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ANDERSON ECONOMIC GROUP

The Net Costs of a 25% Renewable Energy Mandate in Michigan

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I.Executive Summary

PURPOSE OF REPORT

The Small Business Association of Michigan ("SBAM") retained Anderson Economic Group to complete an independent analysis of and report on the "Michigan Energy, Michigan Jobs" proposed amendment to the Constitution of Michigan ("25x25," "the proposed amendment," or "the proposed mandate" in the remainder of this report), to be voted on by the state's electorate in November 2012.[1] The purpose of this report is to analyze the proposed amendment, including its cost and its effect on employment in Michigan. We discuss the implications of the proposal being in the form of a constitutional amendment and include a comparison of our findings with other studies.

THE MEANING OF THE PROPOSED AMENDMENT

The proposed amendment would add a section to the Constitution of the State of Michigan, which would add two sets of requirements:

First, the proposed section states that "it is the policy of Michigan to promote and encourage the use of clean renewable electric energy sources," defining renewable sources to be wind, solar, biomass and hydropower. It requires that, by 2025, all Michigan electricity suppliers generate 25% of all electricity they sell from renewable sources, located either in Michigan or within the area in which the supplier sells electricity.

Second, if compliance with 25x25 would require suppliers to increase prices by more than one percent in any year over and above increases for reasons not related to the mandate, the deadline would be extended beyond 2025. This extension would be the length of time necessary for suppliers to reach the 25% requirement without increasing prices by more than one percent per year due to the mandate.[2]

Lastly, the proposed mandate requires the legislature to enact laws encouraging "the use of Michigan made equipment and employment of Michigan residents." We believe that the wording of the proposed amendment is ambiguous, and discuss this ambiguity in the section "25x25 Is Unclear" on page 26.

OVERVIEW OF APPROACH

The proposed amendment, if passed, would increase electricity costs for consumers in Michigan, and would alter the trajectories of job creation and destruction in the state. We analyze the cost of substituting electricity generated from

1. The proposed amendment and the wording that will appear on the ballot are shown in Appendix A.
2. We discuss the ambiguity in the wording of this requirement in the proposed amendment later in this report.

renewable sources for electricity generated from non-renewable sources. We also consider the net effect of the proposed mandate on jobs in the state, considering the loss of jobs resulting from more expensive electricity and the creation of jobs in the construction and maintenance of renewable electricity capacity.

We analyze a scenario in which the new renewable-source electricity comes 95% from wind generation and 5% from biomass. Other sources of renewables are allowed by the proposed mandate, and there would likely be some generation capacity added from other sources. Nevertheless, our analysis assumes that wind power would make up the vast majority of the new renewable generation due to cost advantages and scalability.

Costs Difference

Electricity generated from renewable sources costs more to produce than electricity from non-renewable sources.[3] We consider the effect of the proposed mandate on the total price of electricity paid by consumers from now until 2025 by determining the difference between the total amounts paid each year for electricity under 25x25 and the total amount paid in the absence of 25x25. To estimate the total amounts paid each year under each scenario, we multiply the projected quantity of electricity demanded by its projected price. For both quantities and prices, we base our analysis on data and projections from the Energy Information Administration at the U.S. Department of Energy.

Two Effects on Jobs

We consider 25x25's effect on jobs in two parts:

1. First, we consider the reduction in the number of jobs in Michigan that would result from the increase in electricity prices. Increasing prices would have the effect of reducing the funds available to Michigan consumers for non-electricity spending, which would result in a decline in economic activity and employment in the state.
2. Second, though jobs would be lost because of the increased cost of electricity, jobs would be created by electricity generators as electricity suppliers increase the proportion of their output that comes from renewable energy sources. We estimate the amount of additional capacity and corresponding investment needed to meet the mandate, using projections of demand and industry standards for investment in renewable energy generation.

3. According to the Energy Information Administration's "Annual Energy Outlook 2011," the projected national average "total system levelized cost" of generation capacity entering service in 2016 (which includes capital, operation and maintenance, and transmission investment spread over the life of the equipment) for conventional coal ($94.8 per MWh) and natural gas ($124.4/MWh) is projected to be lower in 2016 than that for solar ($210.7/MWh for photovoltaic), wind ($97/MWh), geothermal, and biomass ($112.50 per MWh) resources.

To quantify the net effect of 25x25 on jobs, we use input-output economic analysis, counting both costs and benefits and considering substitution. In this analysis we use Bureau of Economic Analysis RIMS II multipliers to estimate the direct and indirect employment effects of changes in expenditures in the state due to the proposed mandate.

Discussion of Proposal Wording and Other Reports

Following the section on net job impact, we examine the wording of the 25x25 proposal, and discuss the implications of using a constitutional amendment to achieve the proposal's goals. We also comment on the economic implications of the mandate's strict definition of renewable energy sources.

Lastly, we compare our work to other recent reports that have similarly attempted to quantify the impact of this proposal.

SUMMARY OF FINDINGS

1. 25x25 would result in $187 million in additional real annual electricity costs in the state of Michigan by the year 2025, expressed in 2012 dollars. Over the 30-year life of the equipment, this would mean a total cost of $5.6 billion resulting from higher electricity rates.

For various reasons, including higher capacity needed for electricity generation and the cost of materials and labor, renewable electricity is more expensive to generate than non-renewable electricity. Because the proportion of electricity generated from renewable sources would increase under 25x25, the average cost of electricity generation and, therefore, prices to households and businesses would increase. We estimate the additional expenditures on electricity in each year from 2016 through 2025. In 2025, the additional expenditures would amount to $187 million in 2012 dollars, and this increased expenditure would persist beyond 2025. For the new renewable capacity built to meet the proposed mandate, ratepayers would pay a total of at least $5.6 billion. This cost would rise to $7.8 billion if a Production Tax Credit (PTC) for wind power is allowed to expire, as shown in Table 1.[4] (Unless otherwise noted, all costs and prices shown throughout this report are in 2012 dollars.)

TABLE 1. Additional Cost Due to Renewable Mandate

	Inflation-Adjusted Cost (2012 dollars)	Nominal Cost (not inflation-adjusted)[a]
Additional Cost (With PTC in place)	$5.6 billion	$9.0 billion
Additional Cost (Without PTC)	$7.8 billion	$12.5 billion

Analysis: Anderson Economic Group LLC

a. The total nominal cost over the 30-year period (in current-year dollars, not adjusted for inflation) assuming approximately 2% inflation.

2. *The average net effect on the employment level in Michigan would be negative 1,678 jobs through the 30-year life of the renewable generation equipment constructed due to the proposed mandate. This includes an initial 6-year period of positive employment impact followed by a 24-year period of negative employment impact.*

The costs to rate-payers and expenditures on the construction and operation of renewable power generation equipment would both create and destroy jobs in Michigan.

Firstly, jobs would be lost because of the increase in electricity costs ($187 million annually, totaling $5.6 billion over thirty years): from 2025 on, employment in Michigan would be lower by 2,900 positions than it would have been in the absence of 25x25.[5] The effect is economy-wide as residential, commercial, and industrial ratepayers would all face higher electricity rates and react by employing fewer workers and spending less on goods and services. This impact is a conservative estimate because it does not account for decreases in output by energy-intensive manufacturers, or decisions by business owners to relocate outside the state to avoid the increased electricity costs.

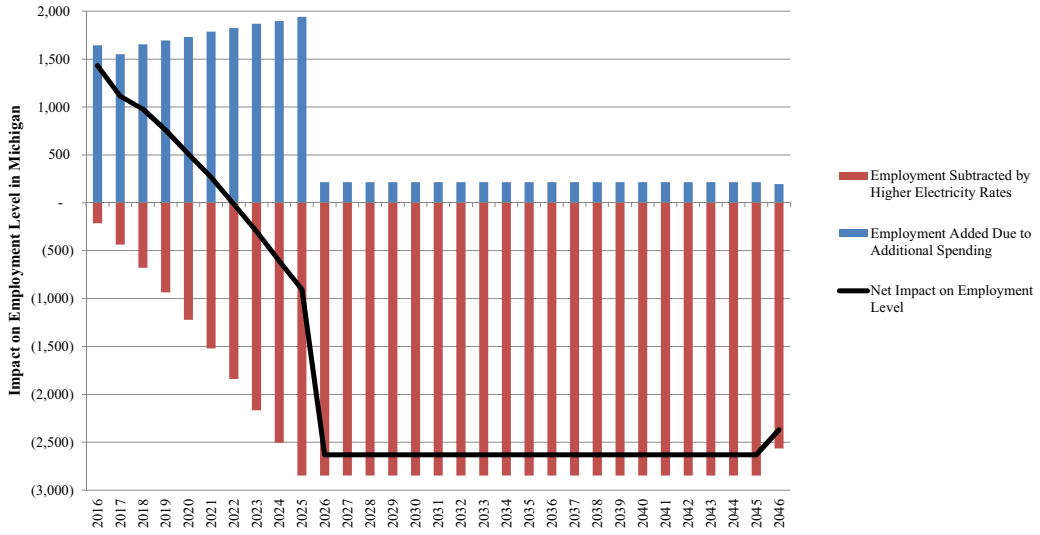
On the other hand, many new jobs would be supported as electricity suppliers construct and bring online additional generating capacity. Construction of the necessary generating capacity would require the employment of 1,500-1,900 workers in each year between 2016 and 2025 as the mandated amount of renewable generation capacity is added and the equipment operated. Once the additional renewable generation capacity has all been added, for the remainder of the 30-year life of the equipment an additional 216 jobs on average would remain for the operation and maintenance of the renewable capacity.

The net result would be 1,678 fewer jobs in the economy on average (or 51,797 "job-years", or jobs of single year duration, during the 30 year period). The net impact varies throughout the life of the equipment, as shown in Figure 1.

4. This estimate is based on a "current policy" baseline, which assumes that the federal production tax credit ("PTC") for energy from renewable sources, which is scheduled to expire after 2012, would remain in effect through the year 2025. If that credit is allowed to expire, the impact would be considerably larger. The annual statewide costs would increase by $70 million to $260 million annually in 2025.

5. If the PTC credit is allowed to expire (as discussed in footnote 5 on page 4), the employment losses would increase by 1,000 to over 3,900 gross fewer jobs, due to the increased cost of electricity. Ratepayers would pay a total of $7.8 billion, rather than $5.6 billion, to cover renewable capacity built to meet the standard if the PTC expires.

FIGURE 1. Net Employment Impact of 25x25 Proposal (95% Wind, 5% Biomass)



We project an initial period of positive employment impact as renewable generation capacity is added while rate-payers are not yet facing the full effect of the proposal on electricity prices, followed by an over 20-year period of negative employment impact as the full effect on electricity prices is felt in the economy, while the initial flurry of construction and installation related employment has ended. See Exhibit 6 in the Appendix.

3. As a result of 25x25, the Constitution of the State of Michigan would simultaneously be excessively rigid and unclear.

The mandate defines renewable energy sources as being wind, solar, biomass and hydropower only. This would have the effect of diverting investment away from other renewable energy sources and away from investment in improving efficiency, both in the generation and the use of electricity. The amendment also restricts electricity suppliers from buying power from cheaper renewable sources outside the state. By enshrining these restrictions in the Constitution, Michigan is curtailing future attempts to produce energy more efficiently with new or improved technologies not specifically allowed by the mandate.

Simultaneously, it is not clear from 25x25's wording whether the mandate requires the price increases resulting from incremental renewable generation costs to be limited to one percent per year, or that price increases resulting from incremental renewable generation costs may not push price increases above one

percent. A third interpretation, from the wording on the ballot, is that the mandate limits price increases *for any reason* to one percent per year. This would likely be unenforceable, as the Constitution's Article I prohibition on property seizure does not allow the state to require that a business bankrupt itself by lowering its prices. 25x25 would enshrine this lack of clarity in the Constitution of Michigan.[6]

4. Previous studies that estimate the economic impact of 25x25 have taken an incomplete view of the proposed mandate's consequences.

There are, at the date of this report's publication, two major existing studies of the 25x25 proposal, one by the Land Policy Institute at Michigan State University, another by the Beacon Hill Institute. Both studies make contributions to the debate in a way that is, on the surface, similar to ours, in that they identify an overall amount of expenditure on renewable generation capacity and use input-output economics to estimate effects on employment. Nevertheless, there is a major difference: ours is the only study that examines both the negative employment impacts from higher energy prices and the positive employment impacts from higher spending on construction and operation of renewables.

The Land Policy Institute's study looks only at the positive impacts of building more renewable generation capacity; it does not consider the loss of jobs that would result from the relative increase in the price of electricity. The Beacon Hill study uses a model that accounts for the effects of higher energy costs on ratepayers and additional spending elsewhere in the economy of the funds associated with these higher costs. It does not separately estimate the employment

6. Our analysis suggests that the incremental price increase due to meeting the renewable energy standard from one year to the next would not exceed 1%, so that this limit does not affect our cost analysis. This price trajectory, however, is contingent on the assumption that the capacity for this electricity is ramped up in approximately a linear fashion. There is a possibility that the actual timing of adding renewable capacity would require a price increase above the limit. The risk that this may occur could affect the timing and overall cost of the proposed mandate.

impact associated with spending on renewable generation.[7] Table 2 summarizes some of the key results of this study and the other studies.

TABLE 2. Comparison of Studies Examining 25x25 Mandate

	Land Policy Institute	Beacon Hill Institute ("medium" cost scenario)[a]	Anderson Economic Group
Total Cost of Renewable Capacity	$10.3 billion (2010 dollars)	$23.6 billion (2010 dollars)	$7.8 billion (2012 dollars)
Average Employment Subtracted by Higher Electricity Costs	Not Addressed	Not Separately Estimated	-2,392
Average Employment Added by New Expenditures (30 year period)	3,199[b]	Not Separately Estimated	714
Net Employment Impact	Not Addressed	-3,320	-1,678

Sources: Land Policy Institute, Beacon Hill Institute
Analysis: Anderson Economic Group, LLC

a. Incremental effect of 25% renewable energy requirement compared to existing 10% requirement alone, medium cost scenarios.

b. To put the LPI study's employment on a consistent basis with ours, we converted their results to a 30-year average basis. We constructed this figure using construction job-years divided by 30, plus reported 20-year operation and maintenance job-years divided by 20.

ABOUT ANDERSON ECONOMIC GROUP

Anderson Economic Group, LLC ("AEG") is a consulting firm that specializes in economics, public policy, financial valuation, market research, and land use economics. Anderson Economic Group has completed economic and fiscal impact studies for a variety of public and private sector clients. See "Appendix C: About AEG" on page C-1 for more information.

7. According the Beacon Hill study's authors, their analysis recognizes that the mandate "would bring some new investment...but that net investment...would fall." (See page 7 in the report.) However, we were unable to identify any separate projections of job gains and losses in the study, and the description of methodology (on pages 5 and 15 of the report) states that the projections were derived from "simulat[ing] these changes in the STAMP model as a percentage price increase in electricity to measure the dynamic effects on the state economy."
While the Beacon Hill study does not provide separate benefit and cost figures, its cost estimates are comparable to the additional cost estimates presented here.

II. The Proposed Amendment

The proposed "Michigan Energy, Michigan Jobs" amendment to the Constitution of Michigan is a proposal to be voted on at the November general election that would change the Constitution to mandate that 25% of electricity sold in the state shall be generated from renewable sources by the year 2025.[8]

THE CURRENT STATUTORY RENEWABLE MANDATE

In 2008, Michigan's Public Act 295, the Clean, Renewable and Efficient Energy Act, came into law. Under this act, Michigan electricity providers are required to meet 10% of electricity demand from renewable sources and from efficiency gains. The mandate includes interim requirements starting in 2012.[9] Laws ensuing from the passage of 25x25 would, we assume, be in addition to the 2008 Renewable Energy Standard.

THE CONSTITUTIONAL AMENDMENT

At issue is a proposal to amend the Constitution of the State of Michigan by adding a Section 55 to Article IV, which is entitled "Legislative Branch."[10] The legislature will have to interpret the wording of the proposed amendment, which is not uniquely interpretable. We assume that the proposed amendment and ensuing laws and regulation will have the following effects:

1. They will require the source of 25% of electricity sold to be renewable by 2025, "renewable sources" being defined exclusively as "wind, solar, biomass, and hydropower."
2. There will be no effect on the sourcing of electricity until 2016, before when any changes in the source of electricity will be the result of the concurrent 2008 Renewable Energy Standard. In 2015, 10% of energy sold will be generated from renewable sources.
3. The transition from 10% of electricity being from renewable sources in 2015 to 25% in 2025 will be linear.
4. They will require that electricity price increases resulting from the proposed amendment may not be more than 1% per year.
5. If compliance with the requirement to increase the proportion of electricity generated from renewable sources requires an incremental price increase of more than 1% in any year, the mandated year by which 25% of electricity must be from renewable sources will be postponed accordingly.[11]

8. See Appendix A for the ballot wording and the wording attached to the petition—the "Initiative Petition, Amendment to the Constitution."
9. See, for example, http://www.michigan.gov/mpsc/0,4639,7-159-16393_53570---,00.html. For a summary, see "Michigan Energy Credits" at http://www.dleg.state.mi.us/mpsc/renewables/michigan_energy_credits_%201_26_10.pdf.
10. See Appendix A for the wording of the proposed amendment.

6. The legislature will be required to promulgate laws "to encourage the use of Michigan made equipment and employment of Michigan residents."

Because the proposed amendment is written for the purpose of being added to the Constitution of Michigan, it cannot and does not touch upon many of the details that will be the subject of the ensuing laws and regulations. We have, therefore, made reasonable assumptions that we describe in the sections that follow. The principal assumptions are:

1. The ultimate goal is to reduce the amount of electricity generated for consumption within Michigan from non-renewable sources relative to the amount that would be the case in the absence of 25x25.
2. There will be no additional electricity generated from hydroelectric sources. The renewable sources that are available under the proposed amendment are therefore wind, solar, and biomass.
3. The proposed amendment will have an equal effect on all electricity suppliers, whether traditional electric utilities, municipal utilities, or cooperatives.

11. The wording in the proposed amendment is "Limit to not more than 1% per year electric utility rate increases charged to consumers only to achieve compliance with the renewable energy standard." Under our assumptions, the incremental increases in the price of electricity will be less than 1% in each year; 25% of electricity will, therefore, be generated from renewable sources by 2025. If the proposed amendment is interpreted to mean that increases in electricity prices resulting from the amendment *and for other reasons* may not be more than 1% per year, the target year may be pushed back. If so, the aggregate results of our analyses will hold, but the effect of the proposed amendment will be delayed commensurately.

III. The Effect of 25x25 on Electricity Costs

It is well known that the price of electricity generated from renewable sources is greater than the price of electricity generated from non-renewable sources.[12] Under Michigan regulation, utilities, which either generate or purchase the electricity that they supply, charge consumers electricity rates that are governed by the Michigan statutes, which are administered by the Michigan Public Service Commission. These prices are designed to allow regulated utilities to operate natural monopolies while maintaining service standards and to make a reasonable return on their investments.

Though the proposed amendment would result in an increase in investment in renewable energy generation, this investment would come at a cost. In order to comply with the requirements of the proposed mandate, the costs to Michigan electricity suppliers of the generation of electricity from renewable sources will be greater than from non-renewable sources. The increased fraction of electricity generated from relatively expensive renewable sources will have the effect of increasing the average cost of generation, and suppliers will pass the cost increase on to consumers.[13] Specifically, we project that Michigan consumers (households and businesses) will pay an additional $190 million per year for electricity once the reforms have been fully implemented.

In the following section, we show our calculations for the effect of the proposed amendment on the cost of electricity to Michigan consumers. Though technical aspects of our analysis are complex (see "Appendix B. Methodology" on page B-1 for more details), the calculation involves a straightforward multiplication of the demand for electricity by the price of electricity. We perform this calculation separately for a baseline scenario in which 25x25 does not pass, and a scenario in which it does. The difference between the costs in these two scenarios is the cost of 25x25 to consumers in Michigan.

ELECTRICITY DEMAND

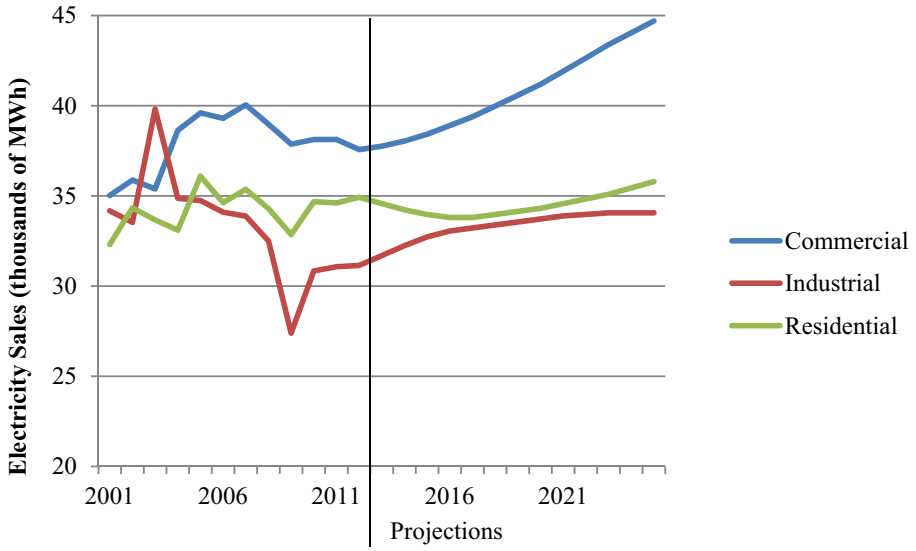
Demand for electricity, most likely due to the dwindling population and stagnant economic conditions in the state, has been relatively flat for households and declining for industry in Michigan. We anticipate that a decline in residential demand will continue for the next few years, followed by a slow increase.

12. According to the Energy Information Administration Annual Energy Outlook, the levelized cost of generation for conventional coal and natural gas falls below that for solar, wind, geothermal, and biomass resources, on average.

13. We assume that there are no increases in the costs of delivering electricity to consumers other than the increased costs of generation. Any other cost increases (for example, resulting from increases in costs of distribution and increases in utilities' overheads caused by the greater proportion of supply from renewable sources) would exaggerate the effects we calculate in this section.

On the other hand, we anticipate that commercial and industrial demand will rebound more quickly.[14] Our baseline projections for demand are shown in Figure 2 below.

FIGURE 2. Baseline Demand Projections for Electricity in Michigan, 2001-2025



Sources: Energy Information Administration Annual Energy Outlook, AEG Estimates Analysis: Anderson Economic Group, LLC

These sectors are sensitive to the price of electricity to varying degrees. Ratepayers in each sector, however, will find ways to cut down on electricity use. Since 25x25 would result in a increase in electricity prices, we expect marginal reductions in demand as the proposed mandate takes effect.

Having estimated demand for electricity over the next few years, we discuss our estimates of how 25x25 would alter renewable energy sources' shares of electricity generation, and how electricity prices for each of the sectors will change.

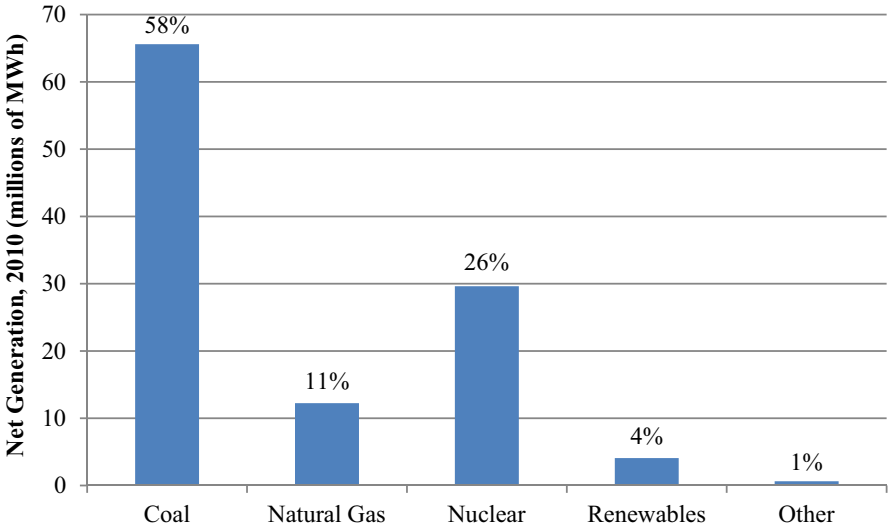
ENERGY SOURCES IN MICHIGAN

The Energy Information Administration reports that approximately 4 million MWh of electric power generation, or 3.9% of Michigan's total electricity consumption, came from renewable sources in 2010. 58% of electricity was generated from coal, 26% from nuclear sources, and 11% from natural gas. See Figure 3 on page 12. From recent growth trends in renewable electricity genera-

14. These projections for growth are based on regional projections from the Energy Information Administration's Annual Energy Outlook. Current levels of demand are based on MPSC estimates and Energy Information Administration data on electricity sales. See "Appendix B. Methodology" on page B-1 for more information.

tion, we estimate that the share of electricity consumption from renewable sources has increased to 4.2% in 2012.[15]

FIGURE 3. Electricity Generation by Source in Michigan, 2010



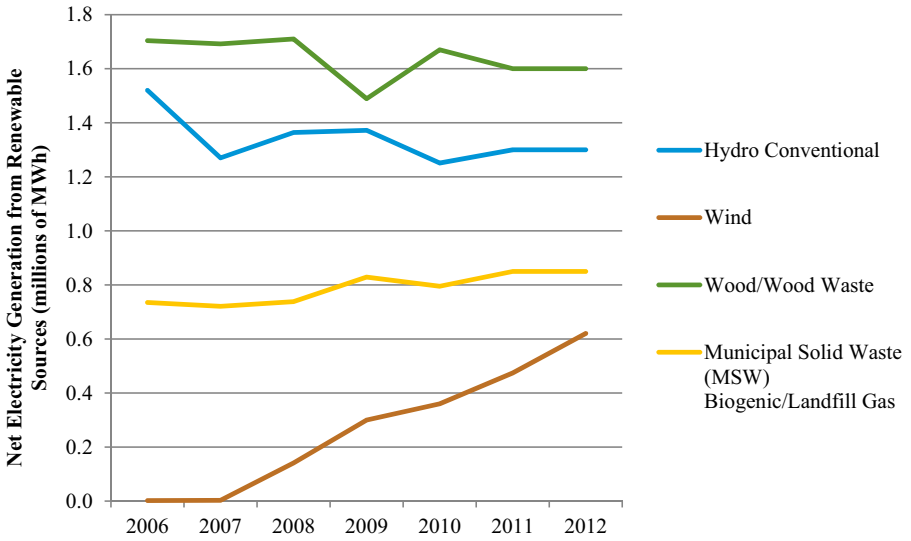
Source: Energy Information Administration
Analysis: Anderson Economic Group, LLC

As shown in Figure 4 on page 13, among renewable energy sources, the amount of generation from hydropower and biomass has remained flat or declined over the past few years, while the amount of generation from wind sources has increased. Despite this recent trend, hydropower and biomass are currently the largest contributors to net electricity generation from renewable energy sources. We assume that the trend will continue for hydropower, solar and biomass. The state's ability to generate hydropower has reached its ceiling.[16] Further developments in solar and biomass technologies that allow for their expansion remain possible, but are speculative. The great majority of increases in renewable electricity generation in the time scale contemplated by the proposed amendment will, therefore, be from wind.

15. This estimate is based on the average annual growth rate in renewable electricity generation since 2007, according to the Energy Information Administration.

16. Hydropower is the cheapest of renewable options, but the state has likely already exhausted all practical options for hydropower generation. Though a study by FERC in 1992 identified 85 potential hydropower sites where 2.3 million MWh of additional annual generation could occur, many of the sites are on federal or state land with various restrictions that preclude new dams. Where FERC found that improvements at current sites could result in marginally greater generation, the generation capacity is relatively low. James R. Bernier, Consumers Energy Hydro Generation, "Renewable Hydroelectric Power in Michigan," Presentation to the Michigan Energy Conference, April 8, 2010.

FIGURE 4. Electricity Generation from Renewable Sources in Michigan, 2006-2012

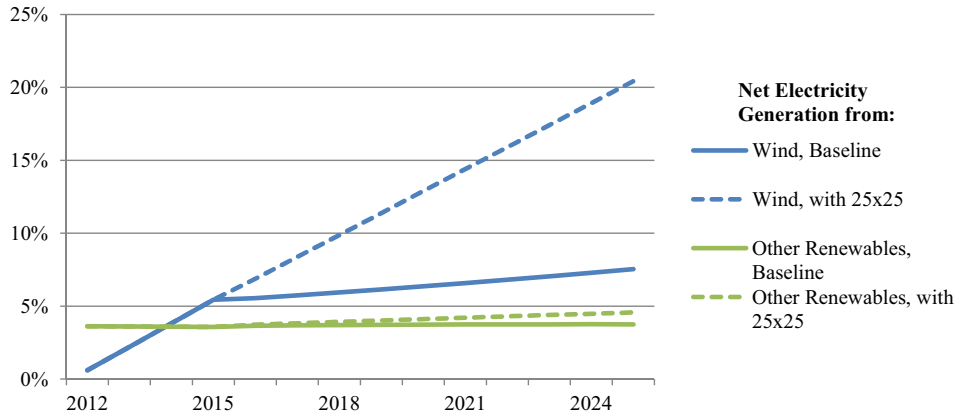


Source: Energy Information Administration, AEG Estimates
Analysis: Anderson Economic Group, LLC
Note: 2011 and 2012 values are estimated.

We assume in our analysis that the state would meet all of the requirements of current law, and reach 9% of generation from renewable sources by the year 2015.[17] (See "The Current Statutory Renewable Mandate" on page 8 for information on current state requirements for renewable energy generation.) After the year 2015, if no additional law is passed, we project that the state would increase generation from renewable sources at the average nationwide rate. This results in renewable energy accounting for approximately 11% of the state's total electricity generation by 2025. Under 25x25, however, renewable generation would need to account for 25%, which would require additional generation from renewable sources of 15 million MWh annually starting in 2025. See Figure 5 below, which shows our projections of the shares of electricity generation from renewable sources over time in each scenario.

17. Current law allows for a company to meet part of the renewable requirement through efficiency improvements. We assume that the state will generate 9.0% instead of 10% of electricity from renewable sources by 2015 due to partially satisfying the requirements through efficiency improvements.

FIGURE 5. Share of Net Electricity Generation from Renewable Sources, Projections Under Baseline vs. 25x25

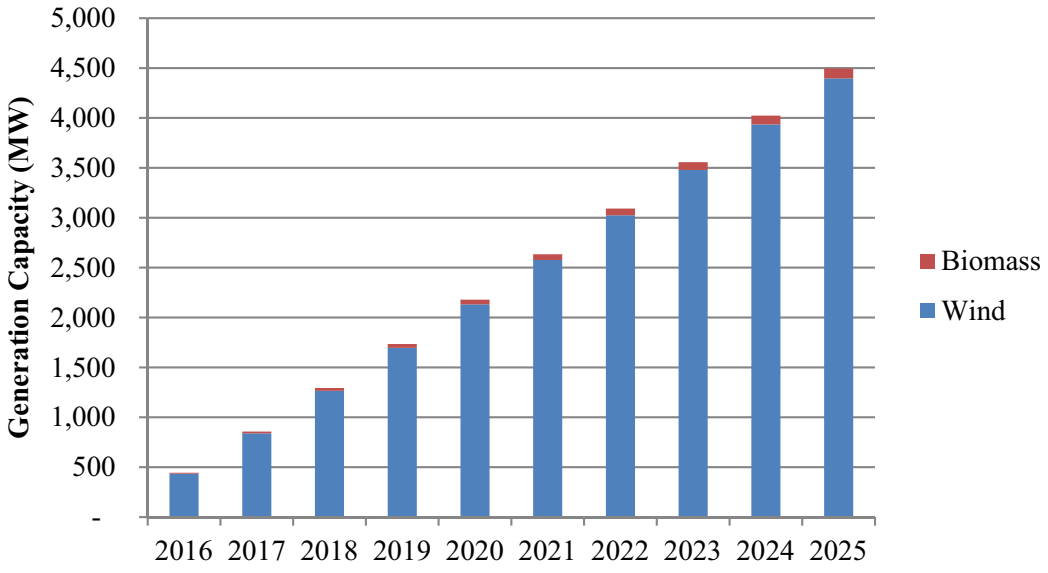


Analysis: Anderson Economic Group, LLC

In order to increase the share of electricity generation from renewable sources, significant renewable generation capacity must be added. The precise mix of renewable sources that will be used to meet the 25x25 standard is unknowable, but—as discussed above—for the past few years hydropower and solar generation have been flat, biomass has increased slightly, and wind has accounted for the majority of renewable generation increases. We evaluate a representative scenario in which we assume that incremental renewable energy will be produced from two sources: 95% wind and 5% biomass.

As shown in Figure 6 below, this scenario would add over 4,000 MW of wind capacity, and 200 MW of biomass capacity. Note that each unit of biomass capacity supplies more of the projected demand than a unit of wind capacity because of the intermittent nature of wind power.

FIGURE 6. Renewable Generation Capacity Added Due to 25x25 Standard, 2016-2025



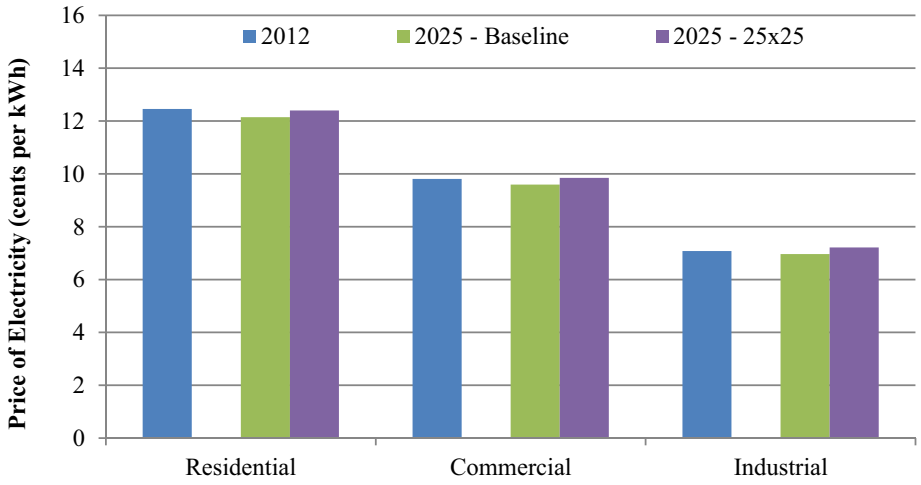
Analysis: Anderson Economic Group, LLC

THE COST OF ELECTRICITY TO CONSUMERS

The proposed amendment would result in a higher cost of electricity for two reasons. Firstly, renewable sources are more expensive than current non-renewable sources. Secondly, the mix of renewables will likely be much more wind-intensive, barring unforeseen developments in biomass and solar energy extraction. Since wind energy is more expensive than other renewable sources used in the state, such as biomass and hydropower, the average cost of renewable energy will increase under 25x25.

We project that, by the time incremental renewable capacity is fully phased in, the average cost per kWh of electricity will be about 2.6% higher than it would be without 25x25. See Figure 7 below for the price of electricity for the commercial, residential, and industrial sectors.

FIGURE 7. Price of Electricity (cents per kWh, in 2012 $)



Sources: Energy Information Administration, AEG Estimates
Analysis: Anderson Economic Group, LLC

The trend for generation costs in our model is fairly flat, or even downward, initially, for non-renewable and renewable energy. This is mainly because non-renewable energy is increasingly provided by natural gas, which has recently declined in price and is more widely used. In addition, we expect that the price of electricity from wind and other renewables will also trend downward in the short term, perhaps even at a faster rate than non-renewable sources;[18] however, the price of electricity from renewable sources will remain at a level above that from conventional sources through 2025. The price is driven up in the 25x25 case by the increasing proportion of energy from renewable sources.

There is a provision in the proposed amendment for the deadline for meeting the 25% requirement to be extended if, in any year, electricity suppliers need to increase prices by greater than 1% to satisfy the mandate. (See "25x25 Is Unclear" on page 26 for comments on the lack of clarity in this provision.) In our analysis, the price increases for one year do not exceed 1%, so this provision would never be effective. This conclusion follows from our assumption that the incremental capacity required to satisfy the mandate will be built up steadily

18. The downward trend in wind costs has been driven largely by a decrease in capital costs over time, as developers gain technology experience, particularly for newer technologies. This downward trend in the cost of wind generation is confirmed by the EIA; however, it may not materialize because of the nature of sites remaining in Michigan for wind generation facilities. According to Wind Powering America, a report by the U.S. Department of Energy, many of the more desirable sites available for wind turbines in Michigan are either on the coast or require turbines to be placed at a particularly high altitude, each of which are expensive.

between the years 2015 and 2025.

Federal Renewable Electricity Production Tax Credits (PTC)

Electricity suppliers receive Production Tax Credits ("PTCs") a tax credit toward their corporate income tax obligations of 2.2¢ for each kWh of electricity produced from wind, geothermal, and some biomass sources. This credit is limited to the first ten years of operation of a new plant or turbine. Credits for wind generation are scheduled to expire on December 31, 2012 and for other sources a year later. These credits have been renewed in the past by Congress.[19] In our analysis, we assume that these tax credits will remain in effect throughout the period of implementation of 25x25.

Because prices charged by electricity suppliers are regulated, we assume that they pass the benefit of PTCs on to consumers. In the absence of PTCs, we project that the average cost of generation from renewable sources would be approximately 0.73¢ higher per kWh.

If these credits were to expire, the cost and economic impact of 25x25 would increase. The state would lose considerably more jobs and households and businesses would see a higher increase in costs. Specifically, we estimate that the expiration of these credits would increase the price tag of the proposed amendment by $70 million above the estimates we show in "Total Statewide Cost of 25x25" below. It would result in an additional 1,000 net job losses over the estimates we show in "Net Employment Impact" on page 24.

TOTAL STATEWIDE COST OF 25X25

In summary, 25x25 will lead to a relative increase in the price of electricity across all sectors, and a slight decrease in the demand for electricity relative to the *status quo* baseline. Our estimates of the statewide total costs of electricity in 2025 in both the baseline scenario and the scenario in which 25x25 is passed are shown in Table 3 below. The difference between these two costs will be the

19. The federal renewable electricity production tax credit (PTC) was originally enacted in 1992. It was extended or expanded in 1999, 2002, 2004, 2005, 2006, 2008, and 2009. Source: Database of State Incentives for Renewables & Efficiency (DSIRE), which is maintained by the North Carolina Solar Center and the Interstate Renewable Energy Council (IREC), Inc.

additional amount that will be spent on electricity by consumers as a result of 25x25.

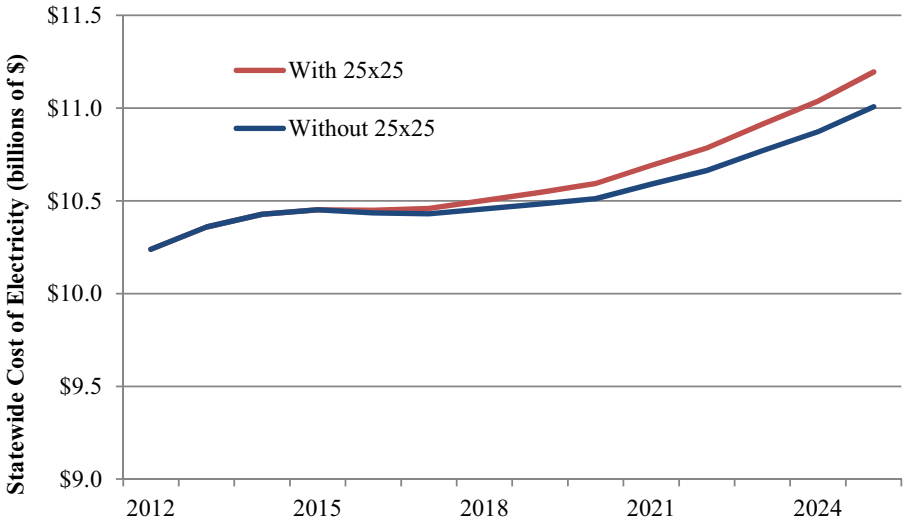
TABLE 3. Total Cost of Electricity in the Year 2025 in Michigan, Baseline vs. 25x25 (in 2012 $)

	Baseline			25x25			
Sector	Total Sales (thousands of MWh)	Price (cents per kWh)	Total Cost (millions of $)	Total Sales (thousands of MWh)	Price (cents per kWh)	Total Cost (millions of $)	Net Cost of 25x25 (millions of $)
Residential	35,794	12.1¢	$4,348	35,608	12.4¢	$4,415	$67
Commercial	44,698	9.6¢	$4,288	44,344	9.8¢	$4,366	$78
Industrial	34,060	7.0¢	$2,372	33,441	7.2¢	$2,413	$42
TOTAL	**114,552**	**9.6¢**	**$11,007**	**113,393**	**9.9¢**	**$11,194**	**$187**

Sources: Energy Information Administration, AEG Estimates
Analysis: Anderson Economic Group, LLC

In the final year of its implementation, 2025, we project that the net cost of the reforms in the 25x25 proposal would be $187 million, total. Of that total, $42 million of additional cost would fall on the industrial sector, with another $78 million falling on the commercial sector. Households in Michigan would see their total electricity costs rise by $67 million.

FIGURE 8. Projected Total Cost of Electricity in Michigan, 2012 to 2025, Baseline vs. 25x25 (in 2012 $)



Analysis: Anderson Economic Group, LLC

Over the period from now until 2025, the cost of the reforms would be $950 million. That is, when we add up the total cost of electricity for each year

through 2025, the cumulative cost is $950 million greater under 25x25 than under the baseline scenario. See Figure 8 on page 18 and Table 4 below for the total cost trajectory over time for each scenario.

TABLE 4. Annual Cost of 25x25 Compared to Baseline, by Sector (millions of 2012 $)

	2015	2020	2025	TOTAL, 2012-2025
Costs Under Baseline Scenario				
Residential	$4,268	$4,194	$4,348	$59,622
Commercial	$3,817	$3,968	$4,288	$55,294
Industrial	$2,366	$2,350	$2,372	$32,780
TOTAL	$10,451	$10,512	$11,007	$147,696
Costs Under 25x25				
Residential	$4,268	$4,223	$4,415	$59,964
Commercial	$3,817	$4,001	$4,366	$55,684
Industrial	$2,366	$2,369	$2,413	$32,997
TOTAL	$10,451	$10,593	$11,194	$148,646
Net Cost of 25x25				
Residential	$0	$29	$67	$343
Commercial	$0	$33	$78	$390
Industrial	$0	$19	$42	$217
TOTAL	$0	$81	$187	$950

Sources: Energy Information Administration, AEG Estimates
Analysis: Anderson Economic Group, LLC
Note: The net cost in 2015 is zero because we assume that, even under the 25x25 plan, utilities will not exceed the amount of generation from renewables already required by state law in that year.

These additional annual costs result from the construction and maintenance of new renewable generation capacity in the state. We estimate that the total cost to electricity consumers for this capacity will be $5.6 billion in real terms (2012 dollars).[20] If the federal production tax credit (PTC) expires, as discussed in "Federal Renewable Electricity Production Tax Credits (PTC)" on page 17, this total cost to electricity consumers balloons to $7.8 billion. (In nominal terms, these total cost amounts are $9.0 billion and $12.4 billion, respectively.)[21]

20. To estimate the total cost over the assumed 30-year lifetime of the generation capacity built to meet the mandate, we multiply the annual cost to ratepayers by 30. The annual cost used is that in the year 2025, once all new generation capacity has been built.

21. Inflation estimates follow Congressional Budget Office baseline projections for the next ten years. After the tenth year, we assume 2% annual inflation.

IV.The Effect of 25x25 on Jobs

The result of increased energy costs will be less money that can be spent by electricity users on goods and services other than electricity. This cost increase applies to households and businesses alike. The increase in costs to businesses will result in an incremental reduction in payroll and other purchases in the state. This will have an adverse effect on the Michigan economy, resulting in fewer jobs, lower earnings, and lower economic output (gross state product, or state GDP).

Offsetting this, jobs will be created as electricity suppliers build the capacity for renewable electricity generation. Construction jobs will be created as additional capital investment occurs, and jobs will be created for operations and maintenance as additional capacity comes on line.

JOBS LOST DUE TO INCREASED COSTS

25x25 will lead to increased energy costs and, because of constraints on budgets, lower spending on non-energy goods. When businesses and households spend less on non-energy goods, there is an impact on the statewide economy. Companies hire fewer workers, and they spend less at their local suppliers. Households with less income will spend less in the local economy than they would do otherwise.

We use RIMS II multipliers, published by the Bureau of Economic Analysis, to estimate the extent to which additional energy costs will result in job losses in Michigan.[22] Our results are presented in Table 5 on page 21, where we show

22. RIMS II multipliers from the Bureau of Economic Analysis are intended to be used to estimate the impact of a change in final demand for an industry in a state, where "final demand" is defined as "total output delivered to final users" (or sales) from the industry in that state. We assume in our analysis that a marginal increase in costs will have the same impact on an industry-by-industry basis as a marginal decrease in final demand. We note, however, that not all businesses and industries would respond to more expensive energy in exactly the way that they would respond to lower sales. For example, businesses may respond to higher electricity costs by investing more in improving the efficiency of their plant. Though some businesses might respond to lower revenues in this manner, it is unlikely. In the case of lost revenues as well as increased costs, however, many businesses will reduce their expenses for labor and non-electricity goods. Since the costs at issue are relatively small compared to total costs, we believe that the marginal impacts across industries are likely to be similar. A similar treatment was used in a previous study in which the economic impact of increased energy costs was analyzed:
Skip Laitner, Stephen Bernow, and John DeCicco, "Employment and other macroeconomic benefits of an innovation-led climate strategy for the United States," *Energy Policy*, vol. 26, no. 5, pp. 425-432, 1998.

our estimates for the impact of additional energy costs in 2025 on state employment, earnings, and value added (or state GDP).

TABLE 5. Economic Impact of Additional Energy Costs due to 25x25, 2025 (in 2012 $)

		Impact on Statewide....		
	Additional Costs (millions of $)	Employment	Earnings (millions of $)	Value Added (GDP) (millions of $)
Commercial	$78	-1,671	-$51	-$91
Industrial	$42	-430	-$18	-$36
Residential	$67	-745	-$24	-$48
TOTAL	**$187**	**-2,846**	**-$93**	**-$175**

Sources: Energy Information Administration, Bureau of Economic Analysis RIMS II Multipliers, AEG Estimates
Analysis: Anderson Economic Group, LLC

As the table shows, we estimate that the total impact of additional costs to households and businesses due to 25x25 would be approximately 2,850 fewer Michigan jobs in the year 2025. The impact on earnings would be a net loss of $93 million, and the state would generate $175 million less in gross state product, or economic output

Our estimates understate the effect of 25x25 on jobs. Firstly, Michigan businesses will use less electricity because it is more expensive. This lower use of electricity will be at least partially reflected in lower output and result in lower employment. Secondly, firms that are considering moving or entering the state may be deterred by the higher energy costs and establish a plant elsewhere.

In a recent paper, economists Matthew Kahn and Erin Mansur estimated the impact of a 1.3 cent per kWh price increase on businesses throughout the state of Michigan.[23] They estimate that this would result in a job loss in the state of 16,653. Assuming that a smaller increase would result in a roughly proportional job loss, our estimate of a 0.26-cent increase per kWh would result in a job loss of roughly 3,330. This is consistent with our estimate of 2,900 job lost than we estimate because of the effects that we have not quantified.

Kahn and Mansur also found that electricity prices had a significantly higher impact on employment in manufacturing industries than in commercial indus-

23. Matthew E. Kahn and Erin T. Mansur, "Do Local Energy Prices and Regulation Affect the Geographic Concentration of Employment? A Border Pairs Approach," NBER Working Paper 16538 and Energy Institute at Haas Working Paper-209, paper revised and resubmitted to the Journal of Public Economics, March 15, 2012.

tries. In particular, the two industries where electricity prices have the greatest impact on employment are primary metal manufacturing and transportation equipment manufacturing. Transportation equipment manufacturing includes auto manufacturing, an important industry to the state of Michigan. Kahn and Mansur found that a 2.6% increase in electricity prices would result in approximately 2.5% less employment in auto manufacturing in a given region. In Michigan, this would be a reduction of over 2,000 jobs in that industry alone.[24]

Impact on Michigan Households

As stated in "Total Statewide Cost of 25x25" on page 17, Michigan households would see a total increase in electricity costs of $85 million (in 2012 dollars), by the year 2025, when the reforms are fully phased in. Averaged over the 3.9 million households in Michigan (2010 Census), this is a cost of $22 per year per household.

The impact on households will be "regressive," meaning that the increased amounts spent on electricity as a result of 25x25 by households with lower incomes, as a proportion of income, will be more than the amounts spent by households with higher income. The lowest income quintile, which spends approximately 9.5% of its income on energy right now, would see that share increase to 9.7% under 25x25, while the highest income household would see its share increase to 1.3% from 1.2%.

JOBS CREATED DUE TO GREATER INVESTMENT IN RENEWABLES

As described in "Total Statewide Cost of 25x25" on page 17, businesses and households across the state would pay an additional $187 million in the year 2025 due to the required addition of renewable energy capacity. Assuming that these additional costs plus the amount of tax credits that utilities receive for producing renewable electricity directly reflect the cost to utilities of building up this new capacity, we estimate that the amount of money spent on the construction and operation of the first generation of this new capacity will be approximately $7.8 billion.[25] This additional spending by utilities to build up and operate renewable energy capacity will result in construction, operations, and maintenance jobs in the state.

In order to estimate the employment impact, we first identify how much additional demand for goods and services in Michigan is created through these

24. Total transportation equipment manufacturing employment is from the U.S. Census Bureau, County Business Patterns data.

25. We estimate $5.6 billion by multiplying this annual increase in cost ($187 million) by 30 years, which is the approximate lifespan of both wind turbines and biomass facilities. Then, we add $2.2 billion, which is our estimate for the amount of tax credits that utilities will receive due to their increased production of electricity from renewable sources.

expenditures. This requires that we estimate what these funds are spent on and what proportion of each category is spent in the state of Michigan (as opposed to out-of-state suppliers). Our estimates for new wind and biomass capacity are summarized in Table 6 below.

TABLE 6. Approximate Breakdown of Expenditures for New Wind and Biomass Generation Capacity

	Wind			Biomass		
Expenditure Category	**% of Total**	**% Sourced in Michigan**	**Increase in Demand in MI for each $1 in Costs**	**% of Total**	**% Sourced in Michigan**	**Increase in Demand in MI for each $1 in Costs**
Purchase of Components (including transport to site)	86%	5%	$0.04	20%	10%	$0.02
Site preparation, engineering, construction, integration, and other initial costs	11%	90%	$0.10	10%	90%	$0.09
Operations and Maintenance	3%	90%	$0.03	70%	85%	$0.60
	100%		$0.17	100%		$0.71

Source: AEG estimates from review of industry literature

Each dollar of additional costs for wind power creates less than half the demand for Michigan goods and services as a dollar in additional costs for biomass power. The key difference driving this result is that biomass generation requires less up-front cost in equipment and much more "operations and maintenance" costs, which include the biomass fuel used in biomass generation, some of which will come from within Michigan.

The expenditures associated with each category occur at different times throughout the life cycle of the power generation equipment. Initial site preparation, equipment and materials purchases, and other installation costs occur before generation begins. Operations and maintenance costs occur regularly throughout the life of the equipment, including near-continuous expenditure on the fuel used to generate biomass power. The first-year and ongoing employment impacts of wind and biomass power are shown in Table 7 below. The analysis is shown in Exhibit 5 in Appendix B.

TABLE 7. Summary of Employment Impact of Wind and Biomass Power

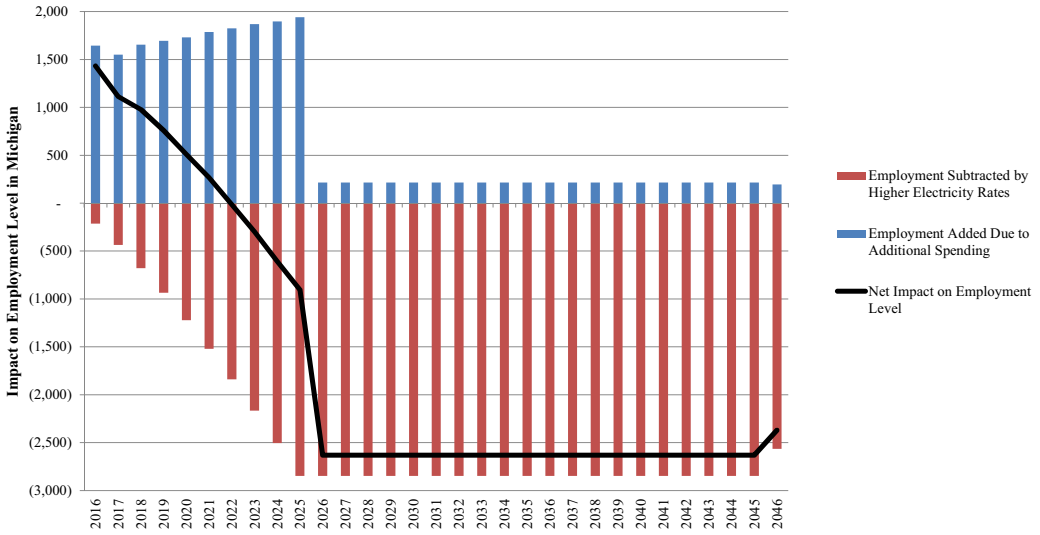
	Construction - Initial Year (Jobs lasting one year)	**Operation - (Jobs Existing Continuously Throughout Life)**
Each 100 MW Wind Capacity	359.0	2.3
Each 100 MW Biomass Capacity	651.3	117.4

Analysis: AEG

NET EMPLOYMENT IMPACT

As discussed above, compliance with the 25x25 proposal would require the construction of significant renewable electricity generation capacity, which would both raise costs to electricity users and generate demand for the construction and operation of the equipment. The resulting employment impact is much larger during the construction (through 2025) period than it is throughout the remainder of the life of the equipment. Figure 9 below shows this clearly: the employment added by construction is much larger than the employment subtracted due to higher electricity prices while the full amount of costlier new renewable generation is being constructed. However, once all of the new capacity is on line, and no new renewables are required to be constructed due to the law, the net employment impact is negative as consumers continue to bear higher electricity costs.

FIGURE 9. Net Employment Impact of 25x25 (95% Wind, 5% Biomass Scenario)



Source: Land Policy Institute, Beacon Hill Institute
Analysis: Anderson Economic Group, LLC

V.25x25 Mandates a Constitutional Amendment

The passing of 25x25 would require its provisions to be enshrined in the Constitution of the State of Michigan.[26] If passed, it would append a unique section to Article IV of the Constitution. No other section of the Constitution has the effect of restricting the behavior of a defined class of private Michigan entities.

CONSTITUTIONAL EMBODIMENT RENDERS 25X25 INFLEXIBLE

Article XII of Michigan's Constitution lists the three mechanisms by which the Constitution can be amended: by legislative proposal and vote of electors; by petition and vote of electors; and at a constitutional convention.[27] All three require a ballot of the citizens of Michigan. The first two methods are available at any time, but are cumbersome. To be placed on the ballot, a proposed amendment must first garner either the support of two-thirds of the members of both the Michigan Senate and the Michigan House of Representatives or the support and signatures of ten percent of the number of citizens of Michigan who voted at the previous gubernatorial election. A constitutional convention is convened if the electorate votes for one, but the electorate votes only once every sixteen years. The last opportunity came in 2010.

The difficulty with which 25x25 can be altered once it has been incorporated in the Constitution has the effect of making it unlikely that its effects can be changed in a timely fashion if it becomes apparent either that it is not having the beneficial effects that were anticipated or that it is having deleterious effects that were not anticipated.

25X25 IS OVERLY RESTRICTIVE

Section (1) of the proposed amendment states that "It is the policy of Michigan to promote and encourage the use of clean renewable electric energy sources. Clean renewable electric energy sources, which naturally replenish over a human rather than geological time frame, are wind, solar, biomass and hydropower." This is overly restrictive for two reasons: first, there are sources of renewable energy other than the four specified; and second, the mandate favors development of renewable electricity sources over investment in improvements in efficiency.

1. Wind, solar, biomass and hydropower are not the only possible sources of renewable energy. The principle alternative source currently used to generate electricity is geothermal, but the proposed mandate would reduce the incentive

26. For the wording of the proposed amendment to the Constitution of Michigan, see "The Proposed Amendment" on page A-2.

27. The Constitution of Michigan may be found at http://www.legislature.mi.gov/%28S%28gyujgnvznt2syy45pwore0mp%29%29/documents/mcl/pdf/mcl-chap1.pdf.

of suppliers to develop new sources. The cost of generation from renewable energy sources will change over time because of technological changes and changes in the economic conditions under which generators operate. The science of renewable energy generation will develop in unpredictable ways and the prices of renewable energy sources will vary relative to each other. Likewise, economic conditions will change in ways that will affect the cost of generation from one source relative to that of another. Michigan 25x25 mandates that generators source from wind, solar, biomass, and hydropower; however, during the period of time covered by the proposed amendment, the relative prices of these and other energy sources will change. Michigan will run the risk, therefore, of being left with the requirement that it use electricity generated from relatively expensive renewable sources.

2. Similarly, the proposed amendment's requirement that electricity supply companies invest exclusively in four specified renewable sources will have the effect of reducing the amount suppliers invest in improving efficiency, both in the efficiency with which they generate electricity and in the efficiency with which consumers use it. If the aim of the proposed amendment is to reduce the use of non-renewable energy, improvements in efficiency should qualify towards satisfying the requirements. The effect of dictating which renewable energy sources to use to suppliers will have the effect of forcing them to use those energy sources at the expense of improving efficiency, particularly if the cost of generating from non-renewable sources increases relative to the cost of increasing efficiency.[28]
3. Lastly, the proposed amendment would attenuate the ability of electricity suppliers to purchase electricity from generation sources outside the state, whether they are renewable or not. If it proves substantially less costly to generate from renewable sources outside the state, electricity in Michigan will be more expensive than if the legislature had the authority to allow suppliers to purchase this cheaper but still renewable power.

In summary, the proposed amendment's requirement that electricity suppliers switch to four specified renewable energy sources will ensure that a quarter of Michigan's energy is generated from renewable sources, but it denies electricity suppliers the option of using the most efficient renewable energy sources available and working towards the ultimate target—the use of less electricity from non-renewable sources—by increasing efficiency.

25X25 IS UNCLEAR

The wording of 25x25 is vague in two important ways: the requirement that rates charged to consumers may not be increased by more than 1% per year because of the mandate and the requirement that the legislature must legislate to

28. Michigan's 2008 Clean, Renewable and Efficient Energy Act allows electricity suppliers to meet in part the 10% renewable source requirement by achieving efficiency gains. See, for example, "Michigan Energy Credits" at http://www.dleg.state.mi.us/mpsc/renewables/michigan_energy_credits_%201_26_10.pdf.

encourage the employment of citizens of Michigan and the use of equipment manufactured in Michigan are unclear.[29]

1. Section (4) of the proposed amendment reads: "To protect consumers, compliance with the clean renewable electric energy standard shall not cause rates charged by electricity providers to increase by more than 1% in any year. Annual extensions for meeting the standard may be granted, but only to the extent demonstrated to be necessary for an electricity provider to comply with the foregoing rate limitation." This is unclear in at least two ways. Firstly, it is not clear whether the purpose is (i) to avoid the possibility of 25x25 changing an annual increase in electricity rates from an amount that would otherwise be less than 1% to an amount that would be greater than 1%, (ii) to limit that part of the increase in electricity prices resulting from the mandate to 1%. The difference could be enormous: if non-renewable generation costs were to increase at, say, 5% per year, under the first interpretation there would be no room for further increases resulting from the mandate. Section (5) of the mandate would allow for any effect of the mandate to be delayed until non-renewable energy price increases declined to less than 1%, at which time the mandate would come into effect. Under the second interpretation, despite the 5% increases in electricity rates resulting from increases in non-renewable generation cost increases, the increase in electricity prices caused by the migration to renewable sources caused by the mandate would increase the electricity rates by a further 1%.

   The language that will appear on the ballot allows a third interpretation: "Limit to not more than 1% per year electric utility rate increases charged to consumers only to achieve compliance with the renewable energy standard." This can be interpreted to mean that the mandate limits increases in electricity prices to one percent under any and all circumstances. It is hard to see how this could possibly be enforced in periods of positive inflation without driving electricity suppliers into bankruptcy.

   Secondly, the mandate provides no guidance for which cost items should be included in the accounting for the 1%: particular items that may or may not be allowable and would likely have a proportionately large impact on cost increases resulting from the mandate include: the costs of building new or altering existing non-renewable plants sufficient to maintain electricity supplies when wind and solar sources are not producing; costs resulting from improvements of existing and new transmission plant; and electricity suppliers' incremental overheads.

2. Section (5) of the proposed amendment reads: "The legislature shall enact laws to promote and encourage the employment of Michigan residents and the use of equipment manufactured in Michigan in the production and distribution of electricity derived from clean renewable electric energy sources." This wording could result in a broad range of policies, at legislators' discretion. At one extreme, there could be laws that are so weak that they do not change anybody's behavior. On the other hand, this provision could result in a law that mandates that generators purchase all equipment from firms that manufacture equipment

29. The language of the proposed amendment and the language that appears on the ballot are in Appendix A.

from parts and raw materials sourced in Michigan. The former would add no cost to the proposed mandate; the latter would add enormous costs.

These requirements are inadequately specified; they will have to be interpreted after the vote, and voters will likely not have a chance to determine their meaning.

OTHER STUDIES OF THE PROPOSED AMENDMENT

The proposed amendment's purpose is "to promote and encourage the use of clean renewable electric energy sources." Throughout our analysis, we have not commented on the desirability of this goal. In our assessment of the proposed amendment, we have considered both the economic benefits and costs in order to assess the net economic effect. In other words, we have quantified the collateral benefits of the proposed amendment—the jobs that will be created in constructing and operation and maintenance of additional renewable generation facilities—and its inevitable associated costs—the investment of $7.8 billion and the loss of jobs resulting from the increase in electricity prices.

There are, as of this report's publication, two major existing studies of the 25x25 proposal, one by the Land Policy Institute at Michigan State University, another by the Beacon Hill Institute. Both studies make contributions to the debate in a way that is, on the surface, similar to ours, in that they identify an overall amount of expenditure on renewable generation capacity and use input-output economics to estimate effects on employment. Nevertheless, there is a major difference: ours is the only study that examines both the negative employment impacts from higher energy prices and the positive employment impacts from higher spending on construction and operation of renewables. The Land Policy Institute's study looks only at the positive impacts of building more renewable generation capacity; it does not consider the loss of jobs that will result from the relative increase in the price of electricity.[30] The Beacon Hill study uses an opaque in-house model that accounts for the effects of higher energy costs, but does not appear to include the positive employment impact associated with additional in-state spending on renewable generation.[31]

30. Note that the Land study reports the benefits of the proposed amendment to be the creation of a certain number of "job years," a job year being one job for one year. This has contributed to confusion, as job years are taken to be jobs. See, for example, the Detroit News' August 10, 2012 "Renewable energy ballot measure called 'job creating machine'," http://www.detroitnews.com/article/20120810/BIZ/208100448, which misreports the Land study as claiming that the proposed amendment will create between 74,495 and 113,845 jobs. The Land study authors contemplate job years and do not attempt to convert job years into jobs.

31. Tuerck, Bachman, Head, "The Projected Economic Impact of Proposal 3 and Michigan's Renewable Energy Standard," Mackinac Center for Public Policy, Policy Brief.

Table 8 summarizes some of the key results of this study and the other studies.

TABLE 8. Comparison of Studies Examining 25x25

	Land Policy Institute	Beacon Hill Institute ("medium" cost scenario)[a]	Anderson Economic Group
Total Cost of Renewable Capacity	$10.3 billion (2012 dollars)	$23.6 billion (2010 dollars)	$7.8 billion (2012 dollars)
Average Employment Subtracted by Higher Electricity Costs	Not Addressed	-3,320	-2,392
Average Employment Added by New Expenditures (30 year period)	3,199[b]	Not Addressed	714
Net Employment Impact	Not Addressed	Not Addressed	-1,678

Source: Land Policy Institute, Beacon Hill Institute
Analysis: Anderson Economic Group, LLC

a. Incremental effect of 25% renewable energy requirement compared to existing 10% requirement alone, medium cost scenarios.

b. To put the LPI study's employment on a consistent basis with ours, we converted their results to a 30-year average basis. We we constructed using construction job-years divided by 30, plus reported 20-year operation and maintenance job-years divided by 20.

Appendix A. Proposal Language

THE BALLOT DESCRIPTION OF THE PROPOSED AMENDMENT

The proposed amendment as it appears on the November 6,2012 general election ballot:

PROPOSAL 12-3

A PROPOSAL TO AMEND THE STATE CONSTITUTION TO ESTABLISH A STANDARD FOR RENEWABLE ENERGY

This proposal would:

- Require electric utilities to provide at least 25% of their annual retail sales of electricity from renewable energy sources, which are wind, solar, biomass, and hydropower, by 2025.

- Limit to not more than 1% per year electric utility rate increases charged to consumers only to achieve compliance with the renewable energy standard.

- Allow annual extensions of the deadline to meet the 25% standard in order to prevent rate increases over the 1% limit.

- Require the legislature to enact additional laws to encourage the use of Michigan made equipment and employment of Michigan residents.

Source: see "State of Michigan, Statewide Ballot Proposal Status," September 10, 2012, http://michigan.gov/documents/sos/Bal_Prop_Status_2011_2_346859_7.pdf, and http://www.michigan.gov/documents/sos/2012_Statewide_Proposal_Language_all_9-7-12_397422_7.pdf

THE PROPOSED AMENDMENT

The proposed amendment as it appears on the petition:

The following new Section 55 would be added to Article IV of the Michigan Constitution:

§ 55 Michigan's Clean Renewable Electric Energy Standard

(1) It is the policy of Michigan to promote and encourage the use of clean renewable electric energy sources. Clean renewable electric energy sources, which naturally replenish over a human rather than geological time frame, are wind, solar, biomass and hydropower.

(2) Beginning no later than 2025, at least 25% of each electricity provider's annual retail electricity sales in Michigan shall be derived from the generation or purchase of electricity produced from clean renewable electric energy sources. The foregoing clean renewable electric energy standard shall be implemented incrementally and in a manner that fosters a diversity of energy generation technologies. Facilities used for satisfying the standard shall be located within Michigan or within the retail customer service territory of any electric utility, municipally-owned electric utility or cooperative electric utility operating in Michigan.

(3) Consumers shall be charged for electricity from clean renewable electric energy sources in the same manner as for electricity from other sources.

(4) To protect consumers, compliance with the clean renewable electric energy standard shall not cause rates charged by electricity providers to increase by more than 1% in any year. Annual extensions for meeting the standard may be granted, but only to the extent demonstrated to be necessary for an electricity provider to comply with the foregoing rate limitation.

(5) The legislature shall enact laws to promote and encourage the employment of Michigan residents and the use of equipment manufactured in Michigan in the production and distribution of electricity derived from clean renewable electric energy sources.

(6) Any provision or portion of this section held unconstitutional shall be severable from the remaining portions, which shall be implemented to the maximum extent possible.

Source: http://www.michigan.gov/documents/sos/Michigan_Energy_Michigan_Jobs_Petition_392139_7.pdf

Appendix B. Methodology

In this appendix, we present the methodology and important assumptions used in our analyses.

TOTAL STATEWIDE COST OF REFORMS

We estimated the overall additional cost that Michigan businesses and households would pay under passage of the amendment. To arrive at this estimate, we took three steps:

1. Estimate the total amount of electricity demanded in each year through 2025 under two different scenarios: a baseline scenario, under current laws; and a 25x25 scenario, where the amendment passes.
2. Estimate the cost per kWh of electricity under the two different scenarios.
3. Multiply the cost per kWh of electricity by the total consumption of electricity to get the total state expenditure on electricity under each scenario. The statewide cost of the reforms is the difference between the expenditure under these two scenarios.

We present the process we went through for each step below.

Electricity Demand

We based our baseline projections for electricity demand on regional estimates by the Energy Information Administration. We started with electricity in the state of Michigan for residential, commercial, and industrial customers in the year 2010. These totals are made available by the Department of Energy's Energy Information Administration, which provides retails sales of electricity by state by sector and provider for the years 1990 through 2010. For the years 2011 and 2012, we used data from the Michigan Public Service Commission.[1] Data for the year 2012 is a projection based on year-to-date sales.

Starting in the year 2012 through the year 2025, we assumed that the baseline change in electricity demand by commercial, industrial, and residential customers, respectively, would approximately follow the projected trajectory for the region, according to the Department of Energy's Energy Information Administration. The difference between our numbers and theirs is in part driven by recent differences between the trajectories of Michigan's electricity consumption relative to that in the region, as a whole. In addition, we smoothed the growth in electricity consumption over time to a greater degree than in the EIA estimates. See Table B-1 on page B-2, which shows the 3-year moving average for growth projections in demand in the North Central region, according to the

1. "Michigan Energy Appraisal: Semiannual Projections of Energy Supply and Demand, Summer Outlook 2012," Michigan Public Service Commission, Department of Licensing and Regulatory Affairs, May 21, 2012.

EIA, and our estimates for growth in electricity demand in Michigan through the year 2025.

TABLE B-1. Projected Growth in Electricity Sales in Baseline Scenario, EIA Regional Projections and AEG Michigan Projections, 2012-2025

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Projected Regional Growth, EIA, 3-yr Moving Average													
Commercial	0.48%	0.00%	0.94%	1.41%	1.39%	1.37%	1.35%	1.33%	1.75%	1.72%	1.70%	1.25%	1.23%
Industrial	4.35%	1.87%	1.84%	0.00%	0.89%	0.44%	0.44%	0.44%	0.44%	0.44%	0.00%	0.00%	0.00%
Residential	-4.09%	-2.16%	-1.11%	-0.56%	0.00%	0.56%	0.56%	0.56%	0.00%	0.55%	0.55%	1.10%	0.54%
Projected Annual Growth in Michigan, AEG Estimates													
Commercial	0.50%	0.75%	1.00%	1.25%	1.25%	1.50%	1.50%	1.50%	1.75%	1.75%	1.75%	1.50%	1.50%
Industrial	1.75%	1.75%	1.50%	1.00%	0.50%	0.50%	0.50%	0.50%	0.50%	0.25%	0.25%	0.00%	0.00%
Residential	-1.00%	-1.00%	-0.75%	-0.50%	0.00%	0.50%	0.50%	0.50%	0.75%	0.75%	0.75%	1.00%	1.00%

Source: Energy Information Administration Annual Energy Outlook 2011, Energy Consumption by Sector and Source, East North Central, Reference case; AEG Estimates Analysis: Anderson Economic Group, LLC
Note: EIA moving averages for the entire East North Central region, which includes the states of Illinois, Indiana, Michigan, Ohio, and Wisconsin.

The projected growth estimates were applied each year to estimate baseline demand through the year 2025. Demand, however, would not remain the same under a regime where 25% of renewable energy is required. Since the price of electricity would go up under this reform, the demand for electricity would correspondingly go down in response. As goods get more expensive, with few exceptions, people buy less of them.

To estimate the reduction in demand that corresponded to an increase in price, we needed to estimate the *price elasticity* of electricity demand for residential, industrial, and commercial customers. The price elasticity of electricity demand gives the percentage change in demand for any given percentage change in price. For example, if then elasticity is -0.5, then a 10% increase in price will lead to a 5% reduction in demand. We reviewed the following economic research to ground our estimates:

- Thomas Bue Bjorner, Mikael Togeby, and Henrik Holm Jensen, "Industrial companies' demand for electricity: evidence from a micropanel," *Energy Economics*, vol. 23, pp. 595-617, 2001.
- James A. Espey and Molly Espey, "Turning on the Lights: A Meta-Analysis of Residential Electricity Demand Elasticities," *Journal of Agricultural and Applied Economics*, vol. 36, iss. 1, pp. 65-81, April 2004.
- Faisal Jamil and Eatzaz Ahmad, "Income and price elasticities of electricity demand: Aggregate and sector-wise analyses," *Energy Policy*, vol. 39, pp. 5519-5527, 2011.
- David R. Kamerschen and David V. Porter, "The demand for residential, industrial and total electricity, 1973-1998," *Energy Economics*, vol. 26, pp. 87-100, 2004.

- Felipe Vasquez Lavin, Larry Dale, Michael Hanemann, and Mithra Moezzi, "The impact of price on residential demand for electricity and natural gas," *Climatic Change*, vol. 109, supplement 1, pp. S171-S189, 2011.
- Richard Madlener, Ronald Bernstein, and Miguel Angel Alva Gonzalez, "Econometric Estimation of Energy Demand Elasticities," E.ON Energy Research Center Series, vol. 3, iss. 8, October 2011.

There was significant variation across methods and datasets in the research that we reviewed. In the end, we determined that the evidence suggested that the industrial elasticity in this case would be approximately -0.50, while the average residential elasticity would be approximately -0.25. Commercial elasticity would be closer to residential than industrial, at -0.30. These are roughly median values from a very broad range of empirical results. Insofar as the response of consumers would be greater, the statewide cost will be less, and the opposite is the case if the elasticities turn out to be lower.

Sources of Electricity Generation

For the current share of total electricity generation, by source, we used data from the Energy Information Administration. Specifically, we used net generation by the total electric power industry by energy source for the state of Michigan in 2010. For the years 2011 and 2012, we projected that renewables would continue to grow at the steady rate that they had been growing between 2007 and 2010, or 3.5% annually, on average. In correspondence with recent trends, we assumed that all of this growth would occur due to increased electricity generated from wind.

Through the year 2015, in both the baseline and the 25x25 scenario, we have the share of electricity being produced from renewable sources, increasingly linearly to 9%. Though current statute requires a 10% share of renewable energy, utilities are allowed to meet this requirement with efficiency improvements, as well. We project that 1% of this requirement will be met with efficiency improvements, suggesting that 9% of electricity generated in Michigan will be from renewable energy sources by 2015.

Over the period from 2012 to 2015, we assume that total *non-wind* renewable generation will remain flat, with all of the increase in renewables coming from wind sources. Beyond that year, the trajectory of generation diverges:

Baseline Scenario. The Energy Information Administration, in its most recent Annual Energy Outlook, projected a 77% increase in the share of electricity from renewable energy sources over the next 25 years, nationally. This is equivalent to an average annual increase of approximately 2.3% in the share of electricity from renewable sources. We assume that, without the 25x25 scenario, for each year after 2015, the share of electricity that is generated from renewable sources will increase by 2.3%.

Among renewable sources, we assume that the total generation from non-wind renewables will increase by 1%, starting in the year 2015. (This is slightly higher than the current annual growth of approximately zero.) All remaining increases in renewable generation, in the baseline scenario in our model, is due to increases in generating capacity from wind.

25x25 Scenario. Under the 25x25 reforms, we assume that the share of electricity coming from renewables will increase linearly over time from 2015 to 2025. That is, the percentage of total electricity sales in the state coming from renewables will increase by 1.6 percentage points each year, from 9% in 2015 to 25% in 2025.

Of new energy produced by renewable sources, we estimate that approximately 95% of this energy will come from wind, with the remainder coming from non-wind sources such as biomass. We tested whether a 90% or 85% mix would significantly alter our numbers and found that the impact was negligible (a few million dollars statewide).

See Exhibit 1 on page B-10 for further details.

Price of Electricity

Electricity prices are not provided by source. For example, one's electric bill does not state a separate cost for electricity from wind sources as opposed to from natural gas. In order to estimate the price of electricity, we translated the cost of generation into a corresponding price for each renewable source. We answered the question, "What would the price of electricity be per kWh if *all* electricity were provided by this source?"

We separated the components of the end-user price into generation from various sources, transmission, and distribution costs. Residential, industrial, and commercial ratepayers all pay different amounts per kWh. We used the average retail price of electricity to ultimate customers by end-use sector for Michigan, in the year-to-date, 2012, as the basis for our analysis. These numbers were gleaned from the EIA's Monthly Electric Sales and Revenue Report.

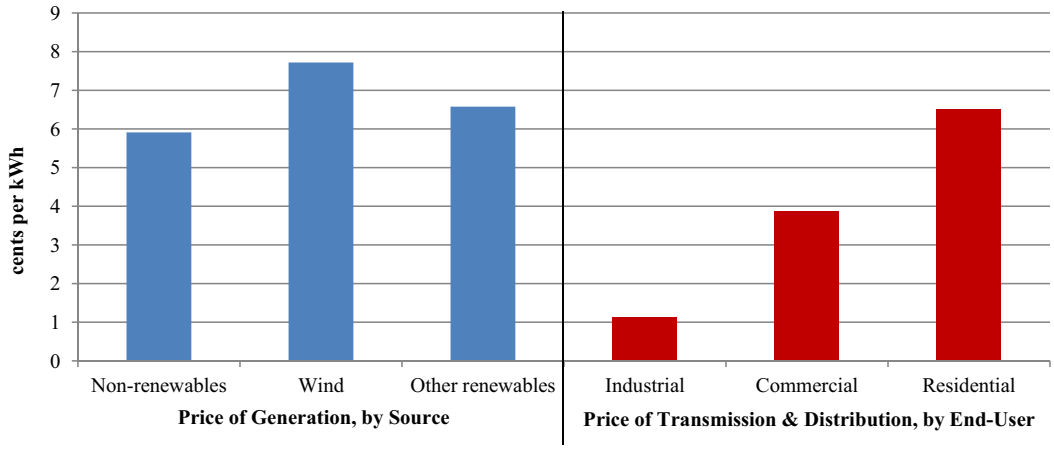
For our analysis, we assumed that variation among sectors was exclusively due to differences in the costs of transmission and distribution, and not due to the costs of generation. In other words, we derived a "price of generation" for non-renewable energies, wind, and renewable energy, as well as a "price of transmission and distribution," which varied according to the type of user (residential, commercial, or industrial).

According to the Annual Energy Outlook of 2012 (Table A8), the average share of the price due to generation in the current year is 60%, with an additional 40% coming from transmission and distribution costs. In addition, we determined a

relative price of electricity generation from various sources using levelized cost of energy, as provided by the EIA.[1] The levelized cost of energy provides the total cost of generation per kWh for a given source of energy, accounting for the fact that some energies require a larger amount of capacity for a given amount of energy.

We determined prices of generation, transmission, and distribution such that, given the current mix of energy sources, we got the correct total price per kWh faced by residential, commercial, and industrial users, respectively, in the year 2012 in Michigan. Figure B-1 below summarizes these prices of generation by source (which are constant across end-users) and prices of transmission and distribution by end-user (which are constant across sources). To further illustrate our method, if one wanted to calculate, say, the price of electricity from wind sources to an industrial user, they merely need to add the price of wind generation (7.7¢) to the price of transmission and distribution to industrial users (2.9¢).

FIGURE B-1. Estimated Price of Generation, Transmission, and Distribution for Various Sources and End-Users in Michigan, 2012



Sources: Energy Information Administration, AEG Estimates
Analysis: Anderson Economic Group, LLC

Once these prices by source and end-user were determined, we needed to estimate how they would change over time. Based on EIA data, we concluded that the generation costs for both wind and non-renewable sources would decrease over the next 7 or 8 years. After that, they would begin to grow again, with wind prices growing slightly faster than non-renewable prices. Prices for other renewables would increase more quickly due to the limited supply and requirement

1. "Levelized Cost of New Generation Resources in the Annual Energy Outlook 2011," Energy Information Administration, November 2010 release, http://www.eia.gov/oiaf/aeo/electricity_generation.html

for technological innovations. In addition, prices have been increasing recently in Michigan, suggesting that current trends point to increased prices for non-renewable and renewable generation in the very short term.

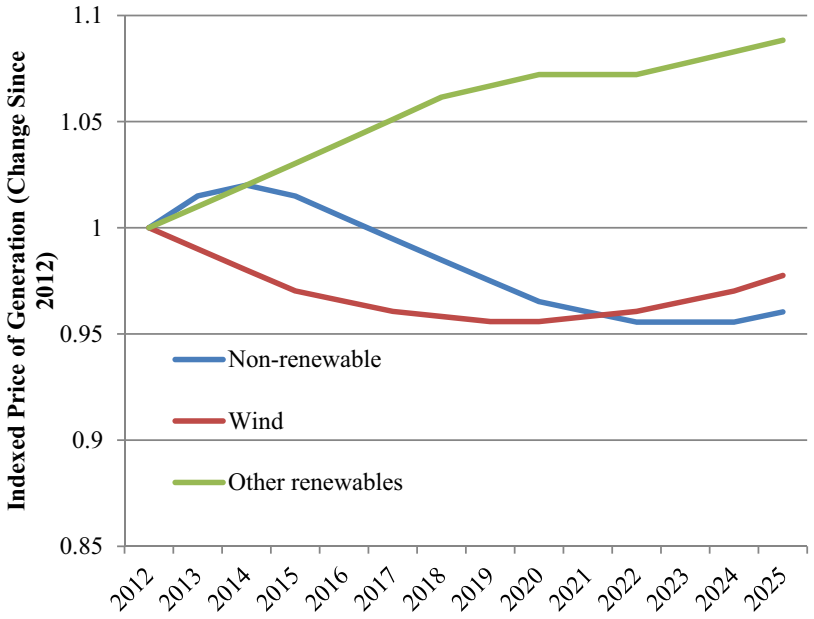
The EIA predicts that, nationally, transmission costs will increase by 0.3% annually between now and 2035, while distribution costs will drop by 0.5% annually in that same time period. We assumed these constant rates for transmission and distribution between now and the year 2025. Our assumptions for growth rates are summarized in Table B-2 below. Also, shows how the price of generation changes for each source over time. The values are indexed to the 2012 price. When interpreting the graph, recall that wind and other renewables are starting out at a higher price than non-renewable sources.

TABLE B-2. Real Projected Growth in Electricity Generation, Transmission, and Distribution Prices, 2012-2025

	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Generation of...													
Non-renewables	1.50%	0.50%	-0.50%	-1.00%	-1.00%	-1.00%	-1.00%	-1.00%	-0.50%	-0.50%	0.00%	0.00%	0.50%
Wind	-1.00%	-1.00%	-1.00%	-0.50%	-0.50%	-0.25%	-0.25%	0.00%	0.25%	0.25%	0.50%	0.50%	0.75%
Other renewables	1.00%	1.00%	1.00%	1.00%	1.00%	1.00%	0.50%	0.50%	0.00%	0.00%	0.50%	0.50%	0.50%
Transmission	0.30%	0.30%	0.30%	0.30%	0.30%	0.30%	0.30%	0.30%	0.30%	0.30%	0.30%	0.30%	0.30%
Distribution	-0.50%	-0.50%	-0.50%	-0.50%	-0.50%	-0.50%	-0.50%	-0.50%	-0.50%	-0.50%	-0.50%	-0.50%	-0.50%

Source: Energy Information Administration Annual Energy Outlook 2012; Michigan Public Service Commission Semiannual Projections of Energy Supply and Demand, Summer Outlook 2012; AEG Estimates
Analysis: Anderson Economic Group, LLC

FIGURE B-2. Projected Change in Generation Costs by Source, Indexed to 2012 Price



Analysis: Anderson Economic Group, LLC

Once we had estimated the price by source and end-user in any given year, we were able to estimate what the price would be for each type of end user by weighting the cost of generation by the estimated mix of wind, non-renewables, and other renewables. For example, to find the price of electricity for commercial users in a year where there is 80% generation from non-renewables, 15% generation from wind, and 5% generation from other renewables, we multiplied the price for generation of each source in that year by the respective proportion, added them together, and then added the transmission and distribution costs in that year for commercial users. See Exhibit 1 on page B-10 for the price by end user in the baseline and the 25x25 scenario, respectively.

Accounting for the federal production tax credit (PTC). The federal government provides a tax credit on corporate income to utilities that produce electricity from renewable sources. Specifically, for the first ten years of a plant or turbine's operations, that utility can claim a tax credit worth 2.2¢ (and tied to inflation) for each kWh produced by that plant or turbine.[1] Assuming a life span of 30 years for biomass plants and wind turbines (as used by the EIA), this implies an *average* impact per kWh of production of 0.73¢, or one-third of the

1. Database of State Incentives for Renewables & Efficiency (DSIRE), maintained by the Interstate Renewable Energy Council (IREC) and North Carolina Solar Center.

tax credit, since the tax credit is only applicable for a third of the life span of the generating source.

We performed an alternate analysis, where we assumed that the credit would expire starting in the year 2013. After that, we estimate that the price of generation for renewable sources will be 0.73¢ higher than it would otherwise be. The main analysis presented in this report assumes that the federal PTC will be continued, but we also note that this policy would be considerably more expensive if the PTC were to expire.

Net Statewide Cost of 25x25

Once the price of electricity and demand for electricity in each scenario had been estimated, the net statewide cost of 25x25 was relatively straightforward. The total cost of electricity in each case, in any given year, could be calculated by multiplying the price of electricity in that year by the demand for electricity in that year for each sector (commercial, industrial, and residential). This product represents the total cost of electricity for that sector in that year. We then added these sectoral costs together to get the total statewide cost of electricity in that year.

We performed this calculation for each year and for each scenario. The difference between the total statewide cost of electricity in each scenario represented the net cost of the 25x25 amendment to state households and businesses. See Exhibit 1 on page B-10 for our calculations.

IMPACT OF COSTS ON JOBS AND STATE ECONOMY

The additional cost of electricity will have an impact on the economy in Michigan. As businesses and households spend more money on electricity, they will have less money to spend on non-electricity goods. We have estimated the *economic* impact of the higher cost of electricity by using Bureau of Economic Analysis RIMS II multipliers.

Electricity Costs by Industry

RIMS II multipliers are industry- and region-specific. In order to apply them, we needed to know how costs of electricity will be allocated among industries in Michigan. Using the 2025 estimate for net statewide electricity costs to industrial, commercial, and residential users, we allocated this cost by industry. To allocate costs, we used two data sources. First, we found the utility expenditures by industry, nationally. This is available from Bureau of Economic Analysis Use Tables, 2010.

Based on the national amount of utility consumption by industry, we estimated the share among industries specifically in Michigan. Within all "industrial" industries, we multiplied the national utility consumption by the ratio of the Michigan share of industrial GDP in that industry divided by the national share

of industrial GDP in that industry. We defined "industrial" industries as agriculture, forestry, fishing, and hunting; mining; utilities; construction; and manufacturing. We repeated the same exercise for "commercial" industries, which are all remaining industries.

Finally, we allocated costs to industry by multiplying the share of industrial (or commercial) consumption, derived from the method above, times the corresponding estimated demand by industrial (or commercial) users in Michigan for the year 2025. Once a given level of demand had been allocated to users, we multiplied this demand by the price for industrial (or commercial) end users to get the total cost for each industry. The difference between total costs using prices and demand under 25x25 versus prices and demand under the baseline gave us the total net cost to that industry of 25x25.

Applying RIMS II Multipliers

Once we had estimated a net cost of 25x25 by industry, applying multipliers was relatively straightforward. We multiplied the net cost for each industry by the corresponding RIMS II multiplier for changes in final demand to the net cost to determine employment changes, earnings changes, and value added changes. The multipliers we used were specific to the State of Michigan. See Exhibit 2 on page B-11 for our results.

Important Assumption Regarding Use of RIMS II Multipliers

We should note that RIMS II multipliers from the Bureau of Economic Analysis are intended to be used to estimate the impact of a change in final demand for an industry in a state, where "final demand" is defined as "total output delivered to final users" (or sales) from the industry in that state. We assume in our analysis that a marginal increase in costs will have the same impact on an industry-by-industry basis as a marginal decrease in final demand. We note, however, that not all businesses and industries would respond to more expensive energy in exactly the way that they would respond to lower sales. For example, businesses may respond to higher electricity costs by investing more in improving the efficiency of their plant. On the other hand, while some businesses might respond to lower *revenues* in this manner, it is unlikely.

That said, in the case of lost revenues as well as increased costs, many businesses will reduce their expenses for labor and non-electricity goods. Since the costs at issue are relatively small compared to total costs, we believe that the marginal impacts across industries are likely to be similar. A similar method of estimating the impact of energy costs on the economy was used in a previous study in which the economic impact of increased energy costs was analyzed.[1]

Exhibit 1. Cost of Compliance with 25x25 Requirement

	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Baseline Demand (thousands of MWhs	103,637	104,021	104,513	105,120	105,758	106,409	107,335	108,272	109,219	110,365	111,443	112,535	113,537	114,552
Commercial	37,569	37,757	38,040	38,420	38,901	39,387	39,978	40,577	41,186	41,907	42,640	43,386	44,037	44,698
Industrial	31,145	31,690	32,245	32,728	33,056	33,221	33,387	33,554	33,722	33,890	33,975	34,060	34,060	34,060
Residential	34,923	34,574	34,228	33,971	33,801	33,801	33,970	34,140	34,311	34,568	34,828	35,089	35,440	35,794
Renewable Generation, Baseline (% of Demand)	4.2%	5.8%	7.4%	9.0%	9.2%	9.4%	9.6%	9.9%	10.1%	10.3%	10.6%	10.8%	11.0%	11.3%
Renewable Generation, Baseline (thousands of MWhs	4,370	6,045	7,740	9,461	9,678	10,022	10,342	10,672	11,013	11,385	11,760	12,149	12,539	12,942
Renewable Generation, Passage of 25x25 (% ofDemand	4.2%	5.8%	7.4%	9.0%	10.6%	12.2%	13.8%	15.4%	17.0%	18.6%	20.2%	21.8%	23.4%	25.0%
Renewable Generation, Passage of 25x25 (thousands of MWh	4,370	6,045	7,740	9,461	11,201	12,960	14,774	16,615	18,481	20,411	22,358	24,338	26,327	28,348
Projection for Statewide Mix of Energy Sources - Baselin														
Non-renewable	95.8%	94.2%	92.6%	91.0%	90.8%	90.6%	90.4%	90.1%	89.9%	89.7%	89.4%	89.2%	89.0%	88.7%
Wind	0.6%	2.2%	3.8%	5.4%	5.6%	5.7%	5.9%	6.1%	6.4%	6.6%	6.8%	7.0%	7.3%	7.5%
Other Renewable	3.6%	3.6%	3.6%	3.6%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.7%	3.8%	3.8%	3.8%
Projection for Statewide Mix of Energy Sources - 25x25 Passe														
Non-renewable	95.8%	94.2%	92.6%	91.0%	89.4%	87.8%	86.2%	84.6%	83.0%	81.4%	79.8%	78.2%	76.6%	75.0%
Wind	0.6%	2.2%	3.8%	5.4%	6.9%	8.4%	9.9%	11.4%	12.9%	14.4%	15.9%	17.4%	18.9%	20.4%
Other Renewable	3.6%	3.6%	3.6%	3.6%	3.7%	3.8%	3.9%	4.0%	4.1%	4.2%	4.3%	4.4%	4.5%	4.6%
Price to End-Users, Projections Under Baseline vs. 25x25 (cents per kWh, in 2012 $														
Baseline Case														
Commercial	9.81	9.91	9.95	9.94	9.87	9.81	9.75	9.69	9.63	9.60	9.57	9.57	9.57	9.59
Industrial	7.08	7.19	7.24	7.23	7.17	7.12	7.07	7.02	6.97	6.94	6.92	6.93	6.93	6.96
Residential	12.46	12.55	12.59	12.56	12.49	12.42	12.36	12.29	12.22	12.19	12.15	12.14	12.13	12.15
25x25														
Commercial	9.81	9.91	9.95	9.94	9.89	9.85	9.82	9.78	9.75	9.74	9.74	9.77	9.79	9.85
Industrial	7.08	7.19	7.24	7.23	7.20	7.16	7.13	7.11	7.08	7.08	7.09	7.12	7.16	7.22
Residential	12.46	12.55	12.59	12.56	12.51	12.47	12.42	12.38	12.34	12.33	12.32	12.33	12.35	12.40
% increase in cost per kWh due to 25x25	0.0%	0.0%	0.0%	0.0%	0.2%	0.4%	0.7%	0.9%	1.2%	1.5%	1.8%	2.1%	2.4%	2.6%
Commercial	0.0%	0.0%	0.0%	0.0%	0.2%	0.4%	0.7%	0.9%	1.2%	1.5%	1.8%	2.1%	2.4%	2.6%
Industrial	0.0%	0.0%	0.0%	0.0%	0.3%	0.6%	0.9%	1.3%	1.6%	2.0%	2.4%	2.8%	3.2%	3.6%
Residential	0.0%	0.0%	0.0%	0.0%	0.2%	0.3%	0.5%	0.7%	0.9%	1.2%	1.4%	1.6%	1.9%	2.1%
Demand with 25x25 requirements	103,637	104,021	104,513	105,120	105,672	106,232	107,058	107,888	108,715	109,737	110,683	111,644	112,510	113,393
Commercial	37,569	37,757	38,040	38,420	38,876	39,336	39,898	40,466	41,039	41,722	42,415	43,120	43,727	44,344
Industrial	31,145	31,690	32,245	32,728	33,008	33,123	33,234	33,342	33,445	33,546	33,561	33,577	33,507	33,441
Residential	34,923	34,574	34,228	33,971	33,788	33,773	33,926	34,079	34,231	34,468	34,707	34,947	35,275	35,608
Total Cost (millions of $, in 2012 $)														
Baseline	**$10,239.4**	**$10,358.6**	**$10,427.3**	**$10,451.3**	**$10,435.0**	**$10,429.5**	**$10,456.6**	**$10,483.1**	**$10,511.8**	**$10,590.0**	**$10,663.7**	**$10,770.0**	**$10,872.6**	**$11,007.2**
Commercial	$3,684.6	$3,741.4	$3,785.6	$3,817.4	$3,840.7	$3,864.5	$3,898.7	$3,933.0	$3,968.2	$4,024.5	$4,081.8	$4,152.2	$4,213.6	$4,287.9
Industrial	$2,204.3	$2,277.7	$2,333.7	$2,366.2	$2,371.7	$2,365.8	$2,360.4	$2,354.7	$2,349.6	$2,353.3	$2,351.3	$2,358.9	$2,360.8	$2,371.7
Residential	$4,350.5	$4,339.5	$4,307.9	$4,267.7	$4,222.5	$4,199.2	$4,197.5	$4,195.5	$4,194.1	$4,212.2	$4,230.5	$4,258.9	$4,298.2	$4,347.5
With 25x25 Requirements	**$10,239.4**	**$10,358.6**	**$10,427.3**	**$10,451.3**	**$10,449.2**	**$10,458.6**	**$10,501.8**	**$10,545.4**	**$10,593.0**	**$10,690.8**	**$10,785.3**	**$10,912.9**	**$11,037.6**	**$11,194.4**
Commercial	$3,684.6	$3,741.4	$3,785.6	$3,817.4	$3,846.3	$3,876.1	$3,916.8	$3,958.0	$4,001.0	$4,065.6	$4,131.7	$4,211.3	$4,282.2	$4,366.2
Industrial	$2,204.3	$2,277.7	$2,333.7	$2,366.2	$2,375.1	$2,372.7	$2,371.1	$2,369.3	$2,368.6	$2,376.7	$2,379.2	$2,391.4	$2,397.8	$2,413.3
Residential	$4,350.5	$4,339.5	$4,307.9	$4,267.7	$4,227.8	$4,209.8	$4,213.9	$4,218.1	$4,223.5	$4,248.6	$4,274.3	$4,310.2	$4,357.6	$4,414.9
Total Statewide Cost of 25x25 Requirements	**$0.0**	**$0.0**	**$0.0**	**$0.0**	**$14.2**	**$29.1**	**$45.2**	**$62.3**	**$81.2**	**$100.9**	**$121.6**	**$142.9**	**$165.1**	**$187.2**
Total Annual Increase in Cost Due to Compliance		0.0%	0.0%	0.0%	0.1%	0.1%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%	0.2%

Analysis: Anderson Economic Group, LLC

Exhibit 2. Economic Impact of Increased Costs due to 25x25, Year 2025 (all values are in 2012 $)

Industry	Cost of 25x25 Plan (millions of $)	MULTIPLIERS Earnings	MULTIPLIERS Employment (per million $)	MULTIPLIERS Value-added	ECONOMIC IMPACT Earnings (millions of $)	ECONOMIC IMPACT Employment	ECONOMIC IMPACT Value-added (millions of $)
Farms	$ 2.54	0.4387	15.5470	0.8352	$ (1.12)	-40	$ (2.12)
Forestry, fishing, and related activities	$ 0.03	0.5657	23.9944	1.0882	$ (0.02)	-1	$ (0.04)
Oil and gas extraction	$ 1.48	0.3344	8.0046	0.9503	$ (0.49)	-12	$ (1.40)
Mining, except oil and gas	$ 1.61	0.4002	8.8846	1.0339	$ (0.64)	-14	$ (1.67)
Support activities for mining	$ 0.78	0.5345	11.9012	0.9779	$ (0.42)	-9	$ (0.77)
Construction	$ 1.79	0.6986	18.1191	1.1372	$ (1.25)	-32	$ (2.04)
Wood products	$ 0.68	0.4942	13.8994	0.8855	$ (0.34)	-9	$ (0.60)
Nonmetallic mineral products	$ 1.86	0.5023	11.1999	0.9754	$ (0.93)	-21	$ (1.81)
Primary metals	$ 4.57	0.4009	8.7528	0.7426	$ (1.83)	-40	$ (3.39)
Fabricated metal products	$ 1.58	0.5369	12.5613	1.0072	$ (0.85)	-20	$ (1.59)
Machinery	$ 0.87	0.5749	12.4304	0.9855	$ (0.50)	-11	$ (0.86)
Computer and electronic products	$ 0.40	0.5692	12.2397	1.0847	$ (0.23)	-5	$ (0.44)
Electrical equipment, appliances, and components	$ 0.40	0.4710	9.8730	0.9548	$ (0.19)	-4	$ (0.38)
Motor vehicles, bodies and trailers, and parts	$ 1.38	0.4844	9.8508	0.8229	$ (0.67)	-14	$ (1.14)
Other transportation equipment	$ 0.67	0.4790	10.3875	0.9400	$ (0.32)	-7	$ (0.63)
Furniture and related products	$ 0.19	0.5487	12.9759	0.9893	$ (0.11)	-3	$ (0.19)
Miscellaneous manufacturing	$ 0.33	0.4942	11.0850	1.0233	$ (0.16)	-4	$ (0.34)
Food and beverage and tobacco products	$ 6.33	0.4157	10.8244	0.8254	$ (2.63)	-69	$ (5.23)
Textile mills and textile product mills	$ 0.48	0.4375	12.3244	0.7168	$ (0.21)	-6	$ (0.34)
Apparel and leather and allied products	$ 0.08	0.5506	15.3315	1.0181	$ (0.04)	-1	$ (0.08)
Paper products	$ 3.25	0.4381	9.9430	0.9208	$ (1.43)	-32	$ (3.00)
Printing and related support activities	$ 0.63	0.6323	16.0819	1.0623	$ (0.40)	-10	$ (0.67)
Petroleum and coal products	$ 0.91	0.1805	3.2516	0.3536	$ (0.16)	-3	$ (0.32)
Chemical products	$ 7.30	0.3561	6.9551	0.7645	$ (2.60)	-51	$ (5.58)
Plastics and rubber products	$ 1.37	0.4193	9.9952	0.8480	$ (0.58)	-14	$ (1.16)
Industrial TOTAL	**$ 41.52**	**0.4363**	**10.3638**	**0.8617**	**$ (18.11)**	**-430**	**$ (35.78)**
Wholesale trade	$ 4.14	0.6024	12.7514	1.1743	$ (2.49)	-53	$ (4.86)
Retail trade	$ 7.74	0.6299	23.7754	1.1926	$ (4.88)	-184	$ (9.23)
Air transportation	$ 0.04	0.2889	6.5255	0.6457	$ (0.01)	0	$ (0.03)
Rail transportation	$ 0.05	0.4371	9.2253	0.8895	$ (0.02)	0	$ (0.04)
Water transportation	$ 0.07	0.3252	8.9479	0.7099	$ (0.02)	-1	$ (0.05)
Truck transportation	$ 0.40	0.6033	15.9416	0.9995	$ (0.24)	-6	$ (0.40)
Transit and ground passenger transportation	$ 0.03	0.8478	33.1296	1.1497	$ (0.02)	-1	$ (0.03)
Pipeline transportation	$ 0.12	0.6682	12.9300	1.0532	$ (0.08)	-2	$ (0.13)
Other transportation and support activities	$ 0.35	0.7368	18.7966	1.1950	$ (0.26)	-7	$ (0.42)
Warehousing and storage	$ 0.52	0.7436	18.8834	1.2669	$ (0.38)	-10	$ (0.65)
Publishing industries (includes software)	$ 0.37	0.5729	13.5624	1.0811	$ (0.21)	-5	$ (0.40)
Motion picture and sound recording industries	$ 0.32	0.4523	16.8231	1.0403	$ (0.15)	-5	$ (0.33)
Broadcasting and telecommunications	$ 1.89	0.5039	11.1113	0.9848	$ (0.95)	-21	$ (1.86)
Information and data processing services	$ 0.15	0.4753	12.0583	1.0167	$ (0.07)	-2	$ (0.16)
Federal Reserve banks, credit intermediation, and related activities	$ 1.19	0.4758	11.0353	1.0254	$ (0.57)	-13	$ (1.22)
Securities, commodity contracts, and investments	$ 1.07	0.8314	29.1050	1.1942	$ (0.89)	-31	$ (1.27)
Insurance carriers and related activities	$ 0.20	0.4620	10.4495	1.1044	$ (0.09)	-2	$ (0.22)
Funds, trusts, and other financial vehicles	$ 0.06	0.4095	10.2917	0.8377	$ (0.02)	-1	$ (0.05)
Real estate	$ 6.12	0.1675	6.5169	0.9678	$ (1.03)	-40	$ (5.92)
Rental and leasing services and lessors of intangible assets	$ 1.28	0.3860	10.9657	1.0641	$ (0.49)	-14	$ (1.36)
Legal services	$ 0.20	0.7622	16.4708	1.2806	$ (0.16)	-3	$ (0.26)
Computer systems design and related services	$ 1.30	0.7622	16.4708	1.2806	$ (0.99)	-21	$ (1.66)
Miscellaneous professional, scientific, and technical services	$ 1.70	0.7622	16.4708	1.2806	$ (1.30)	-28	$ (2.18)
Management of companies and enterprises	$ 1.17	0.7360	12.8820	1.2349	$ (0.86)	-15	$ (1.45)
Administrative and support services	$ 1.33	0.7841	29.5850	1.2559	$ (1.05)	-39	$ (1.68)
Waste management and remediation services	$ 0.44	0.5209	12.8361	1.0601	$ (0.23)	-6	$ (0.47)
Educational services	$ 6.00	0.7909	30.1321	1.2564	$ (4.74)	-181	$ (7.53)
Ambulatory health care services	$ 1.53	0.8199	19.4337	1.2752	$ (1.25)	-30	$ (1.95)
Hospitals and nursing and residential care facilities	$ 5.39	0.7715	23.7160	1.2305	$ (4.16)	-128	$ (6.63)
Social assistance	$ 0.61	0.8091	39.1456	1.2517	$ (0.49)	-24	$ (0.76)
Performing arts, spectator sports, museums, and related activities	$ 0.54	0.7515	27.7194	1.2354	$ (0.41)	-15	$ (0.67)
Amusements, gambling, and recreation industries	$ 1.24	0.5859	25.2070	1.1468	$ (0.73)	-31	$ (1.42)
Accommodation	$ 4.05	0.5654	21.1721	1.1117	$ (2.29)	-86	$ (4.50)
Food services and drinking places	$ 6.58	0.5998	30.6761	1.0940	$ (3.95)	-202	$ (7.20)
Other services, except government	$ 2.44	0.7735	23.1411	1.1844	$ (1.89)	-56	$ (2.89)
Federal general government	$ 3.28	0.7735	23.1411	1.1844	$ (2.54)	-76	$ (3.88)
Federal government enterprises	$ 1.23	0.7735	23.1411	1.1844	$ (0.95)	-28	$ (1.46)
State and local general government	$ 10.01	0.7735	23.1411	1.1844	$ (7.74)	-232	$ (11.86)
State and local government enterprises	$ 3.12	0.7735	23.1411	1.1844	$ (2.41)	-72	$ (3.69)
Commercial TOTAL	**$ 78.26**	**0.6517**	**21.3493**	**1.1599**	**$ (51.01)**	**-1671**	**$ (90.78)**
Households TOTAL	**$ 67.45**	**0.3537**	**11.0501**	**0.7147**	**$ (23.86)**	**-745**	**$ (48.20)**
GRAND TOTAL	**$ 187.23**	**0.4966**	**15.2031**	**0.9334**	**$ (92.98)**	**-2846**	**$ (174.76)**

Source: Bureau of Economic Analysis RIMS II Multipliers, AEG Estimates
Analysis: Anderson Economic Group, LLC

Exhibit 3. Benefits of Compliance with 25x25 Requirement

Change in Electricity Sales		2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Baseline Demand (thousands of MWhs)	1/	103,637	104,021	104,513	105,120	105,758	106,409	107,335	108,272	109,219	110,365	111,443	112,535	113,537	114,552
Non-Renewable Generation, Baseline	2/	99,267	97,976	96,773	95,659	96,079	96,387	96,993	97,599	98,205	98,981	99,682	100,386	100,998	101,610
Renewable Generation, Baseline (thousands of MWhs)	3/	4,370	6,045	7,740	9,461	9,678	10,022	10,342	10,672	11,013	11,385	11,760	12,149	12,539	12,942
Demand with 25x25 requirements (accting for reduction due to increased price)	3/	103,637	104,021	104,513	105,120	105,672	106,232	107,058	107,888	108,715	109,737	110,683	111,644	112,510	113,393
Non-Renewable Generation, Passage of 25x25	4/	99,267	97,976	96,773	95,659	94,471	93,272	92,284	91,273	90,233	89,326	88,325	87,306	86,182	85,045
Renewable Generation, Passage of 25x25 (thousands of MWh)	5/	4,370	6,045	7,740	9,461	11,201	12,960	14,774	16,615	18,481	20,411	22,358	24,338	26,327	28,348
Total Difference in Generation (thousands of MWhs)	6/	0	0	0	0	-86	-177	-277	-384	-504	-628	-759	-891	-1,027	-1,159
Difference in Renewable Generation (thousands of MWhs)	7/	0	0	0	0	1,523	2,938	4,432	5,942	7,468	9,026	10,598	12,190	13,788	15,406
Difference in Non-Renewable Generation (thousands of MWhs)	8/	0	0	0	0	-1,609	-3,115	-4,709	-6,326	-7,972	-9,654	-11,357	-13,081	-14,816	-16,565
Renewable Generation added each year (thousands of MWhs)	9/	0	0	0	0	1,523	1,415	1,494	1,510	1,526	1,558	1,571	1,592	1,599	1,618
Non-Renewable Generation added each year (thousands of MWhs)	10/	0	0	0	0	-1,609	-1,506	-1,594	-1,618	-1,646	-1,682	-1,703	-1,724	-1,735	-1,749
Change in Renewable Generation Capacity															
New Renewables: 95% wind, 5% biomass															
New Renewable Generation Due to 25x25 Law (thousands of MWh)	11/	0	0	0	0	1,523	2,938	4,432	5,942	7,468	9,026	10,598	12,190	13,788	15,406
Wind Generation (thousands of MWh) - 95% of total	12/	0	0	0	0	1,447	2,791	4,210	5,645	7,095	8,575	10,068	11,580	13,099	14,636
Biomass Generation (thousands of MWh) - 5% of total	13/	0	0	0	0	76	147	222	297	373	451	530	609	689	770
Wind Generation Capacity Required (MW, cumulative total)	14/	-	-	-	-	435	838	1,265	1,696	2,131	2,576	3,024	3,479	3,935	4,397
Biomass Generation Capacity Reuqired (MW, cumulative total)	15/	-	-	-	-	10	19	28	38	48	58	68	78	88	99

Notes:

1/ From Exhibit 1.
2/ Calculated using rows 1/ and 3/.
3/ From Exhibit 1.
4/ Calculated using rows 3/ and 5/.
5/ From Exhibit 1.
6/ Calculated using rows 1/ and 3/.
7/ Calculated using rows 3/ and 5/.
8/ Calculated using rows 1/ and 3/.
9/ Calculated using row 7/, subtracting each year's value from previous year's value.
10/ Calculated using row 8/, subtracting each year's value from previous year's value.
11/ Repeat of row 7/ for reference.
12/ 95% of value in row 11/.
13/ 5% of value in row 11/.
14/ Assumes 38% capacity factor.
15/ Assumes 89% capacity factor.

Exhibit 4. Total Expenditures and Employment over 30 Year Period

Total Expenditures on Additional Capacity ($ millions of 2011 dollars)	1/	$ 7,800

		Total Expenditure (Millions 2012 dollars)	MW Capacity Built
Wind - 95% of total	2/	$ 7,410	4,397

Expenditure Category	% of total 3/	% Sourced in Michigan 4/	Total In-State Expenditures 5/	Multiplier 6/	Total employment over life cycle (Job-years) 7/
Purchase of Components (including transport to site)	86%	5%	$ 318.6	15	4,779.5
Site preparation, engineering, construction, integration, and other initial costs	11%	90%	$ 733.6	15	11,003.9
Operations and Maintenance	3%	90%	$ 200.1	15	3,001.1
	100%	Weighted Avg: 16.9%	$ 1,252.3		18,784.4

		Total Expenditure	MW Capacity Built
Biomass - 5% of total	2/	$ 390.00	99

Expenditure Category	% of total 3/	% Sourced in Michigan 4/	Total In-State Expenditures 5/	Multiplier 6/	Total employment over life cycle (Job-years) 7/
Purchase of Components (including transport to site)	20%	10%	$ 7.8	15	117.0
Site preparation, engineering, construction, integration, and other initial costs	10%	90%	$ 35.1	15	526.5
Operations and Maintenance	70%	85%	$ 232.1	15	3,480.8
	100%	Weighted Avg: 70.5%	$ 275.0		4,124.3

Total employment over life cycle (Job-years)	**22,908.6**

Notes:

1/ From Exhibit 2

2/ A split of 95% wind and 5% biomass is assumed for simplicity. Most treatments of RPS requirements assume wind power will make up the bulk of renewable power generation, due its current cost profile and scalability.

3/ Proportion of costs spent on each category will vary by project, and will be influenced by the current cost of commodities and industry practices, which may vary over years before construction is completed in 2025. We consider these proportions to be representative based on professional judgment after examining existing studies of RPS standards, having informal discussions with industry actors, and examining the National Renewable Energy Laboratory's JEDI model, which by license agreement cannot be used for commercial analysis such as this.

4/ Specific sourcing plans will vary by project and over time. We consider these proportions to be representative based our professional judgment. We note that Michigan's existing industry base does play a major role in the wind generation supply chain. While it is possible that this may change in the future, we base our analysis on current conditions.

5/ Product of data from 2/, 3/, and 4/.

6/ Representative multipliers, expressed in jobs created per $1 million in expenditure. The precise expenditure profile of each component will vary by project and over time. Activities that may be included in these broad categories have multipliers for Michigan ranging from 10.351 (for Professional, Scientific, and Technical Services), to 13.3276 (Construction), to 16.0971 (Forestry and related activities), to 22.085 (Contracts and Investments). All examples from 2008 RIMS II multiplier series for the State of Michigan from the U.S. Bureau of Economic Analysis.

7/ Product of 5/ and 6/.

Exhibit 5. Summary of Employment Impact of Renewable Genration Capacity

	Total One-time Jobs During Construction Year 1/	Total Operations Employment 2/	Total Capacity Added (MW) 3/	Employment Per 100 MW Capacity Added: Construction (Job-years, only during initial year) 4/	Employment Per 100 MW Capacity Added: Operation - (Ongoing jobs, each year of Operation) 5/
Wind	15,783	3,001	4,397	359.0	2.3
Biomass	644	3,481	99	651.3	117.4

Notes:

1/ Total from Exhibit 4 in "purchase of components" and "site preparation" categories.

2/ Total from Exhibit 4 in "Operations and Maintenance" category.

3/ Total from Exhibit 3.

4/ Job-years from column 1/, divided by capacity added from column 3/, times 100MW.

5/ Job-years from column 2/, divided by capacity added from column 3/, times 100 MW, divided by the 30 year life of the equipment. The units of this quantity is not "job-years," but rather it is "jobs" in the conventional sense: ongoing employment positions that exist for the life of the

Exhibit 6. Net Employment Impact of 25x25 Mandate

Scenario: New Renewables 95% wind, 5% biomass		2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Wind Generation Capacity Required (MW, cumulative total, assumes 38% capacity factor)	1/	435	838	1,265	1,696	2,131	2,576	3,024	3,479	3,935	4,397	4,397	4,397	4,397	4,397	4,397	4,397	4,397	4,397	4,397	4,397
Biomass Generation Capacity Reuqired (MW, cumulative total, assumes 89% capacity factor)	2/	10	19	28	38	48	58	68	78	88	99	99	99	99	99	99	99	99	99	99	99
New Wind Generation Capacity (MW)	4/	435	404	426	431	435	445	448	454	456	462	-	-	-	-	-	-	-	-	-	-
New Biomass Generation Capacity (MW)	5/	10	9	10	10	10	10	10	10	10	10	-	-	-	-	-	-	-	-	-	-
Employment Impact																					
Jobs due to Wind Generation Capacity (Assumes Capacity Completed in 1 day on 1st day of year)	6/	1,570.0	1,468.8	1,559.3	1,586.0	1,611.7	1,654.8	1,678.6	1,710.0	1,727.5	1,757.6	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Jobs due to Biomass Generation Capacity (Assumes Capacity Completed in 1 day on 1st day of year)	7/	75.07	81.23	95.78	107.84	119.97	133.05	145.44	158.29	170.62	183.60	116.03	116.03	116.03	116.03	116.03	116.03	116.03	116.03	116.03	116.03
Subtotal: Employment Added by Construction and Operation of Renewables		1,645	1,550	1,655	1,694	1,732	1,788	1,824	1,868	1,898	1,941	216	216	216	216	216	216	216	216	216	216
Subtotal: Employment Destroyed by Additional Electricty Costs	8/	(213)	(436)	(679)	(937)	(1,223)	(1,523)	(1,840)	(2,167)	(2,507)	(2,848)	(2,848)	(2,848)	(2,848)	(2,848)	(2,848)	(2,848)	(2,848)	(2,848)	(2,848)	(2,848)
Total Net Impact on Employment Level	9/	1,432	1,114	976	757	508	265	(16)	(298)	(609)	(907)	(2,632)	(2,632)	(2,632)	(2,632)	(2,632)	(2,632)	(2,632)	(2,632)	(2,632)	(2,632)

Scenario: New Renewables 95% wind, 5% biomass		2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055
Wind Generation Capacity Required (MW, cumulative total, assumes 38% capacity factor)	1/	4,397	4,397	4,397	4,397	4,397	4,397	4,397	4,397	4,397	4,397	3,962	3,558	3,132	2,701	2,265	1,821	1,372	918	462	(0)
Biomass Generation Capacity Reuqired (MW, cumulative total, assumes 89% capacity factor)	2/	99	99	99	99	99	99	99	99	99	99	89	80	70	61	51	41	31	21	10	-
New Wind Generation Capacity (MW)	4/	-	-	-	-	-	-	-	-	-	-	(435)	(404)	(426)	(431)	(435)	(445)	(448)	(454)	(456)	(462)
New Biomass Generation Capacity (MW)	5/	-	-	-	-	-	-	-	-	-	-	(10)	(9)	(10)	(10)	(10)	(10)	(10)	(10)	(10)	(10)
Employment Impact																					
Jobs due to Wind Generation Capacity (Assumes Capacity Completed in 1 day on 1st day of year)	6/	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	90.1	81.0	71.3	61.5	51.5	41.4	31.2	20.9	10.5	(0.0)
Jobs due to Biomass Generation Capacity (Assumes Capacity Completed in 1 day on 1st day of year)	7/	116.03	116.03	116.03	116.03	116.03	116.03	116.03	116.03	116.03	116.03	104.56	93.90	82.65	71.27	59.78	48.05	36.21	24.23	12.18	-
Subtotal: Employment Added by Construction and Operation of Renewables		216	216	216	216	216	216	216	216	216	216	195	175	154	133	111	89	67	45	23	(0)
Subtotal: Employment Destroyed by Additional Electricty Costs	8/	(2,848)	(2,848)	(2,848)	(2,848)	(2,848)	(2,848)	(2,848)	(2,848)	(2,848)	(2,848)	(2,566.87)	(2,558.09)	(2,507.11)	(2,456.37)	(2,389.18)	(2,289.34)	(2,146.87)	(1,905.44)	(1,432.69)	0.00
Total Net Impact on Employment Level	9/	(2,632)	(2,632)	(2,632)	(2,632)	(2,632)	(2,632)	(2,632)	(2,632)	(2,632)	(2,632)	(2,372)	(2,383)	(2,353)	(2,324)	(2,278)	(2,200)	(2,079)	(1,860)	(1,410)	0

Notes:

1/ From Exhibit 3.

2/ From Exhibit 3.

4/ New capacity added in given year, subtracting each year's cumulative year's total from the previous year's.

5/ New capacity added in given year, subtracting each year's cumulative year's total from the previous year's.

6/ Calculated using new and existing MW from row 4/, along with jobs per 100 MW from Exhibit 5.

7/ Calculated using new and existing MW from row 5/, along with jobs per 100 MW from Exhibit 5.

Appendix C: About AEG

ANDERSON ECONOMIC GROUP

Anderson Economic Group, LLC is research and consulting firm specializing in economics, public policy, finance and business valuation, and market and industry analysis. The firm has offices in Chicago, Illinois and East Lansing, Michigan. AEG has conducted economic and fiscal impact studies for private, public, and non-profit clients across the United States. For more information please visit www.AndersonEconomicGroup.com.

STUDY'S AUTHORS

Alex Rosaen. Mr. Rosaen is Director of Public Policy and Economic Analysis at Anderson Economic Group. Mr. Rosaen's background is in applied economics and public finance.

Mr. Rosaen's recent work includes several economic and fiscal impact analyses, including of proposed real estate developments, power plants, and infrastructure projects; analysis of tax incentives; an analysis of the impact of federal tax incentives on the freight rail industry; and an analysis of the economic contribution that research universities make in the State of Michigan.

Prior to joining Anderson Economic Group, Mr. Rosaen worked for the Office of Retirement Services (part of the Michigan Department of Management and Budget) for the Benefit Plan Design group. He has also worked as a mechanical engineer for Williams International in Walled Lake, Michigan.

Mr. Rosaen holds a Masters in Public Policy from the Gerald R. Ford School of Public Policy at the University of Michigan. He also has a Masters of Science and a Bachelors of Science in mechanical engineering from the University of Michigan.

Jason Horwitz. Mr. Horwitz is a Consultant at Anderson Economic Group, working in the Public Policy and Economic Analysis practice area. Mr. Horwitz' work includes research and analyses for a range of AEG clients representing both the public and private sectors.

Mr. Horwitz's recent work includes an assessment of the effects of personal property tax reform in Michigan, an assessment of the effects of proposed reforms to state pension and retiree health care systems, analyses of the fiscal condition and tax policies of Michigan's state and local governments, and a review of tax incentive programs administered by the states of Michigan and Kentucky, respectively.

Prior to joining AEG, Mr. Horwitz was the Coordinator of Distribution for the Community Center of St. Bernard near New Orleans, where he oversaw the dis-

tribution of donated food, clothes, and household supplies to low-income residents of St. Bernard Parish and New Orleans' Lower Ninth Ward.

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William M.G. Pearson. Mr. Pearson is a Principal and Senior Consultant in Anderson Economic Group's finance and business valuation practice area, concentrating on economic analysis for litigation. Mr. Pearson specializes in the evaluation and quantification of damages ensuing from business and personal torts, wrongful terminations, contract disputes, securities litigation and intellectual property disputes.

Mr. Pearson has extensive experience in statistical analysis for employment disputes involving discriminatory practices and wage/hour issues. He has provided expert testimony and consulting advice to a wide range of law firms, testifying in matters involving personal injury, medical malpractice, securities valuation and commercial damages. He has experience in a wide range of industries including healthcare, automotive, beverages, insurance and distribution.

Before becoming an economic consultant, Pearson developed residential real estate. Mr. Pearson has an M.B.A. from the University of Chicago.

Patrick L. Anderson. Mr. Anderson founded Anderson Economic Group in 1996, and serves as a Principal and Chief Executive Officer in the company.

Mr. Anderson has taken a leading role in several major public policy initiatives in his home state; he was the author of the 1992 Term Limit Amendment to the Michigan Constitution, and also the author of the 2006 initiated law that repealed the state's 4-decade-old Single Business Tax. His firm's work resulted in a wage increase for Home Help workers in 2006, the creation of a Michigan EITC in 2008, and the repeal of the item pricing law in 2011.

Mr. Anderson has written over 100 published works, including the book Business Economics and Finance and the chapter on business valuation in the book Litigation Economics. He is also the executive editor of three editions of the State Economic Handbook. His 2004 article "Pocketbook Issues and the Presidency" and his 2009 paper "The Value of Private Businesses in the United States" have each been awarded for outstanding writing from the National Association of Business Economics. Anderson's views on the economy are often cited by national news media including The Wall Street Journal, New York Times, National Public Radio, and Fox Business News.

Before founding Anderson Economic Group, Mr. Anderson was the deputy budget director for the State of Michigan under Governor John Engler, and Chief of Staff for the Michigan Department of State.

Anderson is a graduate of the University of Michigan, where he earned a Master of Public Policy degree and a Bachelor of Arts degree in political science. He is a member of the National Association for Business Economics and the National Association of Forensic Economists. The Michigan Chamber of Commerce awarded Mr. Anderson its 2006 Leadership Michigan Distinguished Alumni award for his civic and professional accomplishments.