficiency for each of the state's four investor-owned utilities (IOUs), which between them provide the majority of Ohio's electricity. Under the schedule laid out in the Clean Energy Law, the utilities are responsible for purchasing or generating more renewable electricity each year until 2025, when each utility is expected to obtain 12.5 percent of its electricity from renewable sources, including 0.5 percent that must come from solar energy.²⁶ The utilities are also required to implement efficiency programs to hit energy savings requirements each year, building to a cumulative goal of saving 22 percent of their total sales volume through efficiency by 2025.²⁷ Utilities can meet this goal either by implementing savings programs of their own, or by crediting large-scale customers with savings from efficiency measures undertaken without utility involvement at any time since 2006.²⁸

Meeting renewable energy and energy efficiency goals benefits Ohio's economy. Carrying out energy efficiency projects creates economic activity and jobs and saves utility customers money on electricity in the long term. An ACEEE analysis of the impacts of the energy efficiency provisions of the Clean Energy Law found that the legislation will lead to the creation of more than 32,000 jobs in Ohio by 2025, increase the total value of the state's economy in that year by \$2.5 billion, and save Ohio utility customers \$19 billion between 2008 and 2025.²⁹

The energy savings and clean energy development prompted by the Clean Energy Law will significantly cut pollution from Ohio's electric power sector. A 2010 report by Policy Matters Ohio estimates that the combined effect of the renewable energy and energy efficiency measures included in the legislation will be to reduce Ohio's emissions of carbon dioxide by 310 million tons between now and 2025, and to reduce emissions of sulfur dioxide and nitrogen oxides by 1.8 million tons and 520,000 tons respectively.³⁰

Ohio's Clean Energy Law: The Details

Passed in 2008, the Clean Energy Law calls for Ohio's major utilities to save 22 percent of their sales volume through energy efficiency and to generate 12.5 percent of their electricity from renewable energy by 2025. The law sets four separate clean energy requirements, requiring the state's investor-owned utilities to:

- Save 22 percent of sales through efficiency by 2025.
- Reduce peak demand by 1 percent in 2009 and by 0.75 percent per year from 2010 to 2018.
- Develop or purchase renewable electricity accounting for 12.5 percent of their sales in 2025.
- Develop or purchase solar electricity accounting for 0.5 percent of their sales in 2025.

The law sets annual benchmarks for the efficiency, renewables, and solar requirements, beginning with small steps in the first few years and then requiring greater annual savings later, once Ohio's clean energy industry has had time to expand.²⁵

The Clean Energy Law Is Already Producing Results in Ohio

Over the four years since Ohio adopted the Clean Energy Law, the state has seen rapid development of clean energy resources. With major wind and solar projects already completed, more renewable energy in the works, and significant progress on energy efficiency since 2008, Ohio is already beginning to see the benefits promised by the Clean Energy Law.

Ohio's renewable energy capacity has expanded significantly since 2008. The state now has 17 MW of solar capacity and 110 MW of wind capacity online, with more planned.³¹ The state added 102 MW of wind capacity in 2011 alone, significantly boosting its capacity. Solar panels, which

can be installed on site to provide electricity to individual homes or businesses, have proliferated around the state.

All told, these renewable energy installations provide enough electricity annually to power more than 29,000 homes.³² More wind development is planned; the Ohio Power Siting Board has approved enough facilities to give the state 1,051 MW of wind capacity, and applications for another 784 MW are pending.³³

Individual companies have taken advantage of the Clean Energy Law's support for solar power to install large solar facilities on their own. Metzger's Printing and Mailing, a Toledo company, for instance, has been able to save \$3,000 each month on energy bills by installing a 230 kW solar array.³⁴ Campbell's Soup, meanwhile, signed a deal with a national renewable energy

company to build a 9.8 MW solar array at their facility in the town of Napoleon. That project, which will be the largest solar array in North America dedicated to providing electricity to a single facility, will provide 15 percent of the power used by the Campbell's facility. Construction work began in June 2011; the company expects the plant to come online by the end of the year. First Energy will purchase the renewable energy credits resulting from the panels' operation.³⁵

Energy efficiency improvements implemented by Ohio's four major utilities in 2010 will reduce annual electricity consumption by 944,000 MWh—enough electricity to power 82,000 average homes over the

course of a year.³⁶ Over the two years that the Clean Energy Law has been in effect, the four major utilities have implemented efficiency measures that will save 1,628,000 MWh annually—as much electricity as is consumed by 141,000 average homes.³⁷ Peak demand at the four utilities has fallen sharply over the two years that the law has been in effect; after declining by 815 MW in 2009, it fell by a further 947 MW in 2010; the cumulative decline is slightly greater than the capacity of three medium-sized (500 MW) coal plants.³⁸ (Much of this decline clearly results from lower rates of energy use during the recession, but some is also due to demand reduction measures undertaken by utilities.)

Utility Performance and Grades

Although the state has made impressive progress on clean energy since the beginning of 2009, Ohio is not yet receiving the full benefits of the Clean Energy Law. Several utilities have taken leadership in implementing the law, leading to major new renewable energy investments, but others continue to lag behind.

All the utilities will need to do more in the future—clean energy remains an under-utilized resource, and the Clean Energy Law will require greater savings in future years—but in particular, those utilities that failed to meet the modest targets set in the law’s second year will need to improve their performance.

Efficient Light Bulb Programs

Each of Ohio’s major utilities has implemented a program subsidizing the purchase of efficient compact fluorescent light bulbs (CFLs) for customers in their service territory. These programs have been highly successful over the first few years of the Clean Energy Law, accounting for a large portion of the savings several utilities have achieved.

Beginning in 2012, new federal efficiency standards for light bulbs will remove the least efficient light bulb alternatives from the market.⁴⁰ This law will produce significant nationwide efficiency savings. At the same time, it will reduce the potential for utility companies to achieve efficiency gains by encouraging consumers to switch efficient light bulbs, since the baseline for light bulb efficiency will be significantly higher than in the past.

Efficient light bulb programs are easier to set up than certain other types of efficiency programs. As the potential to save energy by subsidizing light bulbs diminishes over the next few years, utilities will need to ramp up other programs targeting other efficiency opportunities.

This is Environment Ohio Research & Policy Center's second report grading the performance of Ohio's major utilities at meeting their requirements under the Clean Energy Law. Our first report, published in March 2011, examined the utilities' performance in 2009, the first full year that the law was in effect. This report examines the utilities' performance in 2010.

American Electric Power

Through its subsidiaries Ohio Power and Columbus Southern Power, American Electric Power (AEP) serves 1.4 million customers in central, southwestern and northeastern Ohio.⁴² AEP has succeeded in meeting all of its goals under the Clean

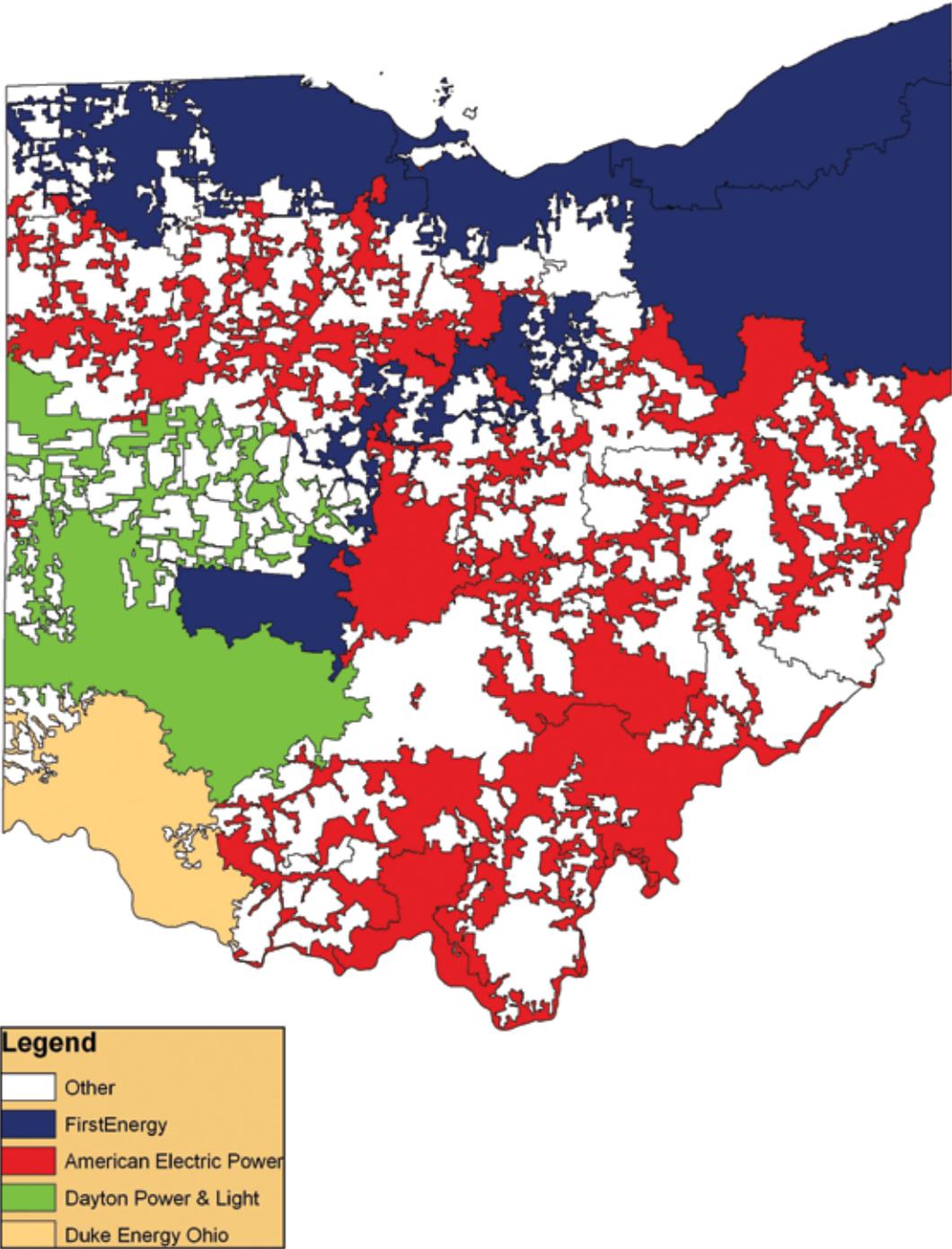
Energy Law in 2010, exceeding them significantly in the case of its energy efficiency targets. **AEP's efforts in 2010 earned an A on our scorecard.**

AEP has shown leadership in the development of Ohio-based renewable energy. In 2010, Ohio's largest solar farm, a 12 MW facility, opened in the town of Wyandot, under a 20-year contract to sell electricity to AEP. A second solar farm, with 50 MW of total capacity, is expected to enter construction in 2012, and come online in stages between 2012 and 2015.⁴³ In 2011, meanwhile, AEP worked with a renewable energy developer to bring about the construction of the state's first major wind farm, in Paulding County.⁴⁴ In 2010, the utility hit its targets for both solar and non-solar renewable energy, including making good the company's shortfall from its 2009 solar requirement.⁴⁵



Gary Allen, a senior physicist at GE Lighting in Cleveland, helped design a new, 9-watt Energy Star LED bulb that can replace a 40-watt incandescent bulb.³⁹ Photo Credit: Lauren Kubiak

Figure 1. Service Territories of Ohio's Utilities



Environmental Responsibility Means More than Investing in Clean Energy

This scorecard takes a limited look at Ohio's major utilities, examining their performance at meeting the goals set out by Ohio's Clean Energy Law in 2008. The utilities that perform well on this scorecard—by taking leadership in developing renewable energy and energy efficiency and exceeding their targets—benefit Ohio's environment and public health.

At the same time, these utilities may also undermine efforts to further improve air quality in Ohio by lobbying against regulations important to protecting the public and the environment. American Electric Power (AEP), for instance, has shown real leadership in developing renewable energy in Ohio—signing long term contracts that allowed for the development of both the state's largest wind farm and its largest solar power plant. However, the utility has also spent money at the rate of two to three million dollars per quarter over the past several years fighting against proposed EPA regulations that would reduce emissions of health-endangering pollutants, including those responsible for global warming.⁴¹ Dayton Power & Light, similarly, has spoken out aggressively against the Clean Energy Law in Ohio.

This scorecard, accordingly, should be taken only as an assessment of each utility's performance at achieving the goals of the Clean Energy Law in 2010. An "A" grade on this scorecard is only one part of the standard a company should meet to be considered an overall environmentally responsible corporate citizen. Lobbying efforts that undermine the public interest can more than outweigh the good a company does by achieving the goals of the Clean Energy Law.

AEP also met its energy efficiency and peak demand reduction requirements in 2010. The company achieved its greatest savings from three programs: a program that provides incentives for efficient light bulbs for residential customers, a program that helps commercial and industrial customers purchase energy efficient equipment, and a program that works with large electricity consumers to develop customized efficiency programs for their facilities.⁵¹ The company also achieved significant peak demand reduction through a demand-response program in which large customers agreed to cut back on their energy use during peak demand times.⁵²

In total, AEP achieved 160 percent of its energy efficiency goal and 335 percent of its peak demand reduction goal. As with several other utilities, AEP should prepare to expand other programs to fill in the gap left as the introduction of light bulb efficiency standards diminishes the potential for savings through efficient light bulb programs.

In 2010, AEP met or exceeded each of its goals under the Clean Energy Law, and took the lead among the state's utilities in committing to long-term contracts for renewable electricity. For its efforts, AEP earned a **perfect score on our 2010 scorecard, meriting an A.**

Dayton Power & Light

Dayton Power & Light (DP&L) is Ohio's smallest investor-owned utility. It serves 515,000 customers, mostly in the Dayton area.⁵³ DP&L was the second-highest scoring utility on our 2009 scorecard, and tied for the highest score this year, **earning an A on our scorecard for its efforts.**

DP&L reached all of its renewable energy goals in 2010.⁵⁴ The company is the first, and so far the only, of Ohio's major utilities to construct a solar facility of its own to meet its targets under the Clean Energy Law. The Yankee Solar Facility, a 1.1 MW facility owned by DP&L, began producing energy in March 2010 and provided enough solar electricity to meet

the utility's full requirement for Ohio-produced solar energy for the year.⁵⁵ DP&L's future plans may involve the development of more utility-owned solar facilities; the utility is considering building as much as 3.9 MW worth of additional solar capacity over the next decade.⁵⁶ For the remainder of its renewable energy requirements, DP&L purchased renewable energy credits on the open market.

DP&L also achieved both its energy efficiency and peak demand reduction goals, exceeding both by a significant margin. The company derived most of its energy efficiency savings from a program that incentivized CFL purchases for customers in DP&L's service territory. That program

Timber Road II Wind Farm: Ohio's First Commercial-Scale Wind Facility

October 2011 marked a major milestone for Ohio's Clean Energy Law—the opening of the first large-scale wind farm in Ohio. EDP Renewables built the facility after signing a 20-year contract with AEP, under which AEP agreed to purchase electricity and renewable energy credits from the facility.

The Timber Road wind farm sits on more than 100 different parcels of land near the Ohio-Indiana border in Paulding County. The facility has a total capacity of 99 MW.⁴⁶ The project consists of 55 turbines, which EDP Renewables expects will produce enough electricity to power 27,000 homes.⁴⁷

EDP Renewables specifically credited the Clean Energy Law with creating the environment for a project of this sort. In an interview with the *Van Wert Times Bulletin*, a company official told the newspaper that “why we chose [Ohio] has to do with policy. The [Clean Energy Law] and the right incentive for utilities to buy wind or solar energy. This is very good for us but very beneficial for consumers and AEP Ohio because they are getting fixed prices for 20 years. Policy matters, it was critical for us to get this project done.”⁴⁸ Ohio's growing supply chain for wind energy, and the existence of job-training centers in the state that could prepare workers to maintain the wind farm, also factored in the decision to site the project here.⁴⁹

A number of Ohio companies were involved in the construction of the wind farm; among the firms involved were construction, concrete, and electrical contractors.⁵⁰ In total, EDP Renewables invested \$175 million in the construction of the wind facility.

The Yankee Solar Facility

Utilities looking to lock in access to large amounts of renewable electricity over the long term can pursue two different strategies. They can sign a long-term contract with a renewables developer, allowing that developer to build a facility with the knowledge that the utility will purchase the electricity produced at a stable price. Alternatively, the utility can construct the facility itself.

Dayton Power & Light chose to build its own renewable electricity facility, the Yankee Solar plant outside Dayton, to meet its solar electricity needs under the Clean Energy Law. The plant took 13,000 man-hours to build, with 80 percent of that labor being supplied by Ohio-based contractors.⁵⁷

In the plant's first year of operation, DP&L was rewarded for its decision to own the facility, which put it in position to harvest the benefits or bear the costs of the plant producing more or less electricity than expected. Yankee produced 1,334 MWh in 2010, 21 percent more than the utility had anticipated.⁵⁸

was significantly more successful than anticipated—accounting for almost four times as much savings in 2010 as originally planned.⁵⁹ As with other utilities, DP&L will need to ensure that other programs fill the gap created as new light bulb efficiency standards reduce the potential gains from that area in future years (see page 14). With the CFL subsidy program leading the way, DP&L achieved 250 percent of its energy efficiency target and 356 percent of its peak demand reduction target.⁶⁰

Duke Energy

Duke Energy is Ohio's third largest investor-owned utility. The utility serves 652,840 customers in southern Ohio, mostly in the Cincinnati area.⁶¹ Duke performed well on its energy efficiency benchmarks, but failed to develop enough renewable energy to meet its targets under the Clean Energy Law, **earning a C- on our scorecard.**

Duke Energy's efficiency strategy relies primarily on two blanket efficiency incentive programs, the residential and commercial Smart Saver programs, under which the utility incentivized a wide range of efficient appliances and other equipment. By the end of 2010, the residential and commercial versions of this program accounted for 37 percent and 22 percent of Duke's overall efficiency savings, respectively.⁶² Other highly successful programs include residential home energy assessments, custom rebate programs tailored to factories' and large businesses' appliances and equipment, and demand-side management programs for both residential and commercial customers.⁶³ Duke relied heavily on efficient light bulb programs, and will need to expand its other offerings in years to come as opportunities for savings through lighting efficiency diminish.

Duke Energy reached both its energy efficiency and its peak demand reduction goals in 2009, due to a large volume of savings from energy efficiency programs it has operated since before the passage of Senate Bill 221.⁶⁴ Those programs contin-

ued to operate effectively in 2010, and as a result, Duke exceeded its electricity savings requirements by 429,379 MWh, and its peak demand savings requirements by 145.2 MW.⁶⁵ Duke Energy achieved 284 percent of its electricity savings goals and 381 percent of its peak demand reduction goals. (See Table A-3).

In order to meet its renewable energy requirements, Duke seeks out solar facility owners in Ohio and in adjacent states to negotiate short-term renewable energy contracts. The company also stimulates solar development in its service area by donating solar panels to local projects. Additionally, the company has committed to purchasing solar renewable energy credits from residential customers for a period of 15 years, in hopes that it will motivate customers to install solar panels.⁶⁶

Duke has yet to sign any long-term purchasing agreements for solar energy or other renewables, citing uncertain future revenues from its customers and the relative inflexibility of long-term purchasing agreements.⁶⁷ However, without pursuing such agreements, Duke risks falling further behind on renewable energy goals.

In both 2009 and 2010, Duke Energy requested significant alterations to its renewable energy targets, claiming that large-scale switching of customers to competitive electricity providers was rapidly shrinking its customer base.⁶⁸ Without viewing the (as yet unpublished) 2010 sales figures for Duke Energy Retail Sales, the competitive provider operated by the Duke Energy holding company, it is impossible to say how much this decrease represents a genuine decline in the size of Duke Energy's market and how much of it is attributable to customers moving to a different division of the same company. In light of this fact—and the fact that the staff of the Public Utilities Commission of Ohio recommended against approving Duke's request for an amendment to its 2009 targets—we have graded Duke's

performance against its requirements under the law, not the new benchmarks the utility requested.⁶⁹

In total, Duke's 2010 programs achieved a grade of **21 out of 30, for a C- on our scorecard.**

First Energy

First Energy is Ohio's largest investor-owned utility, accounting for 40 percent of the state's investor-owned utility market. FirstEnergy operates three major Ohio utilities: Ohio Edison, Toledo Edison, and the Cleveland Electric Illuminating Company. These three companies serve 2.1 million customers in northern and eastern Ohio.⁷⁰ For the second consecutive year, First Energy performed the worst at delivering both renewable energy and energy efficiency to its customers.

First Energy was slow to get its energy efficiency programs off the ground; the Public Utilities Commission of Ohio initially rejected its proposed suite of programs, and First Energy did not secure approval for a suite of programs until early 2011. Environmental and consumer groups have continued to criticize First Energy's preferred approach, which relies much more heavily than any of the other utilities' on savings from projects attempted independently by large commercial and industrial customers, and offers much less opportunity for small-scale residential or commercial customers to benefit from energy efficiency.⁷¹

First Energy's energy efficiency efforts have been inadequate from the outset. While the three other utilities prepared well thought-out plans and took steps to hit their energy efficiency targets in 2009, First Energy proposed flawed programs and attempted to pass off ongoing maintenance of the company's transmission infrastructure as an energy efficiency

program.⁷² The set of programs that the company eventually filed for approval with the Public Utilities Commission of Ohio (PUCO) were insufficient even in theory to meet the company's 2010 targets under the Clean Energy Law.⁷³ First Energy fell well short of its energy efficiency targets for 2010. Its approved efficiency programs saved 91 GWh of electricity, well short of its target of 429 GWh.

First Energy anticipates that the PUCO will find that it met its 2010 energy efficiency targets based on savings from energy efficiency programs pursued independently by large utility customers. First Energy's heavy reliance on these programs is problematic, since they do not offer opportunities for the majority of customers to benefit from energy efficiency programs, and the savings credited may have taken place as far back as 2006. Most worrisome, however, is the fact that, unlike the other utilities, First Energy did not submit these programs for review by the Public Utilities Commission early enough for the PUCO to approve or reject them before the utility's report on its 2010 programs was due. This report credits utilities, including First Energy, only for independent programs that were audited and approved by the PUCO before the reporting deadline for 2010 efficiency programs.

First Energy also failed to procure as much solar electricity as the Clean Energy Law called for, achieving only 78 percent of its 2010 target (counting all three regulated utilities under FirstEnergy's umbrella and its competitive retail electric provider, FirstEnergy Solutions). In particular, First Energy has been slow to procure solar energy from within Ohio. The company purchased 1,973 MWh of Ohio-generated

solar electricity in 2010, just 56 percent of its target for in-state electricity generation.⁷⁴ In contrast to American Electric Power and Dayton Power & Light, First Energy did not pursue strategies in 2010 that would give it long-term access to large amounts of solar electricity, such as constructing solar facilities or signing long-term power purchasing contracts with solar developers.⁷⁵ The utility did meet its overall renewable energy targets, purchasing sufficient renewable energy credits on the open market to meet its requirement for 2010.⁷⁶

Thanks in part to stronger enforcement from the PUCO, First Energy has begun to move in a new direction in 2011, investing in projects such as the installation of solar panels on a Campbell's Soup factory, which should put it in a better position to meet its requirements in the future. One particularly notable step that First Energy took in 2011 was an agreement it signed with Iberdrola Renewables, a major renewable energy developer, to purchase 100 MW of power from a wind farm in Van Wert County. That project, the Blue Creek Wind Farm, should be completed in early 2012, and will become the largest renewable energy facility in the state.⁷⁷ With the help of projects like these, and an approved energy efficiency plan, First Energy should be in a good position to meet its renewable energy targets in future years.

In total, **First Energy scored 18 out of 30 points on our utility scorecard for a grade of D-**. This was a slight improvement over 2009, when the utility received an F, but First Energy has still received the lowest grade of any utility in both years that we have issued this scorecard.

Policy Recommendations

Ohio is already on the road to receiving the environmental and economic benefits that energy efficiency and renewable energy offer to our state. To sustain this progress and ensure that Ohio receives the greatest possible benefit from its renewable energy and energy efficiency potential:

- The Public Utilities Commission should **hold all utilities accountable** for their renewable energy and energy efficiency requirements under Ohio's Clean Energy Law. After waiving requirements for utilities that missed their targets in 2009, the PUCO should not show similar leeway over the 2010 requirements, for which utilities had significant time to prepare.
- Utilities should **ensure that energy efficiency programs deliver real savings to customers**. Several utilities have achieved portions of their savings through programs that credit large non-residential customers for past improvements. These programs fail to deliver benefits to utility customers, while costing money in utility payments for historical savings and in state resources dedicated to examining applications for efficiency credits from old projects. Utilities should change their practices to rely on new savings instead. If this problem persists, the rules should be changed to only allow new savings to qualify for credit.
- The Public Utilities Commission should **facilitate the signing of long-term contracts for renewable energy**. Long-term power purchasing agreements are the best tool for encouraging renewable energy developments. Unlike year-to-year markets for renewable energy credits, they provide renewable energy developers with certainty about returns on their investment over the long term. Since renewable energy pays off over the long term after a large initial investment, a contract that ensures steady demand for electricity from the facility over several decades makes the decision to invest in renewable energy much less risky.

- Ohio should **strengthen the renewable energy requirements** of the Clean Energy Law to prompt further development of Ohio’s renewable energy resources, cut pollution and spur growth. Ohio has the potential to produce much more renewable energy than the current requirement of 12.5 percent of energy consumption. Leading states in renewable energy development have set requirements as high as 33 percent of consumption, and Ohio should follow suit.
- The Public Utilities Commission should **require utilities to present information about their plans and compliance with Ohio’s Clean Energy Law in a clear and standardized fashion.** Currently, utility filings with the PUCO vary in format and level of detail. The PUCO should require all utilities to submit information on their performance in detail and in a standardized format, allowing members of the public to easily follow progress towards Ohio’s clean energy requirements.

Ohio will benefit most from clean energy if it augments the Clean Energy Law with policies that remove barriers to renewable energy and energy efficiency development.

- Ohio should **restore its Advanced Energy Fund, an incentive for renewable energy installation.** The fund, which expired at the end of 2010, could be restored by diverting a small percentage of utility bills (enough to raise, on average, 9 cents per ratepayer per month) to provide an incentive to invest in pollution-free technologies like wind, solar, and efficiency.
- Ohio should complement its existing

efficiency programs by **adopting the latest model building energy codes from the International Codes Council.** Home and building energy codes ensure that new houses and buildings take advantage of opportunities for energy efficiency—locking in savings from the time of construction at the lowest possible cost.

- Programs that **allow property owners to pay for clean energy over the lifetime of their investment** reduce the up-front cost of energy efficiency and solar energy for property owners. Policies like **Property Assessed Clean Energy (PACE)** financing or **on-bill financing** allow more residential and commercial customers to benefit economically from clean energy.
 - Ohio law currently allows cities to adopt PACE legislation (which allows homeowners to pay for clean energy installations over time through an additional charge on their mortgage payment), although mortgage restrictions imposed by national lending agencies may limit the use of this mechanism. Cities should adopt enabling legislation, and national political leaders should work to clear the way for widespread use of this mechanism.
 - Ohio should move to allow on-bill financing, a mechanism which allows property owners to pay back clean energy loans through a surcharge on their utility bills. Legislation allowing this mechanism in Ohio would give home and business owners in the state a new affordable way to spread the costs of clean energy out over the same time frame as the benefits.

Appendix A: Utility Performance and Scoring

Table A-1: American Electric Power

	Requirement	Actual	Percent Attained	Points Received	Points Possible
Energy Efficiency (MWh)	228	365	160%	10	10
Peak Demand Reduction (MW)	152	510	336%	5	5
Non-Solar Renewable Energy (MWh)	217,523	217,523	100%	10	10
Solar Electricity (MWh)	6,104	6,104	100%	5	5
Overall Grade: A				30	30

Table A-2: Dayton Power & Light

	Requirement	Actual	Percent Attained	Points Received	Points Possible
Energy Efficiency (MWh)	71	178	251%	10	10
Peak Demand Reduction (MW)	21	74	356%	5	5
Non-Solar Renewable Energy (MWh)	71,419	71,419	100%	10	10
Solar Electricity (MWh)	1,718	1,718	100%	5	5
Overall Grade: A				30	30

Table A-3: Duke Energy

	Requirement	Actual	Percent Attained	Points Received	Points Possible
Energy Efficiency (MWh)	109	310	284%	10	10
Peak Demand Reduction (MW)	33	127	381%	5	5
Non-Solar Renewable Energy (MWh)	105,623	58,044	55%	4	10
Solar Electricity (MWh)	2,273	1,302	57%	2	5
Overall Grade: C-				21	30

Table A-4: First Energy

	Requirement	Actual	Percent Attained	Points Received	Points Possible
Energy Efficiency (MWh)	429	91	21%	-	10
Peak Demand Reduction (MW)	197	237	120%	5	5
Non-Solar Renewable Energy (MWh)	256,065	256,065	100%	10	10
Solar Electricity (MWh)	7,109	5,532	78%	3	5
Overall Grade: D-				18	30

Appendix B: Methodology

We graded each of the utilities based on the information they filed with the Public Utilities Commission of Ohio (PUCO) detailing their performance in meeting the 2010 benchmarks of the Clean Energy Law. Utilities file in such a way that the full results of their energy efficiency and peak demand reduction programs are visible to the public, while their renewable energy programs are less clearly laid out—since the utilities only have to cash in the minimum required number of Renewable Energy Credits each year, they do not have to report any excess credits reserved for future years. As such, we graded utilities on the full extent of their energy efficiency and peak demand reduction programs—reserving full credit on our scorecard for utilities that went above and beyond the minimum requirements of the law—but graded them only on meeting their full legal requirement on the renewable energy side.

For energy efficiency and peak demand reduction, we graded the utilities on the basis only of savings that came from utility-managed programs, or from mercantile self-directed programs that had been vetted and approved by the PUCO.

Since this is the second full year during which utilities were expected to meet the standards set forth by the Clean Energy Law, we graded the utilities more stringently than we did for 2009. Utilities should not be failing to meet the (relatively low) targets set forth by the law after having had several years to prepare to reach those targets. Accordingly, utilities were eligible for no more than 40% credit if they failed to meet the requirements set forth by the

law. For energy efficiency, utilities could receive full credit only if they went above and beyond the minimum requirements set forth by the Clean Energy Law.

We assigned grades to the utilities as follows:

For energy efficiency and peak demand reduction, we apportioned:

- Full credit for meeting 125% or more of the utility's 2010 target.
- 80% credit for meeting the utility's 2010 target.
- 60% credit for meeting 75%-99% of the utility's 2010 target
- 40% credit for meeting 50%-74% of the utility's 2010 target.
- No credit for meeting less than half the utility's 2010 target.

Energy efficiency was worth a maximum of 10 points, peak demand reduction a maximum of 5.

Renewable energy and solar electricity were graded as follows:

- Full credit for meeting the 2010 target.
- 60% credit for meeting 75%-99% of the utility's 2010 target
- 40% credit for meeting 50%-74% of the utility's 2010 target.
- No credit for meeting less than half the utility's 2010 target.

Letter grades are assigned as follows:

- A: 93% or above
- A-: 90% - 92%
- B+: 87% - 89%
- B: 83% - 86%
- B-: 80% - 82%
- C+: 77% - 79%
- C: 73% - 76%
- C-: 70% - 72%
- D+: 67% - 69%
- D: 63% - 66%
- D-: 60% - 62%
- F: 59% or below

Notes

1 Department of Energy, Energy Information Administration, *State Electricity Profiles 2008: Ohio*, March 2010.

2 Jeff Deyette and Barbara Freese, Union of Concerned Scientists, *Burning Coal, Burning Cash: Ranking the States that Import the Most Coal*, May 2010.

3 Department of Energy, Energy Information Administration, *State Electricity Profiles 2009: Ohio*, March 2011.

4 US Environmental Protection Agency, *Health: Nitrogen Dioxide*, 28 October 2010, downloaded from www.epa.gov/oaqps001/nitrogenoxides/health.html on 18 February 2010.

5 Travis Madsen, Frontier Group, and Lauren Randall, Environment Ohio Research & Policy Center, *Ohio's Biggest Mercury Polluters: How Cleaning Up Power Plants in the State and Across the Nation Will Protect Our Health*, November 2011.

6 Shelley Vinyard and Lauren Randall, Environment America Research & Policy Center, *Dirty Energy's Assault On Our Health: Mercury*, January 2011.

7 Ibid.

8 See note 3.

9 Ibid.

10 Land outside of developed and ecologically sensitive areas with wind capacity factors of 30 percent or higher at 80 meters above ground level: National Renewable Energy Laboratory, "30% Capacity Factor at 80 meters" in *Wind Powering America: 80 Meter Wind Maps and Wind Resource Potential*, 9 December 2010. Downloaded from www.windpoweringamerica.gov/wind_maps.asp on 11 January 2011.

11 Capacity: See note 10; Ohio's homes consumed 54,000 GWh in 2010, according to Department of Energy, Energy Information Administration, "Ohio" in *State Electricity Profiles, 2010 Edition*, 30 January 2012; 54 GW of turbines producing at 30 percent capacity for one year would produce 141,000 GWh.

12 Marc Schwarz et al., National Renewable Energy Laboratory, *Assessment of Offshore Wind Energy Resources for the United States*, June 2010; 45 GW of turbines producing at a 35 percent capacity factor for 1 year would produce 137,000 GWh of electricity. See note 11 for Ohio residential consumption.

- 13 J. Paidipati, L. et al., Navigant Consulting, for the National Renewable Energy Laboratory, *Rooftop Photovoltaics: Market Penetration Scenarios*, February 2008.
- 14 Assuming a capacity factor of 15 percent for installed solar facilities. See note 11 for Ohio residential consumption.
- 15 Calculated by comparing selected data points from NASA, *Surface Meteorology and Solar Energy Dataset*, accessed at eosweb.larc.nasa.gov/cgi-bin/sse/grid.cgi on 10 January 2010. Average horizontal-surface insolation in Ohio ranges from 3.64 kWh/m²/day in the northeast to 3.79 in the southwest, while Germany's ranges from 2.75 in the north to 2.90 in the south. New Jersey's insolation ranges from 3.80 in the north to 3.91 in the south.
- 16 American Council for an Energy Efficient Economy, *Shaping Ohio's Energy Future: Energy Efficiency Works*, March 2009.
- 17 See note 16.
- 18 American Electric Power, "Appendix A" in *2012 to 2014 Energy Efficiency / Peak Demand Reduction (EE/PDR) Action Plan*, 29 November 2011.
- 19 See note 16.
- 20 Katherine Friedrich, et al., American Council for an Energy-Efficient Economy, *Saving Energy Cost-Effectively: A National Review of the Cost of Energy Saved Through Utility-Sector Energy Efficiency Programs*, September 2009.
- 21 See note 3.
- 22 See note 16.
- 23 Doug Hurley, et al., Synapse Energy Economics for Northeast Energy Efficiency Council, *Costs and Benefits of Electric Utility Energy Efficiency in Massachusetts*, August 2008.
- 24 General Assembly of the State of Ohio, *127th General Assembly, SB 221*, downloaded from www.legislature.state.oh.us/bills.cfm?ID=127_SB_221 on 10 January 2011.
- 25 See note 24.
- 26 Ibid.
- 27 Ibid.
- 28 Ibid.
- 29 See note 16.
- 30 Amanda Woodrum, Phil Stevens, and Alex Hollingsworth, Policy Matters Ohio, *Energy Standards at Work: Senate Bill 221 Creates a Cleaner Economy*, September 2010.
- 31 Wind: Public Utilities Commission of Ohio, *Ohio's Alternative Energy Portfolio Standard—Certified Renewable Energy Facilities*, downloaded from www.puco.ohio.gov/emplibrary/files/util/EnergyEnvironment/SB221/Updated%20Approved%20REN%20Cases.pdf on 15 October 2011; Solar: SREC Trade, *Capacity Analysis*, December 2011.
- 32 Assuming a capacity factor of 15 percent for solar and 33 percent for wind, and an average home consumption of 11,500 kWh. See Department of Energy, Energy Efficiency and Renewable Energy, *20% Wind Energy by 2030: Increasing Wind Energy's Contribution to U.S. Energy Supply*, May 2008, for common wind capacity factors.
- 33 Ohio Power Siting Board, *Wind Totals*, 31 August 2011.
- 34 "More NW Ohio Companies Turning to Solar Power," *The Blade* (Toledo), 5 September 2011.
- 35 Benjamin Romano, "Campbell's Soup Factory in Ohio Gets 9.8 MW Solar Project," *Recharge*, 24 August 2011.
- 36 See Appendix A. Based on 11,500 kWh consumed by an average home over the course of a year.
- 37 Based on 684,000 MWh of savings in 2009; see Environment Ohio's 2009

Scorecard. Home figure based on 11,500 kWh consumed by an average home over the course of a year.

38 See Appendix A.

39 Lauren Kubiak, "Clean Energy Rust Busting Road Trip Part 2: Cleveland and Cambridge," *NRDC Switchboard*, 28 November 2011.

40 Recent congressional debates have raised the question of whether the Department of Energy will have funding to enforce this standard in 2012; whether or not it does, the standard will still exist.

41 "AEP Ramps Up Lobbying Effort," *Fort Wayne Journal Gazette*, 3 October 2011. "AEP Spent \$2 Million Lobbying in the 1st Quarter," *Bloomberg BusinessWeek*, 27 June 2011.

42 Department of Energy, Energy Information Administration, *Form EIA 861: Annual Electric Power Database, 2009, 2010*.

43 "50 MW Ohio Solar Project Secures Further Financing," *SRECTrade*, downloaded from www.srectrade.com/blog/srec-markets/50-mw-ohio-solar-project-secures-further-financing on 29 November 2011.

44 Kirk Dougal, "Timber Road Wind Farm Opens Door to a New Energy In Ohio," *Van-Wert Times Bulletin*, 6 October 2011.

45 Initial filing by AEP in PUCO case 11-2417-EL-ACP, *In the Matter of the Annual Alternative Energy Status & Compliance Report Under Rule 4901:1-40-05, Ohio Administrative Code, For Ohio Power Company*, opened 15 April 2011.

46 See note 44.

47 EDP Renewables, *EDP Renewables Builds Ohio's First Utility-Scale Wind Farm; Invests Approximately \$175 Million in Paulding County* (press release), 5 October 2011.

48 See note 44.

49 "Big Expansion of Wind in North Dakota, Ohio Gets First Big Wind Farm," *SustainableBusiness.com*, 13 October 2011.

50 See note 47.

51 Initial filing by AEP in PUCO case 11-1299-EL-EEC, *In the Matter of the Annual Portfolio Status Report Under Rule 4901:1-39-05(C), Ohio Admin. Code, by Columbus Southern Power Company*, opened 15 March 2011.

52 Ibid.

53 See note 42.

54 Combined targets for DP&L and its subsidiary DP&L Energy Resources. See initial filing in PUCO case 11-2381-EL-ACP, *The Dayton Light & Power Company*, opened 11 April 2011 for DP&L and initial filing in case 11-2385-EL-ACP, *DP&L Energy Resources*, opened 11 April 2011 for DP&L Energy Resources.

55 Initial filing in PUCO case 11-2381-EL-ACP, *The Dayton Light & Power Company*, opened 11 April 2011.

56 Ibid.

57 "Strickland, DPL Open Solar Facility," *WHIO TV*, 22 June 2010.

58 Steve Bennish, "DP&L's Solar Array Exceeds Expectations," 10 January 2011.

59 See note 55.

60 Ibid.

61 Initial filing in PUCO case 11-2515-EL-ACP, *DUKE ENERGY OHIO INC*, opened 15 April 2011.

62 Initial filing in PUCO case 09-1999-EL-POR, *DUKE ENERGY OHIO INC*, opened 29 December 2009.

63 Initial filing in PUCO case 11-1311-EL-EEC, *DUKE ENERGY OHIO INC*, opened 15 March 2011.

64 Initial filing in PUCO case 10-0317-EL-EEC, *DUKE ENERGY OHIO ANNUAL ENERGY EFFICIENCY PORTFOLIO STATUS REPORT*, opened 15 March 2010.

65 See note 63.

66 See note 61.

67 Ibid.

68 Ibid.

69 Ibid.

70 See note 42.

71 Response filing by Ohio Consumers' Counsel, Natural Resources Defense Council, Ohio Environmental Council, and Environmental Law and Policy Center, PUCO case 11-2956-EL-EEC, *OHIO EDISON COMPANY* submitted 22 June 2011.

72 Response filing by Ohio Consumer and Environmental Advocates in PUCO case 09-1004-EL-EEC, *OHIO EDISON COMPANY*, submitted 30 November 2009.

73 PUCO opinion and order in PUCO case 09-1947, *CLEVELAND ELECTRIC ILLUMINATING COMPANY*, et al., issued 23 March 2011.

74 First Energy Solutions: Initial filing in PUCO case 11-1344-EL-ACP, *FIRST ENERGY SOLUTIONS CORP*, opened 18 March 2011. Ohio Edison, Toledo Edison, Cleveland Electric Illuminating: Initial filing in PUCO case 11-2479-EL-ACP, *THE CLEVELAND ELECTRIC ILLUMINATING COMPANY/ OHIO EDISON COMPANY/ THE TOLEDO EDISON COMPANY*, opened 15 April 2011.

75 John Funk, "80-acre Solar Farm in Wyandot County Offers Glimpse at Ohio's Energy Future," *Cleveland Plain Dealer*, 20 August 2010.

76 See note 74.

77 "Wind farm Almost Complete," *Times Bulletin* (Van Wert, Ohio), 21 December 2011.