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Energy Productivity: Efficiency Benefits to Power Ohio Jobs and the Economy

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Energy efficiency provides Ohio with a tremendous opportunity to improve its energy productivity, cut consumer costs, create jobs, and decrease the amount of money it sends to other states to import energy. Bipartisan legislation passed in 2008 that includes an energy efficiency portfolio standard has pushed the state to tap into those opportunities. Senate Bill 221 calls for annual energy efficiency targets, requiring electric distribution utilities to save an increasing amount of energy each year, beginning with 0.3 percent of total electricity sales in 2009 and ramping up to a 2 percent annual savings in 2019 and thereafter. The success of the energy efficiency standard is already evident. According to a memo prepared on behalf of the Natural Resources Defense Council (NRDC) and the Ohio Environmental Council (OEC), the state's existing energy efficiency standard has saved businesses and consumers $100 million in utility costs, cut energy waste and created more than 4,000 new jobs in Ohio. Job growth, according to the report, is on target to increase to 32,300 by 2025 as the energy efficiency standard is fully implemented. And Ohio's energy bill is expected to be reduced by $3.3 billion by 2025.

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INTRODUCTION

Ohio has tremendous potential to improve its economy-wide energy productivity and decrease the amount of money it sends to other states to import energy.[1] While there are many opportunities yet untapped, the state has already begun to make great strides in improving its performance in these areas, mostly following the passage of the bipartisan Senate Bill 221 in 2008, which includes an energy efficiency portfolio standard. The legislation includes annual energy efficiency targets that require electric distribution utilities to save an increasing amount of energy, beginning with 0.3 percent of total electricity sales in 2009 and ramping up to a 1 percent annual savings requirement in 2014 and 2 percent in 2019 and thereafter. The investor-owned electric utilities that are subject to the SB 221 requirements are responsible for roughly 88 percent of total electricity sales in Ohio.

There are numerous economic benefits to reducing the energy intensity of Ohio's economy, one is job creation. This memo, prepared on behalf of the Natural Resources Defense Council (NRDC) and the Ohio Environmental Council (OEC), describes how the utility and customer investment in energy efficiency encouraged by the energy efficiency standard will save both energy and money, which will disperse through the Ohio economy and create jobs. Specific findings include these:

- *The energy productivity gains already achieved by Ohio utilities have resulted in 4,250 additional net total jobs today over what would have otherwise been supported by the state's economy.*

- *Full implementation of Ohio's energy efficiency portfolio standard will by 2025, increase employment by 32,300 total net jobs over what would have otherwise been created.*

OHIO'S LABOR ECONOMY

Despite the importance of energy to Ohio's economy, the energy industries are not especially labor intensive compared with the state's economy as a whole. The labor intensities of key Ohio economic sectors—based on 2010 records for the state—are summarized in the chart below (IMPLAN 2011).[2]

These are expressed as the number of jobs per millions dollars of revenue in 2010 dollars for the electric utility sector and for other critical economic sectors within the state.

LABOR INTENSITIES OF KEY OHIO ECONOMIC SECTORS

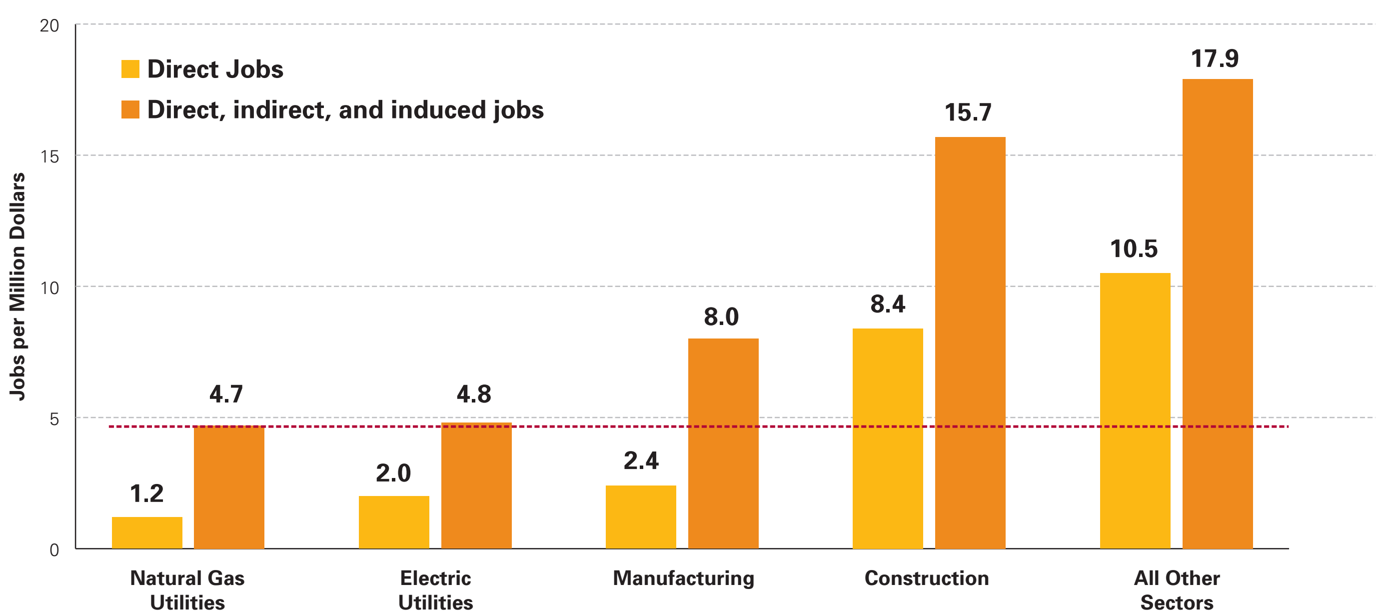
According to Ohio-specific IMPLAN economic data, the electric utility sector provides about 2.0 direct jobs per million dollars of revenue. These include jobs of those who work directly for the state's electric utilities: the power plant operating crews and the accountants, engineers, and administrative staff necessary to maintain the business. If indirect jobs—those who supply the state's utilities with energy and other necessary operations materials—as well as jobs induced by the re-spending of wages within the state are also included, the labor intensity grows to about 4.8 jobs per million dollars of revenue. All other sectors of the economy ranging from agriculture, manufacturing, and construction to wholesale and retail trade, business and financial services, and government services provide, on average, 10.5 direct jobs and 17.9 total jobs per million dollars of revenue (IMPLAN 2011), a significantly higher labor intensity.

This economic context is not unique to Ohio; throughout all regions of the U.S., energy-related sectors support fewer jobs per dollar of revenue than almost all other business activities. This means that where Ohio can invest in greater levels of energy efficiency—in ways that save money for consumers and businesses—the resulting energy bill savings will allow utility customers to shift their spending from energy toward other goods and services. This ultimately increases the total number of jobs supported by the state's economy, since dollars are channeled into sectors more labor intensive than the energy industry.

THE FINANCIAL AND ECONOMIC IMPACT OF ENERGY EFFICIENCY

Against this backdrop we can explore the net employment benefits that follow from Ohio's investor-owned utilities reaching their energy efficiency targets, beginning in 2009 and going forward to 2025. Because the available data and public filings from the state's utilities are presented in different ways, reasonable, conservative assumptions have been made in order to integrate the information into a single set of electricity consumption and savings patterns. See the Appendix for more information.

Figure 1: Labor Intensities of Key Ohio Economic Sectors



Source: Ohio data for 2010 from www.implan.com

Ohio's electric distribution utilities spent about $42 million in 2009 and will spend an estimated $100 million in 2012 to promote energy efficiency improvements among their many residential, commercial and industrial customers (with all values reflecting constant 2010 dollars). The utility programs in 2012 are leveraging an additional $300 million investment from consumers, which will reduce consumers' energy consumption by an additional 1.1 billion kilowatt-hours (kWh) in the same year.[3] Based on an average retail price of 9.1 cents per kWh (again, in constant 2010 dollars), that means consumers will save about $100 million dollars annually as a result of that first year of investment. Thus, efficiency measures for participating consumers will pay for themselves in about 3 years. For the economy at large, the program in 2012 (including program costs and the actual investments in energy efficiency upgrades) will pay for itself in about 5.5 years. As suggested in the table below the state's utilities and their consumers plan to slowly increase annual investments so that total efficiency, including past, present and future electricity savings, will grow to nearly 36 billion kWh by 2025. This represents a cumulative electricity demand savings of about 22.5 percent.

We can examine the economic impacts of these annual investments and resulting electricity bill savings by integrating relevant financial information into an economic policy modeling framework. In this case we tap into economic structural data for Ohio, which provides the critical employment coefficients (IMPLAN 2011)—similar to those shown in the first chart—as well as the anticipated long-term labor productivity and price indexing trends suggested by the Annual Energy Outlook (EIA 2012b).[4]

The table below highlights the likely program impacts in constant 2010 dollars (also the base year of the IMPLAN data set) and in net annual jobs for key benchmark years. Despite recent significant job growth, Ohio's available labor pool remains large; this energy efficiency-associated job growth will create employment opportunities for the state's available labor pool.

As observed in the table, as energy efficiency program efforts continue, investments in energy efficiency upgrades increase as well. The savings also continue to grow, rising 80-fold between 2009 and 2025 and increasing more than tenfold—from $299 million to nearly $3.3 billion—between 2012 and 2025.

Assuming a 5 percent discount rate, the expenditures and total energy bill savings shows a total resource cost, or benefit-cost ratio, of 1.34.[5] This means that over the examined time horizon, every dollar of program cost and consumer contribution will generate a minimum savings of $1.34.[6] This suggests that the energy efficiency improvements catalyzed by the state's investor-owned electric utilities should be highly cost-effective. And as suggested previously, a cost-effective energy efficiency program that redirects money from economic activity with low labor intensity—the electric utilities—into sectors that are more labor-intensive should provide a net positive employment impact for Ohio. Therefore, despite negative net energy bill savings in the first several years of operation, job impacts will still be positive throughout the program's duration. The table above underscores this point by showing a net gain in jobs that rises from 1,800 and 4,250 net total jobs in 2009 and 2012, respectively, to 32,300 total jobs by 2025.[7]

The economy also shows a higher level of robustness under the energy efficiency standards. This can be seen by the positive net gains in Gross State Product (GSP) that move from $156 million in 2009 to nearly $7 billion by 2025 (again, with all values in constant 2010 dollars).

Table 1: Financial and Economic Impacts of Energy Efficiency Program Efforts

	2009	2010	2011	2012	2015	2020	2025
Program Administrative Cost ($MM)	42	68	90	98	117	225	281
Energy Efficiency Investments ($MM)	182	295	390	424	510	977	1,222
Annual Efficiency Payments ($MM)	30	79	144	214	383	577	986
Energy Bill Savings ($MM)	41	108	199	299	660	1,574	3,288
Net Energy Bill Savings ($MM)	-31	-39	-34	-13	160	772	2,022
GSP Net Economic Activity ($MM)	156	312	492	652	1,312	3,399	6,882
Net Jobs (actual)	1,800	2,883	3,847	4,250	6,706	18,478	32,300

CONCLUSIONS

Based on the available data, exploiting Ohio's energy efficiency opportunities using programs and incentives already implemented by Ohio utilities should both create jobs and be a cost-effective investment for utility customers. This analysis shows that the policies in place are stimulating a more productive investment pattern, which provides Ohio and the United States with needed goods and services, delivered much more efficiently.

Beyond this, the analytical findings reported here, and those provided by other Ohio-specific energy efficiency studies (Laitner et al. 1994, Neubauer et al. 2009), are entirely consistent with many past studies included in a 48-study meta-review covering state and regional energy policy assessments in the United States (Laitner and McKinney 2008). In short, this analysis suggests that an innovation-led energy policy strategy—one emphasizing a cost-effective substitution of energy productivity gains for inefficient energy consumption—will lead to a net positive economic impact for Ohio and for the United States as a whole.

An Economic Thought Experiment

In 1994, the American Council for an Energy-Efficient Economy (ACEEE) documented the potential of a 26 percent economy-wide energy efficiency savings by the year 2010 (Laitner et al. 1994). Had the cost-effective energy efficiency measures considered in the ACEEE study actually been adopted, the Ohio economy might have experienced a net employment gain of 63,000 jobs, also by 2010. This 26 percent energy efficiency gain was not achieved, and Ohioians spent an estimated total of $14.1 billion on electricity in 2010, according to data from the Energy Information Administration (EIA 2012a). Using this information, in addition to the Ohio employment data adapted from the chart above, we can determine the potential magnitude of impact on the Ohio economy had the state been 26 percent more energy-efficient in its electricity use. We can estimate the impact of efficiency gains on the state's net employment as follows:

14,100 x 0.26 x (17.9—4.8) = 48,025 net jobs

In other words, had Ohio promoted a slightly different mix of investments in 1994 so that the state was 26 percent more energy-efficient in 2010 than it turned out to be, it could have supported about 48,000 more jobs than it does now. While this number seems small compared with a population of 11.5 million people, it is a significant total in a state looking to increase overall employment and economic development opportunities. Beyond, additional efficiency improvements in all energy end uses could have further expanded that number of jobs.

APPENDIX: KEY ASSUMPTIONS AND DATA

The data used in this analysis are taken from a variety of utilities reports and public sources. The analysis begins with a working baseline of historical and future electricity consumption for Ohio's investor-owned electric utilities. This includes the anticipated electricity consumption without energy efficiency improvements, as well as the expected electricity savings as the investments build up over time. The table below provides this data in thousands of megawatt-hours (MWh).

KEY TRENDS IN OHIO'S ELECTRICITY CONSUMPTION PATTERNS

The data in table 2 above build an approximate representation of the historical and the projected electricity consumption "but for" energy efficiency gains. The base case, based on utility data, assumes an electricity growth pattern (without efficiency) of 1.2 percent annually from 2012 through 2025. The efficiency case assumes a build-up of accumulative savings over time as the utilities meet the eventual 2025 target reflected in Senate Bill 221.

In completing this analysis, the choice was to err on the conservative side with regard to costs. For example, the modeling effort assumed a constant average price of electricity of $0.0914 cents per kilowatt-hour (in 2010 dollars). This was based on the 2010 average retail price reported for Ohio in EIA (2012a). A rising cost would, by definition, increase the cost-effectiveness of efficiency investments. Moreover, the first costs of the efficiency upgrades were assumed to average (in 2010 dollars) $0.40 per kWh, which produces a benefit-cost ratio (with a 5 percent discount rate) of 1.34 between 2009 and 2025. If costs proved to be less than that, the benefit-cost ratio would increase. With costs at, say, $0.25/kWh, the benefit-cost ratio would be about 2.14. In this case the number of jobs would essentially be unchanged, as the lower cost of the upgrades (meaning slightly fewer jobs in the construction, engineering, and business service sectors) would be offset by consumers having more saved dollars to spend on other goods and services.

In reviewing utility programs in Ohio and throughout the United States, the analysis incorporated an average incentive equal to about 30 percent of the total cost. With additional administrative and program costs expected to be about 23 percent of the installed cost of the efficiency improvements, the full cost of the improvements would be 1.23 times the investment of $0.40/kWh, or $0.49/kWh (again in constant 2010 dollars). With the average cost of electricity at $0.091/kWh, the annual program expenditures, including all costs, would pay for themselves in about 5.4 years. If the average life of the efficiency upgrades is 15 years, for example, this would mean a full savings over the remaining 9.6 years of the measure life.

A final assumption in this assessment is that with large uncertainties remaining about the cost of carbon, the potential need for new generation units, or for units that might need to be upgraded to meet tighter emissions standards, the retail price of electricity is a reasonable, conservative proxy for the avoided cost of electricity. This working assumption is even more plausible if one considers that as the efficiency investments are likely to generate several "non-energy" benefits in addition to the anticipated energy savings. Often, the magnitude of non-energy benefits from energy efficiency measures is significant. These added savings or productivity gains range from reduced maintenance costs and lower waste of both water and chemicals to increased product yield and greater product quality. In one study of 52 industrial efficiency upgrades, all undertaken in separate facilities, Worrell et al. (2003) found that these non-energy benefits were sufficiently large that they lowered the aggregate simple payback for energy efficiency projects from 4.2 years to 1.9 years. Unfortunately, these non-energy benefits from energy efficiency measures are often omitted from conventional performance metrics. This omission leads, in turn, to overly modest payback calculations and an imperfect understanding of the full impact of additional efficiency investments.

Table 2: Key Trends in Ohio's Electricity Consumption Patterns

	2009	2010	2011	2012	2015	2020	2025
Electricity Use Without Energy Efficiency	42	68	90	98	117	225	281
(1,000 MWh)	138,753	136,249	135,303	136,927	141,915	150,637	159,895
Cumulative Annual Efficiency Savings	30	79	144	214	383	577	986
(1,000 MWh)	449	1,186	2,180	3,271	7,222	17,222	35,976
Savings as a Percent of Base Case Projection	0.3%	0.9%	1.6%	2.4%	5.1%	11.4%	22.5%
GSP Net Economic Activity ($MM)	156	312	492	652	1,312	3,399	6,882
Net Jobs (actual)	1,800	2,883	3,847	4,250	6,706	18,478	32,300

OTHER NON-ENERGY BENEFITS

Several other studies have quantified non-energy benefits from energy efficiency measures and numerous others have reported linkages from non-energy benefits and completed energy efficiency projects. In one, the simple payback from energy savings alone for 81 separate industrial energy efficiency projects was less than 2 years, indicating annual returns higher than 50 percent. When non-energy benefits were factored into the analysis, the simple payback fell to just under one year (Lung et al. 2005). In residential buildings, non-energy benefits have been estimated to represent between 10 percent to 50 percent of household energy savings (Amann 2006). If the additional benefits from energy efficiency measures were captured in conventional performance models, such figures would make them even more compelling.

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Endnotes

1 Over $1.49 billion on coal alone in 2008. Data from U.S. Energy Information Administration, State Energy Data 2009: Prices and Expenditures, Washington, DC: U.S. Department of Energy (2011), and Deyette, Jeff and Freese, Barbara, "Burning Coal, Burning Cash: Ranking the States that Import the Most Coal," Union of Concerned Scientists (Cambridge, MA; 2010).

2 IMPLAN® (IMpact analysis for PLANning) is a national database and a set of analytical software tools that provide an array of economic and structural data for both the U.S. and for each of the states and counties within the U.S. For more information, see http://www.implan.com.

3 As explained in the Appendix of this working memo, the assumption used in this analysis is that each new kilowatt-hour of energy efficiency improvement will cost about 40 cents per kWh using the first-year cost convention. With an average electricity cost of 9.1 cents per kWh, that investment will have a simple payback of about 4.4 years. This is a very conservative assumption; data from utilities and elsewhere suggest that many efficiency improvements might cost as little as first-year 20 to 25 cents/kWh.

4 For background material on how this kind of impact assessment is undertaken, see a characterization of the ACEEE Dynamic Energy Efficiency Policy Evaluation Routine (DEEPER) Modeling System, as summarized in a similar assessment for Texas (Laitner 2011).

5 A five percent discount rate was chosen, as this is a typical, reasonable, rate used in short-term assessments. Had a three percent discount rate been chosen, the-benefit cost ratio would be 1.37; it would be 1.30 for a 7 percent discount rate. Office of Management and Budget, Circular A-4, Regulatory Analysis, 17 September 2003.

6 As mentioned in endnote 5, the cost for many energy efficiency improvements could be on the order of 20 to 25 cents per kWh, which suggests a significantly larger benefit-cost ratio than what is indicated in this particular assessment.

7 Interestingly, the 2009 ACEEE study (Neubauer et al. 2009) suggested a suite of 10 innovative programs and policies that might deliver a 22 percent savings by 2025 and promote a net gain of 32,100 net jobs by 2025. The ACEEE report also suggested a significantly larger economic potential for efficiency gains, 64,284 GWh economic potential by 2025.