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Economic Impact of the Montcalm County Wind Energy Project

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Prepared for the Montcalm Economic Alliance

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Using an Economic Impact Model from
Regional Economic Models Inc. (REMI)

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Wind energy is one of several types of "clean" energy collected from natural, renewable resources. Although dependent on time and weather, renewable energy resources are considered efficient, and they aid in supplying and meeting consumer energy demands. According to the International Renewable Energy Agency (IRENA 2019), wind energy is considered one of the fastest-growing types of renewable energy resources and is primarily produced through wind parks or farms, many of which are located on agricultural land.

The Midwest and Southwest experience more wind output than other regions. Michigan ranks fifteenth of the 50 states in wind energy, producing more than 5.8 million megawatt hours (MWh) in wind energy annually (Moraes 2021). Wind generation in Michigan creates economic opportunity both locally and throughout the state—Michigan manufacturers produce components for the wind industry and its supply chain, thus creating jobs for the state's citizens.

Michigan currently has 32 wind farms operating, with several additional projects under development. There is interest in developing a wind farm in Montcalm County and in assessing the economic impact of wind farm operations over a 30-year period. On behalf of the Montcalm Economic Alliance, the W.E. Upjohn Institute for Employment Research (Upjohn Institute) estimated the economic impact for the construction of a 375 MW wind farm in a 12-month period and the impact from the wind farm's projected 30-year operations.

Breakdown of Investments over the Projected Life of the Wind Farm

The investments in building and operating the wind farm over the expected life cycle of the project, as well as the payments to leaseholders and to local and state units of government, do meet the "but for" standard of economic development projects. In this case, "but for" the project-related expenditures of three quarters of a billion dollars in Montcalm County, the returns outlined in this research are not likely to have occurred. These investments include:

Revenue source	Time span	Amount* (millions of $)
Construction phase	Year 1	463
Operations and maintenance	Years 2 to 31	115
Payments to leaseholders	Years 2 to 31	118
Payments to units of government	Years 2 to 31	80
Total		776

*Investments and expenditures in nominal dollars

The construction, operations, and maintenance of the wind farm are estimated to impact Montcalm County and Michigan for 31 years. Included in these estimates are the long-term benefits from operating and maintaining the wind farm; payments to leaseholders and others affected by the wind farm; and additional state, county, special district, and local (e.g., township, school district) tax collections due to the increased value of personal property.

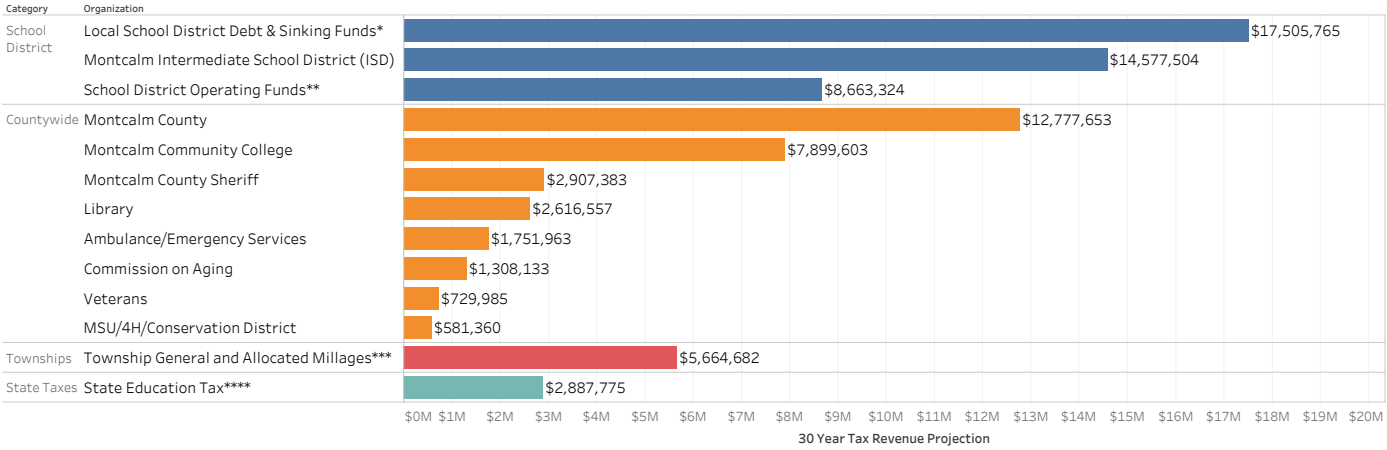
The construction of the wind farm is projected to generate $463 million in spending and create added employment of 876 full-time-equivalent jobs for one year, with 813 of these in the private, nonfarm industry sectors. Construction is estimated to increase total sales in the county by $132.8 million and personal income by $47.3 million.

The 30-year period of operations and maintenance from the wind farm is estimated to create an increase of 15.5 jobs per year, with 14.3 of these annual jobs gained in the private sector. Total sales in the county from the wind farm's operations and maintenance are estimated to amount to $111.8 million over the 30-year period. The project also is estimated to add $53.7 million in personal income over its life cycle.

The project will produce revenue to those leasing property for use of the wind farm. Income paid to leaseholders will generate 11.9 jobs in the county each year, 10.6 of them in the private sector. Leaseholder payments totaling about $117 million over the 30-year period could boost total sales in the county by $85.8 million and personal income by $177.4 million.

Public-sector revenue collections of approximately $80 million over the 30-year project could result in an additional 20.4 jobs, with 10.4 of them in the private sector. Total sales in the county are estimated to increase by $123.7 million over the 30 years, and personal income by $68.5 million. As shown in the figure below, multiple entities as well as the State of Michigan will benefit from increased personal property values.

Estimated Property Tax Revenue Generated by a 375 MW Wind Farm for Montcalm County



* Based on an average debt millage of 5.99525 for Montcalm County School Districts
**Net benefit dependent on state aid formula. Tax levied on utility personal property components only (collection line, transmission line, substation).
*** Based on an average township millage of 1.94 for Montcalm County Townships. Tax rate based on location of project components.
**** Tax levied on utility personal property components only (collection line, transmission line, substation).

Finally, it is important to note that were it not for the developer's investment in the project to meet the increasing demand for renewable energy, the jobs and economic benefits estimated to accrue to Montcalm County over the life cycle of the wind farm would likely not occur.

References

IRENA. 2019. *Renewable Capacity Statistics 2019*. Abu Dhabi: International Renewable Energy Agency.

Moraes, Frank. 2021. *Which U.S. States Are Producing the Most Wind Energy?* Commodity.com. https://commodity.com/blog/states-wind-energy/.

Introduction

Montcalm Economic Alliance, in reviewing the potential economic impact of a proposed wind energy project in Montcalm County, Michigan, asked the Regional and Economic Planning Services Team at the W. E. Upjohn Institute for Employment Research (Upjohn) to estimate the economic impact of an array of activities associated with the building and operations of the project.

To create the needed estimates for the application, staff at Apex Clean Energy (Apex), the developer of the proposed wind farm, worked closely with Upjohn in providing detailed data on the costs of construction based on their recent first-hand experience constructing the state's largest wind farm in Isabella County. Apex also provided detailed data to develop a series of inputs on operating a 375 megawatt (MW) wind farm over a 30-year event horizon. These inputs were based on real-world cost estimates from turbine manufacturers and their currently operating projects. Activities associated with the long-term operations include the operation and maintenance of the project, payments to participating landowners and compensated community participants (through the project's community lease or "good neighbor agreements"), and public revenue collections based on property taxes generated by the project. The team at Upjohn used an economic impact model from Regional Economic Models Inc. (REMI: www.remi.com). The model was custom designed to estimate the impacts for the study region. The study region for this project was defined as Montcalm County, although inputs were also entered into the model for the rest of the state of Michigan as well as the rest of the United States. Impacts are reported for Montcalm County, the rest of Michigan (which combines the 82 other counties in Michigan, minus Montcalm), and the state of Michigan.

An "economic impact" to a study region is based on the source of the investment or spending and is commonly referred to as a "shock" to the study region. Most economists assume that only dollars from outside the study region (and so "new" to the region) are able to be considered to drive an economic impact. In many ways, this meets the "but for" criteria of an economic development project. In this case, "but for" the investment in the wind farm and the long-term operation of the farm, the jobs and income estimated and reported in this study would not be likely to occur. The anticipated economic impacts of a wind farm are the factors that provide a net benefit to the wealth of a region.

There are a few caveats to the input data and related impact estimates. First, the build data (data pertaining to the time in which the project is being constructed) are collapsed into a single year. This was done for two reasons: 1) The project will likely occur over a slightly longer time frame, likely over 18 months. REMI is an annualized model, so it is easier to condense the estimates into a single year. This made it easier to model the project. And 2), some costs, such as soft costs (e.g., legal, permitting, and architectural) occur well in advance of the build. However, for this project, exact timing and expenditures are not available. In the end, this creates a larger single-year set of estimates for construction than would occur more organically, but it is believed to be consistent with the combined set of activities associated with the build.

The second caveat to the data is that with any set of pro formas based on future expenditures, the inputs are estimates. Inputs for materials and workers in the build phase and in the near term are more grounded in experience and planning, while the data for out years are based

on estimates of growth and change. In all cases of operational inputs, the team at Upjohn worked with the staff at Apex to verify and validate the assumptions of the inputs based on experience in prior projects.

The following sections provide a set of estimates for each area of inputs, as well as a combined set of estimates with 30 years of operating impacts.

Inputs into REMI

Apex provided Upjohn with estimates for capital expenditures associated with building and operating the wind farm, as well as estimated payments to both leaseholders and public entities, including but not limited to townships, school districts, and the county.

The estimated costs of the project are currently just over $463 million. Per Apex, this is consistent with the most recent capacity-weighted costs of installed wind projects, which averaged $1,460/kW in 2020 according to the U.S. Department of Energy in its *Land-Based Wind Market Report* for that year. There are a couple of caveats to understanding how those expenditures fit into the REMI model. First, as noted earlier, while the project has costs occurring prior to the actual build, these costs are included in a single year of estimates. Second, aside from prebuild costs, the exact term of the project is unknown, and while it may take more than a year from start to finish, the duration will be less than two years, and so all build costs and labor are condensed into a single year of activity.

A third caveat is that not all expenditures will occur in Montcalm County. The team at Upjohn worked closely with the team at Apex to distribute costs for materials among three locations: Montcalm County, the rest of Michigan, and the rest of the United States. REMI is a dynamic model that uses economic geography as a basis for estimating economic impacts. This modeling takes into account trade flows between places. The implication of these trade flows is that activity in Montcalm County may affect economic activity in the rest of Michigan as well as the rest of the country. The reverse is also true: economic activity in the rest of the country may impact industries and economic activity in the county. For that reason, all non-Michigan economic activity was entered into a "rest of the United States" region in the REMI model. At the time of the creation of the estimates, the sourcing of materials such as nacelles and blades was not fully determined, and some of the "rest of United States" inputs may be supplied from offshore sources. Given the relatively rural nature of Montcalm County, it is unlikely that this condition will have a significant impact on the county-based estimates, but it does need to be noted.

In addition to the build-out costs used in creating the first-year estimates, Apex provided pro formas on the operations of the wind farm, the lease payments to landowners and others, and the estimates of personal property taxes paid to a variety of units of government in the county. Estimates of personal property tax payments from Apex were informed by confirmed tax valuations and payment data from the recently built Isabella Wind Farm in Michigan. Updated quotes and cost estimates reflecting the true cash value and taxable value of a 75-turbine wind farm built with five megawatt (MW) turbines were combined with current millage rates for Montcalm County taxing jurisdictions. It is important to note that an average millage rate was used for township and school debt. This is due to millage rates varying among townships and school districts. All of the pro formas were based on a 30-year event horizon

with an estimated beginning in 2025 and running through 2054. For use within this report, the timeline for operations is referred to as Years 1 through 30.

As with the build aspects of the project, Apex worked with the Upjohn team to determine the share of materials and labor for operations and maintenance (O&M) that would be attributed to the county, the rest of the state, and the rest of the nation. While the forecast expected expenditures vary by year and are based on life-cycle conditions of project components, a total of just over $115 million will be spent maintaining and operating the wind farm. This translates into an average annual expenditure of just over $3.8 million.

Again, noting the nature of the life cycle of materials for maintenance and ongoing project operations needs, a project of this size would be expected to create an average of about 18 direct jobs each year over the 30-year operational horizon.

According to the Bureau of Labor Statistics, wind turbine service technicians are one of the fastest growing occupations in the country, with a projected growth rate of 68 percent from 2020 to 2030 (https://www.bls.gov/ooh/fastest- growing.htm). An estimated 1,400 openings for wind turbine technicians are projected each year, on average, over the next decade, with close to 12,000 technicians projected to be working across the country by 2030 (https://www.bls.gov/ooh/installation-maintenance-and-repair/wind-turbine- technicians.htm#tab-6). Median pay for technicians is $56,230 per year, or just over $27 an hour.

More locally, as of 2019, Greater Gratiot Development Inc., in Gratiot County, Michigan, reports that 28 full-time-equivalent (FTE) jobs were created as a result of the first three wind farms developed in the county. Since then, two additional projects have come online, Consumers Energy's Gratiot Farms project and DTE's Polaris Wind project (https://ggdi.gratiot.org/wp-content/uploads/2020/07/Benefits-of-Wind- Development-2019.pdf).

A third set of economic impacts was created using estimates of operations payments to lease holders. These payments include wind energy easements, with all participants being in the final project footprint, including those hosting wind turbines, access roads, collection, and transmission lines. Based on the anticipated number of acres signed and participating households, Apex projected these payments over a 30-year event horizon. The total of estimated payments in nominal dollars over the period is just over $118 million, with an average annual contribution to the economy of the county of just under $4 million per year. As noted with the O&M jobs, but for developing the wind farm, these revenues would not have flowed to more than 400 families in the county.

The final set of economic impacts was based on public-sector revenues that will be collected because of the increased value of personal property in the county. The increased tax revenue is based on the addition of turbines and associated infrastructure to collect the turbine output (electricity) and transmit it to the grid. These taxable investments include not only turbines and towers but also substations, high-voltage line extensions and other electrical equipment.

Total estimated personal property tax revenues[1] are estimated to be just under $80 million in nominal dollars over the 30-year project horizon. Average annual collection for the period is estimated at just under $2.7 million. As with the O&M and lease payments, "but for" this proj-

[1] Under current Michigan tax code.

ect, these revenues would likely not come to Montcalm County. Tax collections are distributed to a number of public entities in Montcalm County, including townships, schools/independent school districts, libraries, senior services, veterans' programs, ambulance services, the community college, and others.

REMI's Baseline for Montcalm County

Underlying every REMI model is a national baseline forecast that is estimated through 2060. The baseline contains detailed data on both economic and demographic aspects of the macro economy. In the short run, the baseline mainly uses the forecasts from the Research Seminar in Quantitative Economics (RSQE),[2] the oldest forecasting group in the country, which is housed at the University of Michigan in Ann Arbor. The REMI model used in this analysis is version 2.4.3, and the longer-run forecast is based on the outlook from the Bureau of Labor Statistics.[3] Since the first quarter of 2020, the economy has been responding to the COVID-based pandemic. In response to quickly varying conditions in the national economy, REMI has relied on updated forecasts using outlooks from both RSQE and the Congressional Budget Office (CBO) to update the national baseline and outlook. The estimates prepared in this report use the most recently available macro forecast update for the 2.4.x models, which was released in the spring of 2021.

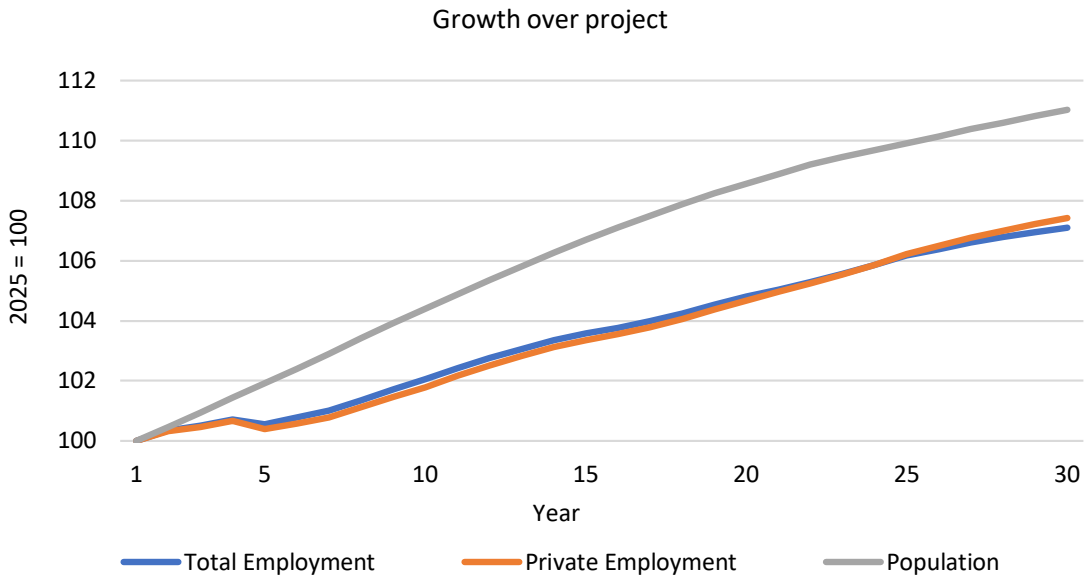
Along with a macro baseline, REMI also estimates baselines for each region in the custom-designed model. A "region" is usually a single county or a group of counties for which impacts are estimated. In this study, the model version used had Montcalm County broken out from the rest of the state. This allows inputs to be allocated to the county and impacts estimated for just Montcalm County. The Upjohn model had other regions in the state for which baselines were also estimated. These other regions combine to allow inputs from the project to be entered from the rest of the state, as well as allow for impacts to be estimated for the rest of Michigan (ROM). When Montcalm County impact estimates are combined with estimates of impacts from the combined ROM region, impact estimates from the project can be reported for the state of Michigan

When a REMI model is used to estimate impacts for a place such as Montcalm County, the dynamic model uses the regional baseline forecast to create estimates of differences from the baseline due to the economic changes. In this way, REMI is different in that it estimates differences in the baseline due to economic activity rather than statically running through an input-output model. This is particularly useful and important in a study such as this, because of the dynamic nature of impacts being estimated over an event horizon rather than for a single year.

REMI's baseline forecast for the county over the 30 years is shown in Figure 1. In this figure, total employment, private-sector employment, and population are indexed to 2025, where 2025 equals 100 and so indicates a relative change. The year 2025 was chosen as a starting year for reporting, as it is the earliest potential year for a first full year of operations for the wind farm. Both population and jobs are expected to grow over the study period, but not at a particularly fast rate. Slow or no growth in population is consistent with much of Michigan

[2] https://lsa.umich.edu/econ/rsqe.html.
[3] https://www.remi.com/wp-content/uploads/2020/10/PI-Data-Sources-and-Estimation-Procedures.pdf.

Figure 1 Trends in Employment and Population in Montcalm County



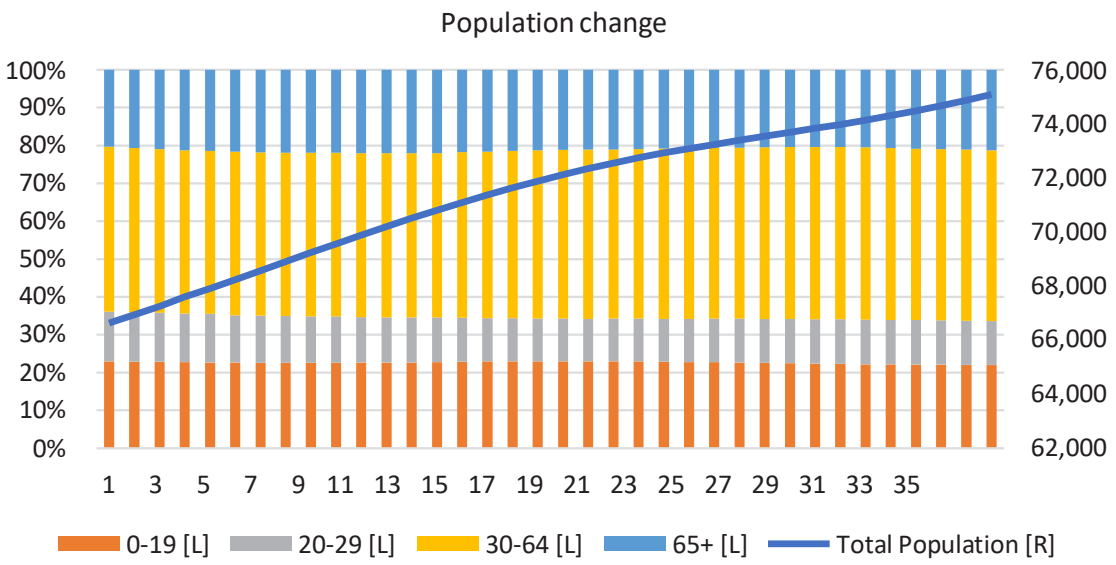
SOURCE: REMI and Upjohn Institute.

and the Midwest in general. With low population growth, it is difficult to grow employment, as the base of available workers is relatively unchanging. The county's population is forecast by REMI in Figure 1.

In looking at the population base for the county, much as with the rest of Michigan and the rest of the Midwest, the population is forecast to grow slightly older over the study period, but the overall forecast for the county suggests a relatively constant mix of students (newborns to 19), emerging workers (20-29), prime-aged workers (30-64) and post-prime workers (65+). Figure 2 displays these trends over time, with the overall population trends indicated on the right-hand or Y2 axis and the shares of population by age cohort on the left-hand axis.

While REMI estimates a 3 percent drop in total employment of 780 employees between 2025 and 2054, the mix doesn't change all that significantly in actual employees by industry. Because of the change in some industry employment with smaller numbers of initial employees, the percentage change can appear dramatic. As an example, as shown in Table 1, farm employment in the 30-year study period is estimated to grow by 117 jobs, which reflects an increase of nearly 22 percent. Conversely, the government sector is forecast to lose 738 jobs, or just over 9 percent, and construction is predicted to lose 83 jobs, or 7 percent.

Figure 2: General Population Trend and Composition by Age Cohort



SOURCE: REMI and Upjohn Institute.

Table 1: Sector Trends in Employment: 2025 to 2054

Industry sectors	2025	2054	% change
Natural resources	684	683	-0.15%
Construction	1,182	1,099	-7.02%
Manufacturing	922	970	5.21%
Retail and wholesale	3,689	3,732	1.17%
Transportation and public utilities	721	749	3.88%
Finance, insurance and real estate	1,444	1,421	-1.59%
Services	8,145	7,973	-2.11%
Government	8,148	7,410	-9.06%
Farm	541	658	21.63%
All industries	25,476	24,696	-3.06%

SOURCE: REMI and Upjohn Institute.

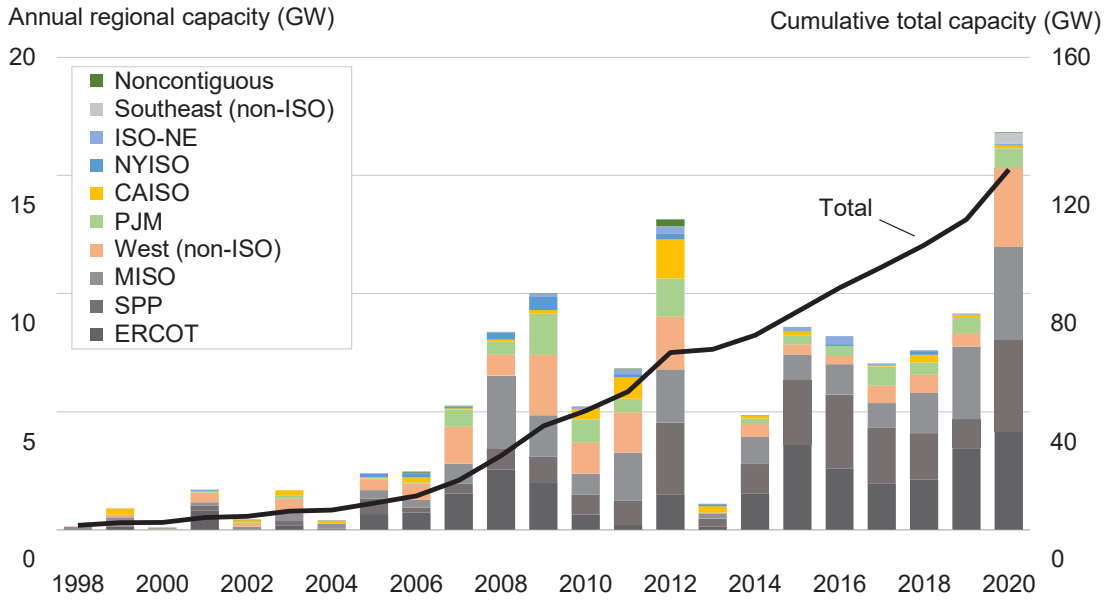
The State of Wind: Nationally and in Michigan

National perspective

In August 2021, the U.S. Department of Energy (DOE) released its annual report on the wind industry, titled *Land-Based Wind Market Report: 2021 Edition*.[4] The report was produced by a collaboration of authors from both the public and private sectors and was assembled at the Lawrence Berkeley National Laboratory. The report discusses outcomes for the land-based wind industry for the calendar year 2020.

Data included in the report and shown in the Figure 3, below, taken from the data file, show that investment in wind power capacity in 2020 reached its highest level since reporting began in 1998. In 2020, investment in wind across all regions added 16.84 gigawatts (GW) of capacity. The closest the industry had previously come to that increase in annual capacity occurred in 2012, at 13.34 GW. The average annual increase in capacity over the past 10 years was 8.33 GW, and the increases on an annualized basis ranged from a low of 1.09 GW in 2013 to the high reported for 2020.

Figure 3: Annual and Cumulative Growth in Wind Power Capacity



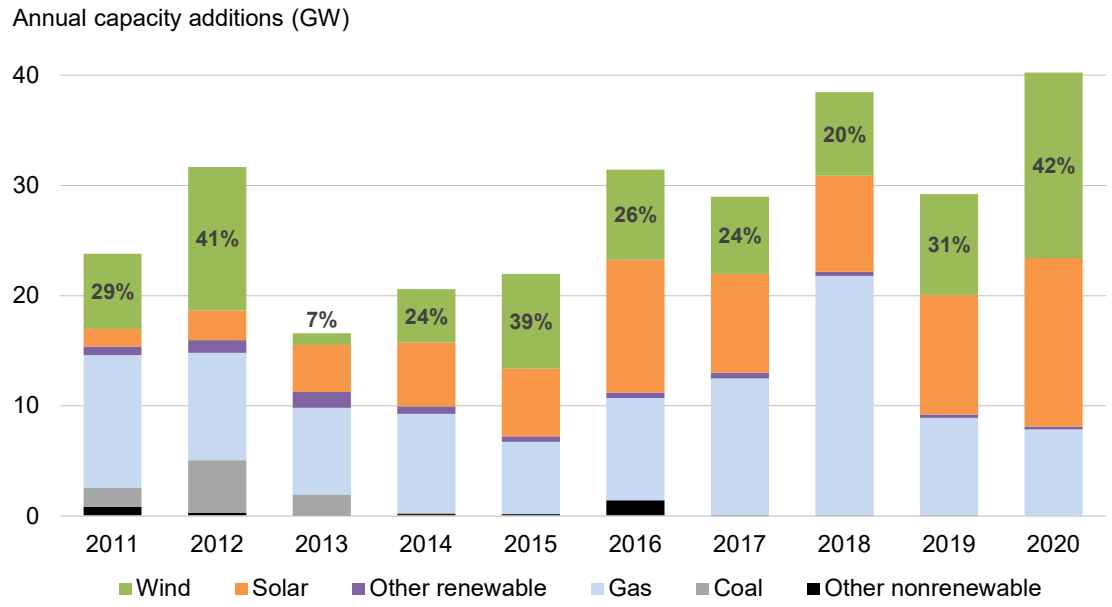
SOURCE: American Clean Power Association (ACP), taken from the data file supporting the report *Land-Based Wind Market Report: 2021 Edition*.

On a cumulative basis, total United States wind capacity increased to 121.99 GW in 2020. The growth from 105.12 GW in 2019 represents an increase of just over 16 percent.

Wind energy represents about 42 percent of total generating capacity brought online in the United States in 2020. As shown in Figure 4, wind, at 16.8 GW; solar, at 15.3 GW; and natural

[4] The full report and data file are available at https://emp.lbl.gov/wind-technologies-market-report/.

Figure 4: Relative Contribution of Generation Types



SOURCE: ACP, Wood Mackenzie, ABB Group, and Berkeley Lab, taken from the data file supporting the report titled *Land-Based Wind Market Report: 2021 Edition*.

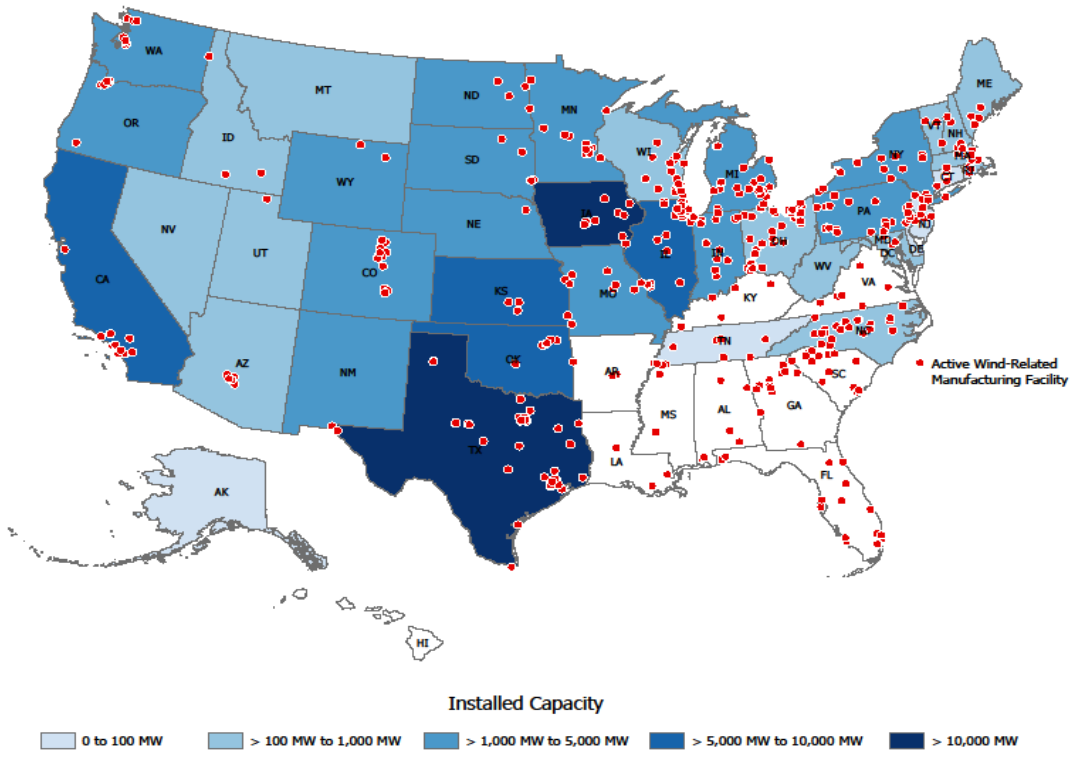
gas, at 7.8 GW, made up the three main components of capacity growth in 2020. Total capacity growth from all three sources was just under 40 GW.

The United States lags far behind China in both annual capacity increases (16.8 GW versus 52.0 GW) and cumulative capacity (121.9 GW versus 288.3 GW) (not shown). In annual increase in capacity, Brazil is a distant third, with about 2.3 GW coming online in 2020. In cumulative capacity increases, Germany is a distant third, with 62.8 GW in total capacity by the end of 2020. While the United States has made strides to increase its capacity from wind, according to the DOE report, it still ranked a mere 23rd in wind generation as a percentage of total energy generation in 2020, at 8 percent. That places the country behind Mexico and tied with Turkey.

Within the United States, the state of Michigan ranked 12th in new generation in 2020, adding 493 MW of wind generation. Michigan also ranked 12th in the country for cumulative generation at 2,681 MW (2.68 GW) as of 2020. In 2021, Michigan added an additional 457 MW of wind energy generation capacity, including the completion of the 385 MW Isabella Wind Farm, the largest wind farm in the state and the third largest project by capacity completed in the United States last year. Data from the DOE report indicates that investment in Michigan wind capacity in 2020 was just under 3 percent of all U.S. investment. Michigan's share of cumulative national wind energy capacity is 2.2 percent.

In modeling the economic impacts of Montcalm Wind, data on materials sourcing for the project was based on estimates from Apex Clean Energy and allocated to three geographic areas: 1) Montcalm County, 2) the rest of the state of Michigan, and 3) the rest of the United States. As shown in Map 1, there is production of turbine and component manufacturing in and around the state of Michigan.

Map 1: Location of Wind Turbine and Component Manufacturing Facilities in the United States



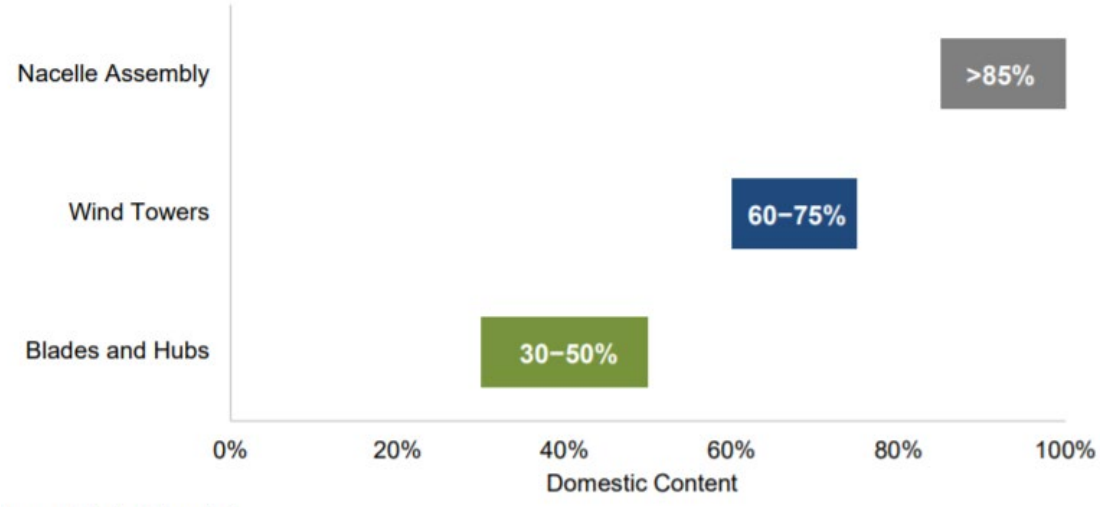
SOURCE: ACP, taken from the data file supporting the report *Land-Based Wind Market Report: 2021 Edition*.

Although sourcing has not been finalized for the project, it is likely that materials may be sourced from all three geographies.

Figure 5, taken from the data file for the DOE report, shows that a significant share of nacelle assemblies were produced domestically in 2020. Similarly, most of the tower sections were domestically produced. For blades and hubs, between one-third and one-half are estimated to be domestically produced. A note from the report should be considered when looking at the data: "Figure reflects estimated percentage of blades, towers, and nacelles that were installed in the U.S. in 2020 that were also manufactured/assembled domestically."

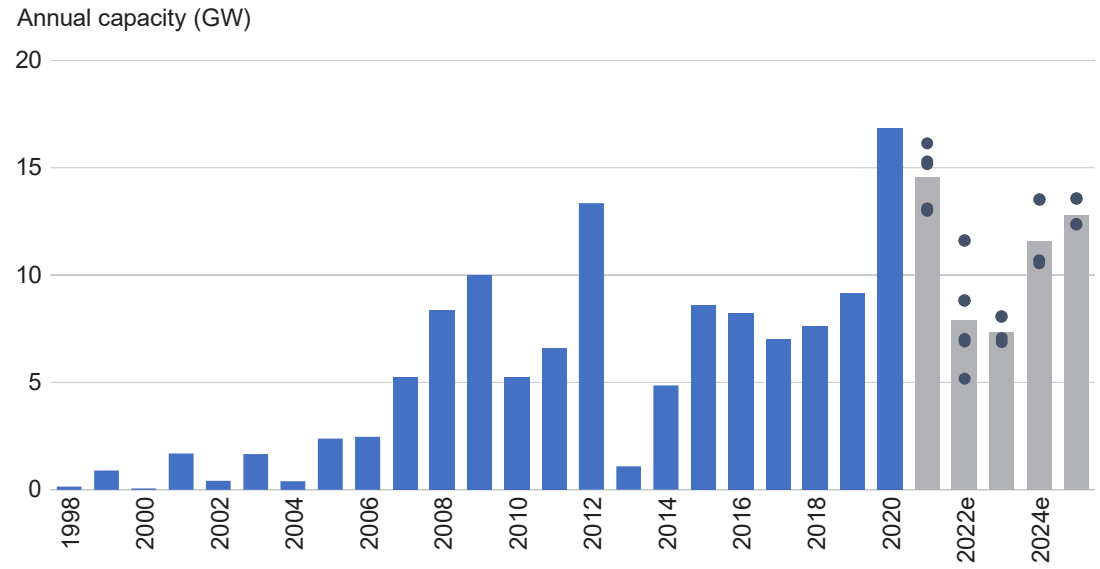
Finally, Figure 6 contains the forecast growth in generation capacity. As noted earlier, 2020 was a bellwether year in total generation coming online. While 2021 is forecast to see slightly less new generation, at 14.5 GW it is still ahead of the next highest year, 2013, which saw 13.34 GW of new generation. The forecast out to 2025 suggests more of a return to the pre-2020 trend, with average new generation of 10.8 GW. As seen in the figure, 2021 is still high, but estimates for 2022 and 2023 are below trend, while estimates for 2024 and 2025 are above trend.

Figure 5: Approximate Domestic Content of Major Components in 2020



SOURCE: Lawrence Berkeley National Laboratory (Berkeley Lab), taken from the data file supporting the report *Land-Based Wind Market Report: 2021 Edition*.

Figure 6: Trends in Domestic Wind Power Capacity, including History and Forecast



SOURCE: ACP and analyst forecast, taken from the data file supporting the report *Land-Based Wind Market Report: 2021 Edition*.

Demand for renewable energy in Michigan and renewable portfolio standard

The state of Michigan has adopted—as have many other states—a renewable portfolio standard (RPS),[5] which requires all retail providers of electricity to have a portion of their portfolio supplied by renewable sources, such as wind generation. The Clean, Renewable, and Efficient Energy Act (PA 295) required the state's electricity providers to generate 10 percent

[5] See https://www.michigan.gov/mpsc/0,9535,7-395-93308_93325_93423_93502-500271--,00.html.

of their retail electricity sales from renewable sources by 2015. SB 438, signed by Governor Rick Snyder in 2016, increased this requirement to 15 percent by 2021. In addition to the requirements imposed by the state, Michigan's utilities have self-imposed carbon-free energy generation goals ranging from 80 to 100 percent by 2050.

Renewable energy, as stated on the Michigan.gov website, includes electricity generated from wind turbines, solar photovoltaic panels, biomass, waste-to-energy, and hydroelectric. As the site notes, "Nearly all of the renewable energy used to meet the requirements of Michigan's RPS is generated in Michigan."

Both the presence of the RPS and the requirement of an increasing share of the portfolio supplied by renewables support the necessity of alternative energy sources, including wind. Also supporting investment in wind in the state of Michigan, based on statements from Michigan government officials, is that much of this portfolio relies on self-supply from producers in Michigan.

Returns from lease payments to landowners

One cannot estimate a wind project's impact to a local economy without including the economic impacts of lease or easement payments to landowners and others affected by the project. These annualized payments will directly affect more than 400 families in Montcalm County through the project's community-based leasing model. Every family who owns any amount of land in the project area is able to participate. In this analysis, these payments were modeled in REMI as "transfers from corporations." Using this variable, these transfers or payments to leaseholders enter into the economy as normal consumption. The implication of the inflow of new money into the county's economy is that while overall spending will increase, it will follow the same patterns of consumption within the county that are based on earned income spending.

Given that the exact distribution of payments to each family is unknown, this assumption is the most acceptable in creating estimates of local impact to the county. It is expected that while some will receive payments that will likely be treated as income, for some recipients receiving larger annual payments, these may be treated more as a windfall. In the case of windfall payments, consumption patterns may change, given the ability to leverage these payments into larger and particularly capital purchases.

Sarah Mills, as part of her doctoral research at the University of Michigan, has explored the difference in how landowners invested in their farms based on having wind farms or not having wind farms in their communities. From Dr. Mills's summary document,[6] which is based on survey data from 2014 for the state of Michigan, she finds that landowners with wind turbines

- "invested twice as much money in their farms—in home improvements, outbuildings, farm equipment and drainage/irrigation—in the past five years as their neighbors."
- "are more likely to believe their land will be farmed in the future"
- "are more likely to have a succession plan in place"

[6] "Farming the Wind: The Impact of Wind Energy on Farming," Sarah Mills, University of Michigan, 2015.

Dr. Mills found that on the capital investment side, those responding to the survey with turbines made, on average, $41,970 in improvements to their homes, versus $26,897 for those without turbines on-site. Similarly, investments in outbuildings were $72,780 for those with turbines and $36,521 for those without. Finally, those with turbines spent $279,539 on new or used farm equipment versus $125,027 for those without turbines.

Economic Impact Estimates: Montcalm County

Summary: Combining all four sets of inputs over the 30-year project horizon

In the following analysis, it is important to separate the impacts on jobs versus estimates that are based on dollar values. While estimates valued in dollars, such as personal income, can be summed over time as they are accumulated, jobs are temporal and so only exist for a specified time. In the case of this research, a "job" is considered to be in place for the calendar year, but the job is not necessarily a full- time or full-time-equivalent (FTE) position. This is consistent with how the Bureau of Economic Analysis reports employment data. When looking at jobs reported over the 30-year operations and maintenance (O&M) cycle, a reported job across the 30-year event horizon may be filled consistently by one person, so although that person is employed for 30 years, the sum of that employment does not accumulate to 30 jobs. For that reason, in this summary section and in the rest of this report, the summary of jobs uses the mean of annual employment for the 30 years.

As the build-out of the project is condensed into a single year, the event horizon of the project, at least for this analysis, is over a 30-year timeline. As shown in Table 2, during the construction phase the project will create an estimated 876 jobs in Montcalm County and an average of 47.8 jobs from O&M, lease payments, and government expenditures. Of those estimated jobs, 813 and 35.4, respectively, are in the private sector. Total project output or sales across the 31 years of construction and operations adds $454 million to the county economy, with about $132 million coming from the build-out and more than $321 million coming from long-term returns. Value-added, or the value created by workers, increases in the county by $265 million across the project, with just under $78 million coming from the construction component and slightly more than $187 million coming from long-term returns. Finally, incomes in the county increase by $346 million, with just over $47 million in construction and just over $299 million coming from long-term returns. Note that these values are above the existing economic baseline forecast for the county and so are unlikely to occur without the construction, operations, and payments within the county, "but for" this project.

Table 2: Summary of Economic Impacts

	2024	Years 1 to 30	Project totals
Total employment	876	47.8	
Private nonfarm employment	813	35.4	
Output	$132,861,000	$321,340,200	$454,201,200
Value-added	$77,941,000	$187,143,500	$265,084,500
Personal income	$47,344,000	$299,538,100	$346,882,100

Summary: Estimating impacts from building the wind farm in 2024

Based on input estimates of building the wind farm in Montcalm County, Table 3 contains the estimates of impacts on the county. Note that while some of this investment may occur at the end of 2023 or possibly into 2025, for the purposes of this study, all of the construction-related expenses are modeled in 2024. Also note that there are additional preconstruction expenditures that will have occurred prior to the state of construction, and those impacts are not included in this set of estimates.

As shown in Table 3, the construction phase of the project creates an estimated 876 jobs in both the public and private sectors. Of the total jobs, 813 are in the private nonfarm sector. In looking at estimates of output or total sales in the county, the build-out adds more than $132 million to the economy of the county.

Table 3: Estimates of Economic Impacts from Building the Wind Farm

	2024
Total employment	876
Private nonfarm employment	813
Output	$132,861,000
Value-added	$77,941,000
Personal income	$47,344,000

Part of that output is from the value-added of workers, and that value is estimated at just under $78 million. Included in the value-added estimated is personal income, which increases in the county by just over $47 million because of the construction investment.

Reported jobs are often identified by categories of job types: direct, indirect, and induced. These are defined as:

- Direct – The employment created by actual investment, growth, or change. This includes both those employed directly on-site performing construction, as well as those employed in the manufacturing sector.
- Indirect – The employment created by the need of the new firm to purchase goods and services—essentially the local supply chain.
- Induced – The household that supplies goods and services to the workers in the prior two elements. Examples include restaurants, hotels, barbers, educators, dry cleaners, accountants, gas stations, lawyers, and grocers.

Table 4 contains the job estimates broken down by these categories. A note of caution in thinking about these categories and comparing them to other studies using a different methodology and different model: As part of the process, the study team worked with the team at Apex to understand how and where investments will be made. As noted earlier, categorical spending and employment were intentionally allocated to the county, the rest of the state of Michigan, and the rest of the United States. The implication of this approach is to allocate spending for goods and services directly into the model rather than to ask the model to allocate supply chains using embedded regional purchase coefficients (RPCs). The RPCs allocate

Table 4: Direct, Indirect, and Induced jobs in Montcalm County from Construction

	Montcalm County 2024
Direct	690
Indirect	33
Induced	153
Total	876

SOURCE: REMI and Upjohn Institute.

spending by categories for goods such as wire or transformers, based on the input/output matrix for a place and for a specific input such as nacelles.

The approach used in this study was to directly input components into the model—the implication of this is that "indirect" jobs from supply chains for intermediate inputs are moved into "direct" jobs and so allocated and counted differently from other impact models such as IMPLAN or RIMS. The indirect jobs are therefore the supply chain jobs supporting the manufacturing of primary components demanded on the project.

Summary: Estimating impacts from operating the wind farm across the 30-year time line

This section reports the impact estimates for operating and maintaining (O&M) the wind farm over the projected 30-year life cycle. It is important to note for this and the following sections of impacts over the estimated life cycle of the wind farm that these jobs, while reported annually, are new jobs in the county due to the operation of the project.

The operations and maintenance of the wind farm are cyclical in nature, with regular annual activities occurring in most years, while in some years major work increases activity and so increases in employment and economic measures. Table 5 contains the summary data of impact estimates for the life cycle from 2025 to 2054. Additional detailed annual impact estimates are available in Appendix A2.

On average, O&M activities create an estimated 15.5 jobs per year, 14.3 of which are in the private nonfarm sector. While jobs, as noted earlier, cannot be accumulated, economic measures can be summed. Across the 30 years of the wind farm's life cycle, almost $112 million of additional output is estimated to occur in the county. The estimated increase in value-added is just under $60 million for the period, and the change in personal income is estimated to be just under $54 million.

Table 5: Estimates of Impacts from Operations and Maintenance on Montcalm County

	Years 1 through 30
Total employment	15.5
Private nonfarm employment	14.3
Output	$111,820,300
Value-added	$59,910,800
Personal income	$53,693,900

SOURCE: REMI and Upjohn Institute.

Summary: Estimating impacts from lease payments over 30 years of operations

This section provides estimates of the returns to the landowners from the lease payments over the life cycle of the project of 30 years. In looking at the estimates of impacts for economic measures, it will quickly be noted that the distribution of output versus value-added versus personal income is different from that of other aspects reported in this study. In the other areas of expenditures, including build-out, O&M, and property taxes, the primary consumer of expenditures is either industry or government, or both. In this set of impacts, more than 400 households in the county are estimated to be recipients of the transfers for lease payments. This changes the supply-chain relationship and so finds both output and value-added well below personal income.

This is likely for a number of reasons. First, some income will go into savings and not enter into the economy directly or in productive ways. Next, Montcalm County is relatively rural, and it is quite likely that some spending will occur outside of the county, with both goods and services being "imported" into the county. Finally, most economists assume that most goods consumed are produced outside of a study region. For that reason, only the "margins" to purchases are considered when estimating consumer spending. Margins are the portion of each dollar spent locally to support sales; they include the costs of labor, rent, utilities, and other overhead. A commonly used value for margins is that about one-third of the price of sales is in margins and the other two-thirds of the sales price is exported out of the study region to purchase the goods imported into the region.

Table 6 contains the estimates of job creation and economic measures due to the lease payments to landowners in the county.[7] Total jobs created, on average, are estimated at 11.9 per year, with 10.6 per year in the private nonfarm sector. While the lease payments and associated additional transactions add more than $177 million to the county in personal income across the life cycle of the project, sales/output in the county increase by just under $86 million, and value-added to just under $50 million. For detailed annual estimates of impacts, see Appendix A3.

Table 6: Impact Estimates from Lease Payments

	Years 1 through 30
Total employment	11.9
Private nonfarm employment	10.6
Output	$85,836,000
Value-added	$50,410,000
Personal income	$177,386,000

SOURCE: REMI and Upjohn Institute.

[7] This study and the associated economic impact estimates assume continued use of the land in its current manner. It is possible that alternative uses of leased property may also have created jobs and income, but it is beyond the scope of this project to estimate the opportunity cost of the alternatives.

Summary: Estimating impacts of property-tax collections from 30 years of operations

The Montcalm Wind project would create a tangible asset base that is taxable as both industrial and utility personal property under Michigan law. Under MCL 211.8, wind energy systems are taxed as personal property, and the State Tax Commission clarified in 2008 that the turbines themselves are to be classified as industrial personal property. The taxable base for personal property is 50 percent of its fair market value in Michigan. Industrial personal property is exempt from the 6-mill state education tax and is also exempt from up to 18 mills levied for school operating purposes (Michigan Department of Treasury).

In addition to the turbines themselves, any transmission line, electrical equipment (including but not limited to underground collection lines and junction boxes), and project substation are expected to be assessed as utility personal property. Utility personal property is not exempt from the 6-mill state education tax nor local school operating millages.

The study used valuation estimates from Apex that reflected updated cost estimates and taxable values for constructing a 375 MW wind farm using 5 MW turbines. This analysis referenced current tax law, actual taxes paid in the first year of operation by the recently completed Isabella Wind farm, and current depreciation tables (the column labeled "Current STC table" in Table 7) for the taxation of wind turbines and associated infrastructure, as endorsed by the State Tax Commission and recently affirmed by the Michigan Tax Tribunal.

Some local governments have assessed wind energy projects using an alternative depreciation table, known as the Applied Economics or AE table. The use of that table has been challenged by wind farm owners in other parts of the state, and the Michigan Tax Tribunal recently ruled against the use of the AE table in certain tax appeals. There is also debate at the

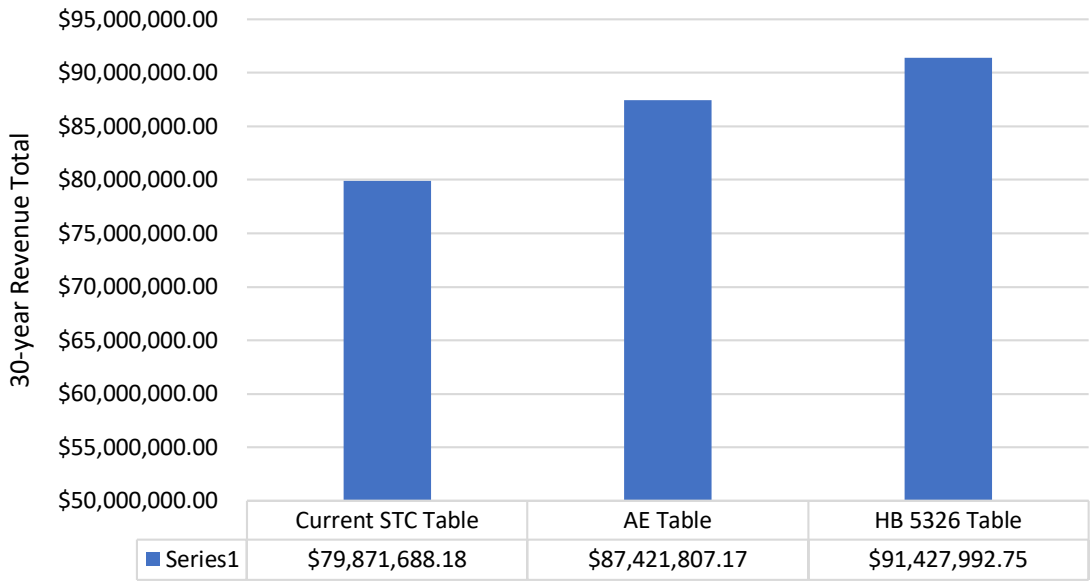
Table 7: Current Depreciation Tables for the Taxation of Wind Turbines

Depreciation Tables under Consideration			
Year	**Current STC table**	**AE table**	**HB 5326 table**
1	1	0.991	1
2	0.8	0.906	0.95
3	0.75	0.82	0.9
4	0.7	0.777	0.85
5	0.6	0.743	0.8
6	0.5	0.673	0.75
7	0.45	0.618	0.7
8	0.4	0.569	0.65
9	0.35	0.52	0.6
10	0.3	0.47	0.55
11	0.3	0.45	0.5
12	0.3	0.415	0.45
13	0.3	0.364	0.4
14	0.3	0.302	0.35
15	0.3	0.3	0.3

SOURCE: REMI and Upjohn Institute.

state level about codifying a depreciation schedule that more closely mirrors the table that was in place in 2012, when the first wind farms in the state were constructed. HB 5326 would set the multiplier table at 100 percent in Year 1, with the value decreasing by 5 percent each year until Year 15, when turbines would be valued at 30 percent of their original cost. (Table 7 shows the differences between all three tax tables).

Figure 7: Depreciation Table Impact on Montcalm Wind Projected Tax Revenue



SOURCE: APEX Clean Energy.

For purposes of this study, the detailed tax estimates below were calculated using the existing State Tax Commission table, the most conservative estimate of the three. For reference purposes only, Figure 7 provides an overall estimate of taxes paid by the project using each of the three depreciation tables. This is intended for informational purposes only. The most accurate and conservative estimates under existing tax law are reflected in the first column and in Tables 8 through 16.

Tax estimates were generated by applying 2021 millage rates for townships (general and allocated), counties, local and intermediate school districts, higher education, and entities with county-assessed millages such as libraries, law enforcement, and EMS services to the taxable value of industrial and utility personal property for the proposed wind farm.

Tables 8 through 16 detail the projected tax implications for the Montcalm Wind project. The analysis assumes that the valuation of the wind farm is the same as set forth by the State Tax Commission in the above-referenced memo. Other specific assumptions built into the analysis in these tables include the following:

- Assumes project begins operations the next year after construction is completed.
- Total projected project valuation of $463 million based on materials and installation costs, with a Year 1 taxable value equal to 50 percent of that amount, or $231 million.

Of this total taxable value, over $205 million is considered industrial personal property and $25 million is considered utility personal property.

- Because final tax payments will be based on facility locations, which are not yet known, an average township millage of 1.94 and an average school debt millage of 5.99 was used to project revenue for these jurisdictions.
- If local millages were increased or new millages for roads, fire services, and other investments were put in place, total tax returns could be greater than the amounts currently estimated.
- The tax analysis assumes that the project is decommissioned in 30 years and pays no more taxes after that date.
- These calculations are only to be used to illustrate the economic impact of a 375 MW project using 5 MW turbines and are not tied to any particular turbine layout.

Table 8 shows the total projection for all the property taxes contained in Tables 9 through 16 and summed by year. In the first full year of operation, total property-tax payments from the project would exceed $6 million. Wind turbine generators reach maximum depreciation in Year 10, and utility personal property infrastructure reaches maximum depreciation in Year 15. Over the 30-year life of the project, the total property taxes paid to the various taxing entities will be close to $80 million. Of that, $38 million in revenues would be generated in the first 10 years of operations.

As shown in Table 9, taxes paid by the project to Montcalm County operations would begin with payments over $1 million in Year 1 and would total $12.7 million over the project's 30-year lifetime.

Table 8: Total Estimated Property Tax Revenue from Montcalm Wind Project

Tax Year	Total Revenue
1	$6,014,466
2	$5,013,962
3	$4,735,726
4	$4,444,997
5	$3,913,512
6	$3,382,027
7	$3,091,298
8	$2,800,569
9	$2,522,333
10	$2,244,098
11	$2,206,618
12	$2,169,139
13	$2,131,660
14	$2,094,180
15	$2,069,194
16	$2,069,194
17	$2,069,194
18	$2,069,194
19	$2,069,194
20	$2,069,194
21	$2,069,194
22	$2,069,194
23	$2,069,194
24	$2,069,194
25	$2,069,194
26	$2,069,194
27	$2,069,194
28	$2,069,194
29	$2,069,194
30	$2,069,194
30-year total	$79,871,688
30-year annual average	$2,662,390

SOURCE: APEX Clean Energy.

Table 9: Montcalm County Estimated Tax Revenue from Montcalm Wind Project

Tax Year	Montcalm County
1	$1,011,277
2	$827,707
3	$779,220
4	$729,579
5	$634,910
6	$540,241
7	$490,600
8	$440,959
9	$392,471
10	$343,984
11	$340,523
12	$337,063
13	$333,603
14	$330,143
15	$327,836
16	$327,836
17	$327,836
18	$327,836
19	$327,836
20	$327,836
21	$327,836
22	$327,836
23	$327,836
24	$327,836
25	$327,836
26	$327,836
27	$327,836
28	$327,836
29	$327,836
30	$327,836
30-year total	$12,777,653
30-year annual average	$425,922

SOURCE: Apex Clean Energy.

Table 10 shows the total dollars forecast to be paid to township governments across the project footprint over a 30-year time horizon. For this purpose, an average township millage rate of 1.94 was used. Individual township millage rates and facility locations will impact the share of this revenue going to each township.

In total, it is estimated that a project of this size will generate approximately $5.6 million in township tax revenue over 30 years. The annual average in township revenues will be just under $190,000 per year.

Table 10: Township Tax Estimated Revenue from Montcalm Wind Project

Tax Year	Township revenue
1	$448,327
2	$366,945
3	$345,449
4	$323,442
5	$281,473
6	$239,504
7	$217,496
8	$195,489
9	$173,993
10	$152,497
11	$150,963
12	$149,429
13	$147,895
14	$146,361
15	$145,339
16	$145,339
17	$145,339
18	$145,339
19	$145,339
20	$145,339
21	$145,339
22	$145,339
23	$145,339
24	$145,339
25	$145,339
26	$145,339
27	$145,339
28	$145,339
29	$145,339
30	$145,339
30-year total	$5,664,682
30-year annual average	$188,823

SOURCE: Apex Clean Energy.

Table 11 shows an estimate of taxes to be paid to various countywide services. These estimates are based on current voted millages, including those for the Montcalm County Commission on Aging, the Sheriff's Office, Veterans Affairs, Michigan State University/4-H/Conservation District, libraries, ambulance, and Montcalm Community College (MCC).

As shown in the estimates in Table 11, the Commission on Aging should receive over $1.3 million; the Sheriff's Office over $2.9 million; Veterans Affairs over $700,000; for MSU Extension and the Montcalm Conservation District, about $580,000; for county libraries about $2.6

Table 11: Tax Revenue from Montcalm Wind Project for Other Countywide Taxing Jurisdictions ($)

Tax Year	Commission on Aging	Sheriff	Veterans	MSU/Conservation	Libraries	Ambulance	MCC
1	103,531	230,103	57,774	46,011	207,085	138,658	625,208
2	84,738	188,334	47,287	37,659	169,495	113,488	511,718
3	79,774	177,301	44,517	35,453	159,566	106,840	481,742
4	74,692	166,006	41,681	33,194	149,400	100,034	451,052
5	65,000	144,465	36,272	28,887	130,014	87,053	392,524
6	55,308	122,925	30,864	24,580	110,628	74,073	333,997
7	50,226	111,629	28,028	22,321	100,463	67,267	303,307
8	45,144	100,334	25,192	20,063	90,298	60,461	272,617
9	40,180	89,302	22,422	17,857	80,369	53,812	242,640
10	35,216	78,269	19,652	15,651	70,440	47,164	212,663
11	34,862	77,482	19,454	15,493	69,731	46,690	210,524
12	34,507	76,694	19,256	15,336	69,022	46,215	208,385
13	34,153	75,907	19,059	15,178	68,314	45,741	206,245
14	33,799	75,120	18,861	15,021	67,605	45,266	204,106
15	33,563	74,595	18,729	14,916	67,133	44,950	202,680
16	33,563	74,595	18,729	14,916	67,133	44,950	202,680
17	33,563	74,595	18,729	14,916	67,133	44,950	202,680
18	33,563	74,595	18,729	14,916	67,133	44,950	202,680
19	33,563	74,595	18,729	14,916	67,133	44,950	202,680
20	33,563	74,595	18,729	14,916	67,133	44,950	202,680
21	33,563	74,595	18,729	14,916	67,133	44,950	202,680
22	33,563	74,595	18,729	14,916	67,133	44,950	202,680
23	33,563	74,595	18,729	14,916	67,133	44,950	202,680
24	33,563	74,595	18,729	14,916	67,133	44,950	202,680
25	33,563	74,595	18,729	14,916	67,133	44,950	202,680
26	33,563	74,595	18,729	14,916	67,133	44,950	202,680
27	33,563	74,595	18,729	14,916	67,133	44,950	202,680
28	33,563	74,595	18,729	14,916	67,133	44,950	202,680
29	33,563	74,595	18,729	14,916	67,133	44,950	202,680
30	33,563	74,595	18,729	14,916	67,133	44,950	202,680
Total	$1,308,133	$2,907,383	$729,985	$581,360	$2,616,557	$1,751,963	$7,899,603
Annual avg.	$43,604	$96,913	$24,333	$19,379	$87,219	$58,399	$263,320

SOURCE: Apex Clean Energy.

million; for ambulance (based on current levy rates of .6 mills) about $1.7 million; and for Montcalm Community College almost $7.9 million. Combined, these countywide millages would be expected to produce almost $17.8 million in new tax revenue over the project's 30-year lifetime.

Table 12 shows the estimates of property tax revenue forecast to be paid by the project to local school districts. For this purpose, a general school debt millage of 5.99 was used to create the estimates. This was based on the average of current school-district debt millages within the project area. Tax payments for school operating levies are also shown, though

Table 12: Local School District Tax Implications of Montcalm Wind Project

Tax year	Operating funds	Debt/Sinking funds
1	$455,465	$1,385,480
2	$441,232	$1,133,984
3	$426,998	$1,067,554
4	$408,021	$999,544
5	$389,043	$869,846
6	$370,065	$740,147
7	$351,088	$672,137
8	$332,110	$604,127
9	$317,877	$537,697
10	$303,643	$471,268
11	$289,410	$466,527
12	$275,177	$461,787
13	$260,944	$457,046
14	$246,710	$452,305
15	$237,221	$449,145
16	$237,221	$449,145
17	$237,221	$449,145
18	$237,221	$449,145
19	$237,221	$449,145
20	$237,221	$449,145
21	$237,221	$449,145
22	$237,221	$449,145
23	$237,221	$449,145
24	$237,221	$449,145
25	$237,221	$449,145
26	$237,221	$449,145
27	$237,221	$449,145
28	$237,221	$449,145
29	$237,221	$449,145
30	$237,221	$449,145
30-year total	$8,663,324	$17,505,765
30-year annual average	$288,777	$583,525

SOURCE: Apex Clean Energy.

those funds may not result in a net budget increase for school districts because of the state aid formula.

Over the 30-year life of the project, Montcalm Wind would pay an estimated $26 million in property taxes to local schools. Of that total, about $8.6 million would be from the school operating tax on utility's personal property and $17.5 million would be for bond/sinking fund tax payments.

Table 13 contains estimates of other education-related taxes that would be paid by the project to the Montcalm Intermediate School District (ISD) and the State Education Fund. The

Table 13: Estimates of Other Education-Related Taxes

Tax Year	Montcalm ISD	State Education Tax
1	$1,153,725	$151,822
2	$944,298	$147,077
3	$888,980	$142,333
4	$832,346	$136,007
5	$724,343	$129,681
6	$616,339	$123,355
7	$559,706	$117,029
8	$503,072	$110,703
9	$447,755	$105,959
10	$392,437	$101,214
11	$388,489	$96,470
12	$384,542	$91,726
13	$380,594	$86,981
14	$376,646	$82,237
15	$374,014	$79,074
16	$374,014	$79,074
17	$374,014	$79,074
18	$374,014	$79,074
19	$374,014	$79,074
20	$374,014	$79,074
21	$374,014	$79,074
22	$374,014	$79,074
23	$374,014	$79,074
24	$374,014	$79,074
25	$374,014	$79,074
26	$374,014	$79,074
27	$374,014	$79,074
28	$374,014	$79,074
29	$374,014	$79,074
30	$374,014	$79,074
30-year total	$14,577,504	$2,887,775
30-year annual average	$485,917	$96,259

SOURCE: Apex Clean Energy.

Montcalm ISD would be the second greatest beneficiary of the project. The primary beneficiary of the project would be the local school district debt funds. The Montcalm ISD would be expected to receive more than $14.5 million in revenue from the project over its 30-year lifetime. For purposes of this estimate, the current full 4.9924 millage rate is applied to the entire project area, but facilities located in districts that do not levy the ISD's vocational education millage of 1.33 would have a slightly different tax rate. The State Education Fund would see an additional $2.8 million in revenue over 30 years from revenue generated by the project's collection and transmission infrastructure.

In estimating the economic impacts of these new revenues, it is important to note that not only are traditional government services part of the public sector, but all local K–12 school districts as well as Montcalm County Community College employees and activities are counted in the public sector. This leads to a larger delta between total jobs and private nonfarm jobs for these impacts than for those estimated for the other expenditures in this study.

Table 14 contains the estimates of impacts from tax collections over the life cycle of the project. On average, property tax collections are estimated to increase employment in the county by just over 20 jobs. About half will be in the public sector and half in the private nonfarm sector. Output due to property tax collections from the project will increase sales/output in the county by just under $124 million. Value-added will increase in the county by just under an estimated $77 million. Personal income estimates increase by just under $65 million in the county over the 30-year operation of the project. For more detailed information on returns to the investment on an annual basis, see Appendix A4.

Table 14: Impact Estimates from Property Tax Collections

	Years 1 to 30
Total employment	20.4
Private nonfarm employment	10.4
Output	$123,683,900
Value-added	$76,822,700
Personal income	$68,458,200

SOURCE: REMI and Upjohn Institute.

Impacts to the State of Michigan

This section of the research provides estimates of the impacts for the entire state of Michigan. The earlier set of estimates were only for Montcalm County, while the following set of estimates includes the county estimates as well as impacts to the rest of the state, including the additional 82 counties that make up the state of Michigan.

Summary: Combining all four sets of state-of-Michigan inputs over the build and operations time line

The differences in the values of estimates between the county and state totals are derived from two components of the REMI model. First, the REMI model is based on concepts in economic geography and trade flows. Using these concepts, REMI estimates the value, in both jobs and dollars, of purchases made in the rest of the state as a means to supply the direct purchases made in Montcalm County. In this case, the additional jobs and value created in the rest of the state are in the indirect and induced sectors and are derived as part of the supply chain and supply of households for imports into the county.

Also included in the estimates are direct expenditures in the rest of the state. As mentioned earlier in this study, Apex was able to provide estimates of expenditures by category for each geography, including Montcalm County, the rest of the state of Michigan, and the rest of the United States. Therefore, along with supply chains supporting direct purchases in Montcalm County, there are also impacts from direct purchases made inside of the state but outside of the county.

As shown in Table 15, within the build cycle, supply chains to Montcalm County and direct purchases outside of the county but within the state create a significant amount of impact, in both jobs and dollar-value estimates. Given the local nature of spending in O&M, lease payments, and property tax collections, the effect on the larger state is more muted.

Table 15: Summary Estimates for the State of Michigan

	Construction	Years 1 to 30	Project totals
Total employment	1,791	78.1	
Private nonfarm employment	1,656	63.4	
Output	$247,838,000	$610,811,200	$858,649,200
Value-added	$168,015,000	$349,317,500	$517,332,500
Personal income	$137,344,000	$419,229,100	$556,573,100

SOURCE: REMI and Upjohn Institute.

Summary: Estimating impacts on the state of Michigan from operating the wind farm over 30 years

Impact estimates from operations and maintenance (O&M) on the state of Michigan include adding an estimated 33.4 jobs per year on average, with 30.9 of those jobs in the private nonfarm sector. As shown in the appendix, the number of jobs and dollar-value impacts vary over time. This is due to the cyclical nature of O&M—some years will see higher returns than

others. The summary data for the period 2025 to 2054 are shown in Table 16, and the annual returns are shown in the appendix. Part of the returns to the state are the conditions under which some support services, such as monitoring the turbines, may occur outside of Montcalm County. And while some workers will be in the county for work, others may be commuting into the county from other locations in the state.

Table 16: Estimates of Impacts from Operations and Maintenance on the State of Michigan

	Years 1 to 30
Total employment	33.4
Private nonfarm employment	30.9
Output	$287,420,300
Value-added	$157,890,800
Personal income	$137,662,900

SOURCE: REMI and Upjohn Institute.

Summary: Estimating impacts on the state of Michigan from lease payments over 30 years

The lease payments accrue to more than 400 families in Montcalm County, and the impacts of that purchasing power extend well beyond the county boundaries. On average, total employment in the state is projected to grow by 18 jobs annually over the period from 2025 to 2054. Total output/sales in the state is estimated to be just under $146 million, with value- added increasing to just under $84 million. As mentioned in the reporting of estimates for Montcalm County, as these payments are made to households and likely will go to either savings or consumption, the impact to value-added will be relatively low.

Table 17: Estimates of Impacts from Lease Payments on the State of Michigan

	Years 1 to 30
Total employment	18.0
Private nonfarm employment	16.3
Output	$145,841,000
Value-added	$83,914,000
Personal income	$185,269,000

SOURCE: REMI and Upjohn Institute.

Summary: Estimating impacts from property tax collections over the 30 years

Similar to the lease payments to families, the collection of new property taxes because of the project focuses mostly on collecting personal property taxes in support of local government (county and townships), schools (K–12 and the community college), and special districts (ambulance and libraries) in Montcalm County. As might be expected, while the impacts are also mainly focused on staffing and purchasing goods in the county, some expenditures by both organizations and households will spill over into the larger state economy.

Table 18 contains the summary estimates of state impacts based on Montcalm County tax collections. The employment estimates are the average over the 30-year life cycle of the project. Total employment is estimated at an annual average of 26.7 jobs and 16.2 private-sector jobs. Detailed annual job change can be found in the appendix. Property tax collections add just under $178 million in output/sales, just under $108 million in value-added, and just under $97 million in personal income.

Table 18: Impact Estimates on the State of Michigan from Property Tax Collections

	Years 1 to 30
Total employment	26.7
Private nonfarm employment	16.2
Output	$177,549,900
Value-added	$107,512,700
Personal income	$96,297,200

SOURCE: REMI and Upjohn Institute.

Summary/Conclusions

The Montcalm Economic Alliance, with funding from Apex Clean Energy, engaged the W.E. Upjohn Institute for Employment Research to create estimates of the economic impacts of developing a 375 megawatt wind farm in Montcalm County, Michigan. The estimates are based on building the wind farm over a 12-month period, then from the operation of the wind farm over a 30-year life cycle. Included in the estimates are the long-term benefits from operating and maintaining the wind farm, payments to leaseholders and others affected by the wind farm, and the additional tax collections by the state, county, townships, school districts, as well as other special districts, due to the increased value of real personal property. The team at Upjohn used data from Apex as inputs into an economic impact model supplied by Regional Economic Models Inc. (REMI). The REMI model was custom designed for this analysis and allows the Apex data to be used to create estimates of impacts to Montcalm County as well as to the rest of the state of Michigan.

Economic impacts are generated when new monies flow into a study area. In this study, those new monies are the investments in building and operating the wind farm. Based on this new inflow of dollars, the building of the wind farm and associated operations in Montcalm County also meet the "but for" requirements of economic impacts. In this case, "but for" the investment and long-term revenues from operations, these impacts would likely not have occurred in the county.

On the input side to the REMI model, it is forecast that the project would cost approximately $463 million to build, including materials and labor. While not all the investment would occur in the county, recent experience by Apex on other projects, including those in Michigan, allows for reasonable estimates of where project dollars would be spent in Montcalm County, the rest of the state of Michigan, and the rest of the United States.

Over the 30-year period, it is forecast that the wind farm operator will spend over $115 million, or on average just over $3.8 million a year, in operations and maintenance. A similar

amount, about $118 million over the 30-year life cycle, is estimated to be paid to leaseholders. These payments of $4 million a year are expected to be divided among more than 400 families in the county. The final set of estimates is based on payments to various forms of local government. Based on current millages in the county for these taxing entities, as well as the aforementioned recent experience by Apex with other projects in Michigan, total payments to local governments, including school districts, are estimated to amount to just under $80 million over the 30 years. This translates to an estimated annual average of $2.7 million in local revenues generated by the presence of the wind farm in Montcalm County. Note that all of the estimates are based on nominal dollars.

The combined impact estimates across the 31 years of the project's construction and life cycle will create an estimated 876 jobs in the county and an average of 47.8 jobs from the combined investments in operations and maintenance, payments to leaseholders, and payments to local governments. These estimates include the direct jobs (those generated directly from the project), indirect jobs (those generated through supply chains), and induced jobs (those generated through households in the county supplying goods and services to workers who are employed either directly or indirectly (through suppliers).

Estimates of the buildout of the wind farm are condensed into a 12-month cycle. While some work may be done prior to or after that period, the jobs estimated to be created over the period are 876, with most of them, about 813, in the private sector. The remaining 63 jobs are in the public sector, including but not limited to federal, state, and local units of government. Total output (i.e., sales) in the county is estimated to be just under $133 million. Personal income is estimated to increase by just over $47 million in Montcalm County during the build year.

Over the 30-year operations life cycle of the wind farm, an estimated annual average of jobs that will be created in the county is estimated at 15.5, with 14.3 occurring in the private sector. It is important to note that the wind farm, over its 30-year life cycle, will see fluctuations in demand for workers based on the annual requirements in services. Over the 30-year life cycle, an additional $111.8 million in output (sales) is estimated to occur in the county, along with an additional $53.7 million increase in personal income over the period.

Over the 30 years of lease payments, it is estimated that nearly 12 jobs each year will be created in the county, with 10.6 of them, on average, in the private sector. Total output in the county for the period is projected to be $85.8 million, with personal income estimated at $177.3 million across the life cycle.

Property tax collections are projected to create an additional 20.4 jobs per year, with 10.4 of them in the private sector. Projections are that the county will increase its output (sales) by nearly $123.7 million, and personal income is estimated to increase in the county by an aggregate of $68.5 million due to taxes collected on the personal property associated with the wind farm.

Besides just Montcalm County, impacts to the state of Michigan as a whole could be quite significant. Total jobs involving construction and related supply chains are estimated to increase by 1,791, of which 1,656 could be in the private sector. When operations and maintenance, leaseholder payments, and personal property tax collections are combined for the 30-year life cycle, an average of 78.1 jobs could be created annually, 63.4 of them in the private sector.

Sales in the state are estimated to increase by $858.6 million and personal income by $556.6 million due to the investment in the Montcalm County wind farm.

The REMI Model

The Upjohn Institute uses a model to estimate economic impacts developed specifically for the study region by Regional Economic Models, Inc. (REMI, www.REMI.com). The team's project director has over 20 years of experience with REMI in estimating economic impacts across a wide array of economic activity, including visitor/tourism activities, industrial development, mixed-use development, and forecasting future economic and labor conditions. The REMI model is the preeminent model of its type and is widely recognized to be at the forefront of modeling. Its clients are located not only in North America but also in the European Union.

REMI is a dynamic model that creates estimates using equations rather than a simple input/output (I/O) table. This allows sensitivity in the analysis of both timing and scale/scope issues not found in other models. Features that are unique to REMI include the following:

- It is calibrated to local conditions using a relatively large amount of local data, which is likely to improve its performance, especially under conditions of structural economic change.
- It has an exceptionally strong theoretical foundation.
- It combines several different kinds of analytical tools (including economic-base, input-output, and econometric models), allowing it to take advantage of each specific method's strengths and compensate for its weaknesses.
- It allows users to manipulate an unusually large number of input variables and gives forecasts for an unusually large number of output variables.
- It allows the user to generate forecasts for any combination of future years, through special flexibility in analyzing the timing of economic impacts.
- It accounts for business cycles.
- It has been used by many users under diverse conditions and has been proven to perform acceptably.

Terms Used in This Study

Jobs Created or Retained
The estimated number of jobs created or retained by project activities are simply "jobs" as counted by the U.S. Bureau of Economic Analysis (BEA) and can be either full- or part-time positions. They are likely distributed across multiple industries. In any given industry, a "job" may represent a summation of positions across several industries in which each industry has less than one complete position. For example, the impact study may report one "job," but the spending patterns in the study may generate positions in three industries. However, each industry may require only one-third of a person. In this case, the three industries that employ one-third of a person each to meet demand would sum to one "job" in the REMI model. Employment is composed of three elements:

- Direct – The employment created by actual investment, growth, or change.
- Indirect – The employment created by the need of the new firm to purchase goods and services, essentially the local supply chain.
- Induced – The household that supplies goods and services to the workers in the prior two elements. Examples include education, dry cleaners, accountants, gas stations, lawyers, and grocers.

Value-Added
Value-added is an economic measure of the value of goods and services produced within the United States. It is the broadest measure of economic activity within a region or country. It consists of compensation of employees; taxes on production and imports, less subsidies; and gross operating surplus. It does not include intermediate inputs; it is a measure of the value contributed by labor and capital to production.

Personal Income
Income is the goods and services produced by citizens and residents in the study region (i.e., gross national product) minus the consumption of fixed capital (i.e., depreciation).

Output
Gross output includes both GDP and expenditures on intermediate inputs. In that way, it is considered double counting, but it is an essential statistical tool to understand the interrelationships between industries. Gross output is principally a measure of an industry's sales or receipts.

Appendix Tables for Montcalm County

APPENDIX TABLE 1: TOTAL

Panel A

	Build out	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Total employment	876	84	89	78	72	64	58	53	50	46	43
Private nonfarm employment	813	56	64	54	49	45	41	37	36	33	32
Output ($)	132,861,000	11,219,300	13,088,700	12,120,100	11,542,500	10,754,600	10,030,700	9,429,400	9,111,800	8,700,000	8,417,200
Value-added ($)	77,941,000	6,836,200	7,901,500	7,317,900	6,984,500	6,512,300	6,062,100	5,708,900	5,507,900	5,251,500	5,066,500
Personal income ($)	47,344,000	4,191,900	8,423,000	6,756,000	6,963,600	7,065,500	7,174,800	7,306,900	7,494,000	7,623,000	7,789,000

Panel B

	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21
Total employment	43	43	41	41	40	41	41	41	40	40	39
Private nonfarm employment	32	32	31	31	30	31	31	31	31	31	30
Output ($)	8,661,600	8,805,300	8,821,700	8,987,900	9,164,000	9,700,200	10,008,600	10,295,400	10,402,600	10,678,800	10,860,800
Value-added ($)	5,180,600	5,251,200	5,246,000	5,320,300	5,404,400	5,664,300	5,818,900	5,959,900	6,000,100	6,130,900	6,207,000
Personal income ($)	8,075,000	8,332,100	8,548,900	8,818,700	9,094,500	9,459,300	9,969,600	10,289,100	10,560,600	10,897,700	11,202,100

Panel C

	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	2025 to 2054	2025–2054
Total employment	39	38	38	37	37	36	36	36	35	47.8	Average
Private nonfarm employment	30	30	29	29	29	29	28	28	28	35.4	Average
Output ($)	11,050,500	11,273,700	11,477,000	11,692,200	11,921,900	12,152,900	12,393,800	12,643,000	12,901,100	321,340,200	Total
Value-added ($)	6,287,400	6,384,600	6,470,100	6,561,000	6,658,900	6,756,600	6,858,400	6,963,700	7,072,600	187,143,500	Total
Personal income ($)	11,522,100	11,860,000	12,198,400	12,551,100	12,914,100	13,286,500	13,672,700	14,071,300	14,485,000	299,538,100	Total

APPENDIX TABLE 2: OPERATIONS

Panel A

	Build out	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Total employment	0	17.8	15.4	14.0	12.7	12.6	13.5	13.1	14.0	13.8	14.1
Private nonfarm employment	0	17.2	14.6	13.1	11.8	11.7	12.6	12.1	13.0	12.7	13.1
Output ($)	0	2,466,000	2,354,600	2,244,900	2,123,800	2,170,400	2,378,800	2,377,100	2,583,900	2,634,400	2,771,600
Value-added ($)	0	1,341,700	1,291,300	1,229,500	1,166,500	1,195,500	1,308,500	1,313,300	1,430,000	1,457,200	1,534,400
Personal income ($)	0	781,300	697,500	693,800	693,400	750,600	848,600	890,800	998,600	1,047,600	1,136,100

Panel B

	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21
Total employment	15.1	15.5	15.0	15.2	15.4	16.8	16.5	16.8	16.3	16.6	16.5
Private nonfarm employment	14.0	14.3	13.8	14.1	14.2	15.5	15.3	15.6	15.0	15.3	15.2
Output ($)	3,077,500	3,231,600	3,232,500	3,367,500	3,486,600	3,932,800	4,023,500	4,195,900	4,202,600	4,385,200	4,481,100
Value-added ($)	1,689,300	1,774,100	1,771,400	1,842,100	1,907,200	2,127,500	2,168,000	2,256,800	2,253,700	2,345,900	2,388,200
Personal income ($)	1,259,400	1,353,100	1,401,300	1,500,200	1,596,700	1,772,600	1,850,300	1,972,500	2,040,400	2,171,900	2,270,200

APPENDIX TABLE 2: OPERATIONS (CONT.)

Panel C

	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	2025–2054	2025–2054
Total employment	16.4	16.4	16.4	16.4	16.3	16.3	16.3	16.3	16.2	15.5	Average
Private nonfarm employment	15.1	15.2	15.1	15.1	15.1	15.1	15.0	15.0	15.0	14.3	Average
Output ($)	4,587,100	4,725,300	4,843,400	4,970,300	5,108,400	5,245,300	5,388,800	5,538,000	5,691,400	111,820,300	Total
Value-added ($)	2,436,400	2,501,200	2,554,400	2,611,900	2,674,700	2,736,300	2,800,700	2,867,400	2,935,700	59,910,800	Total
Personal income ($)	2,378,900	2,499,600	2,616,200	2,739,700	2,869,200	3,001,900	3,140,600	3,285,300	3,435,600	53,693,900	Total

APPENDIX TABLE 3: LEASES

Panel A

	Build out	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Total employment	0	24.1	18.2	17.5	16.1	15.0	13.9	12.9	12.3	11.8	11.4
Private nonfarm employment	0	22.9	16.8	16.1	14.7	13.6	12.5	11.6	10.9	10.5	10.1
Output ($)	0	3,471,000	2,908,000	2,856,000	2,719,000	2,603,000	2,471,000	2,367,000	2,311,000	2,287,000	2,289,000
Value-added ($)	0	2,048,000	1,714,000	1,692,000	1,620,000	1,559,000	1,486,000	1,429,000	1,399,000	1,387,000	1,389,000
Personal income ($)	0	5,798,000	4,053,000	4,232,000	4,311,000	4,405,000	4,488,000	4,582,000	4,683,000	4,789,000	4,902,000

Panel B

	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21
Total employment	11.2	11.0	10.8	10.7	10.6	11.0	10.9	10.8	10.6	10.5	10.3
Private nonfarm employment	9.9	9.7	9.5	9.4	9.3	9.7	9.6	9.5	9.3	9.2	9.0
Output ($)	2,312,000	2,349,000	2,396,000	2,450,000	2,510,000	2,696,000	2,779,000	2,849,000	2,914,000	2,975,000	3,034,000
Value-added ($)	1,402,000	1,422,000	1,446,000	1,473,000	1,503,000	1,607,000	1,649,000	1,684,000	1,714,000	1,743,000	1,770,000
Personal income ($)	5,019,000	5,141,000	5,266,000	5,395,000	5,527,000	5,902,000	6,041,000	6,187,000	6,334,000	6,484,000	6,635,000

Panel C

	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	2025–2054	2025–2054
Total employment	10.1	10.0	9.8	9.7	9.6	9.4	9.3	9.2	9.0	11.9	Average
Private nonfarm employment	8.9	8.7	8.6	8.5	8.4	8.2	8.1	8.0	7.9	10.6	Average
Output ($)	3,095,000	3,158,000	3,221,000	3,288,000	3,358,000	3,429,000	3,503,000	3,579,000	3,659,000	85,836,000	Total
Value-added ($)	1,798,000	1,826,000	1,855,000	1,885,000	1,916,000	1,948,000	1,981,000	2,015,000	2,050,000	50,410,000	Total
Personal income ($)	6,791,000	6,950,000	7,113,000	7,281,000	7,452,000	7,628,000	7,810,000	7,997,000	8,190,000	177,386,000	Total

APPENDIX TABLE 4: PERSONAL PROPERTY TAXES

Panel A

	Build out	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Total employment	0	60.5	49.8	46.2	42.2	36.1	30.2	26.6	23.3	20.4	17.7
Private nonfarm employment	0	33.3	26.8	24.8	22.3	18.8	15.3	13.3	11.5	9.9	8.4
Output ($)	0	7,987,700	7,279,900	6,975,400	6,602,200	5,866,700	5,078,000	4,606,600	4,167,100	3,756,400	3,358,600
Value-added ($)	0	5,043,200	4,566,000	4,374,200	4,144,100	3,694,500	3,210,300	2,923,200	2,651,900	2,396,300	2,146,100
Personal income ($)	0	2,180,700	1,917,800	2,009,000	2,059,000	2,007,900	1,938,200	1,939,500	1,922,800	1,901,200	1,870,900

Panel B

	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21
Total employment	16.9	16.2	15.6	15.0	14.5	14.2	13.9	13.6	13.2	12.9	12.6
Private nonfarm employment	8.1	7.8	7.5	7.3	7.1	7.0	6.8	6.7	6.5	6.4	6.2
Output ($)	3,294,200	3,262,300	3,242,100	3,227,200	3,229,100	3,260,200	3,292,300	3,323,600	3,353,300	3,381,900	3,406,000
Value-added ($)	2,103,800	2,078,600	2,058,300	2,039,400	2,031,000	2,041,400	2,052,200	2,062,400	2,071,200	2,079,000	2,084,100
Personal income ($)	1,920,400	1,965,900	2,011,800	2,056,400	2,104,800	2,160,900	2,217,100	2,274,100	2,330,600	2,387,900	2,443,800

Panel C

	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	2025–2054	2025–2054
Total employment	12.3	12.0	11.7	11.4	11.1	10.8	10.6	10.3	10.0	20.4	Average
Private nonfarm employment	6.1	6.0	5.8	5.7	5.5	5.4	5.3	5.2	5.0	10.4	Average
Output ($)	3,430,100	3,453,300	3,476,300	3,499,300	3,524,000	3,548,400	3,573,700	3,600,000	3,628,000	123,683,900	Total
Value-added ($)	2,089,200	2,093,600	2,097,900	2,102,000	2,107,100	2,112,000	2,117,200	2,123,000	2,129,500	76,822,700	Total
Personal income ($)	2,502,400	2,562,200	2,624,000	2,688,200	2,753,100	2,820,100	2,889,500	2,961,300	3,036,700	68,458,200	Total

Appendix Tables for the State of Michigan

APPENDIX TABLE 5: TOTAL

Panel A

	Build out	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Total employment	1,791	166	140	130	117	105	94	85	80	73	69
Private nonfarm employment	1,656	134	112	103	91	82	74	66	63	58	55
Output ($)	247,838,000	25,792,700	24,755,500	23,847,300	22,330,000	20,655,100	19,114,800	17,644,700	16,996,000	16,085,800	15,640,200
Value-added ($)	168,015,000	15,125,900	14,494,300	14,008,700	13,177,600	12,219,000	11,314,800	10,472,500	10,082,900	9,541,500	9,259,500
Personal income ($)	137,344,000	14,535,000	12,707,300	12,803,800	12,588,400	12,222,500	11,883,800	11,547,300	11,461,400	11,233,800	11,188,000

Panel B

	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21
Total employment	69	69	66	66	66	69	68	68	66	66	65
Private nonfarm employment	55	55	54	54	54	57	56	56	55	55	54
Output ($)	15,947,700	16,344,900	16,393,600	16,899,700	17,482,700	18,753,000	19,150,800	19,827,500	19,960,900	20,578,100	20,846,100
Value-added ($)	9,401,100	9,603,700	9,600,700	9,849,500	10,142,200	10,795,900	10,977,200	11,314,200	11,345,900	11,639,900	11,739,300
Personal income ($)	11,405,800	11,678,000	11,815,100	12,144,600	12,516,500	13,317,500	13,621,400	14,065,600	14,294,000	14,722,800	15,010,000

Panel C

	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	2025–2054	
Total employment	64	63	62	61	61	60	59	59	58	78	Average
Private nonfarm employment	53	53	52	51	51	50	50	49	49	63	Average
Output ($)	21,158,200	21,567,600	21,920,700	22,320,600	22,777,400	23,236,700	23,727,500	24,251,000	24,804,400	610,811,200	Total
Value-added ($)	11,862,600	12,035,800	12,178,300	12,343,900	12,538,800	12,734,300	12,942,900	13,168,400	13,406,200	349,317,500	Total
Personal income ($)	15,335,300	15,701,800	16,060,200	16,450,900	16,866,300	17,297,000	17,754,100	18,240,600	18,760,300	419,229,100	Total

APPENDIX TABLE 6: OPERATIONS

Panel A

	Build out	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Total employment	0	43	38	34	30	29	30	29	31	30	31
Private nonfarm employment	0	42	36	32	28	27	28	27	29	28	28
Output ($)	0	7,241,000	7,202,600	6,691,900	6,159,800	6,144,400	6,502,800	6,413,100	6,915,900	6,954,400	7,298,600
Value-added ($)	0	4,012,700	4,026,300	3,756,500	3,476,500	3,477,500	3,682,500	3,640,300	3,928,000	3,951,200	4,146,400
Personal income ($)	0	2,806,300	2,752,500	2,652,800	2,535,400	2,601,600	2,797,600	2,829,800	3,083,600	3,139,600	3,332,100

Panel B

	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21
Total employment	32	33	32	32	33	35	35	35	34	35	34
Private nonfarm employment	30	30	29	30	31	33	32	33	31	32	32
Output ($)	7,791,500	8,212,600	8,195,500	8,588,500	9,012,600	9,857,800	10,024,500	10,524,900	10,518,600	11,031,200	11,230,100
Value-added ($)	4,405,300	4,636,100	4,616,400	4,823,100	5,048,200	5,479,500	5,552,000	5,810,800	5,788,700	6,047,900	6,132,200
Personal income ($)	3,554,400	3,775,100	3,823,300	4,040,200	4,271,700	4,637,600	4,761,300	5,035,500	5,105,400	5,384,900	5,532,200

APPENDIX TABLE 6: OPERATIONS (CONT.)

Panel C

	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	2025–2054	
Total employment	34	34	34	34	34	34	34	34	33	33	Average
Private nonfarm employment	31	32	31	31	31	31	31	31	31	31	Average
Output ($)	11,473,100	11,810,300	12,085,400	12,390,300	12,729,400	13,062,300	13,412,800	13,782,000	14,162,400	287,420,300	Total
Value-added ($)	6,240,400	6,398,200	6,520,400	6,657,900	6,812,700	6,962,300	7,119,700	7,285,400	7,455,700	157,890,800	Total
Personal income ($)	5,708,900	5,921,600	6,114,200	6,324,700	6,549,200	6,775,900	7,015,600	7,267,300	7,532,600	137,662,900	Total

APPENDIX TABLE 7: LEASES

Panel A

	Build out	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Total employment	0	40.104	31.369	29.768	27.045	24.623	22.151	20.125	18.703	17.677	16.95
Private nonfarm employment	0	38.3	29.268	27.533	24.813	22.454	20.08	18.157	16.822	15.863	15.188
Output ($)	0	6,558,000	5,812,000	5,650,000	5,313,000	4,971,000	4,592,000	4,272,000	4,058,000	3,929,000	3,870,000
Value-added ($)	0	3,788,000	3,360,000	3,283,000	3,105,000	2,920,000	2,709,000	2,530,000	2,410,000	2,337,000	2,303,000
Personal income ($)	0	6,859,000	5,211,000	5,289,000	5,280,000	5,246,000	5,202,000	5,171,000	5,163,000	5,181,000	5,224,000

Panel B

	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21
Total employment	16.448	16.085	15.804	15.565	15.357	16.016	15.863	15.64	15.356	15.036	14.696
Private nonfarm employment	14.724	14.389	14.13	13.91	13.72	14.363	14.211	13.997	13.73	13.434	13.121
Output ($)	3,869,000	3,908,000	3,975,000	4,059,000	4,156,000	4,481,000	4,625,000	4,731,000	4,820,000	4,893,000	4,957,000
Value-added ($)	2,300,000	2,318,000	2,349,000	2,389,000	2,435,000	2,613,000	2,684,000	2,734,000	2,772,000	2,802,000	2,826,000
Personal income ($)	5,288,000	5,368,000	5,459,000	5,559,000	5,667,000	6,050,000	6,181,000	6,304,000	6,423,000	6,539,000	6,653,000

Panel C

	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	2025–2054	
Total employment	14.372	14.078	13.802	13.552	13.312	13.082	12.869	12.665	12.478	18.0	Average
Private nonfarm employment	12.826	12.559	12.312	12.088	11.876	11.674	11.486	11.308	11.145	16.3	Average
Output ($)	5,023,000	5,094,000	5,168,000	5,253,000	5,347,000	5,446,000	5,553,000	5,667,000	5,791,000	145,841,000	Total
Value-added ($)	2,852,000	2,879,000	2,909,000	2,943,000	2,982,000	3,024,000	3,069,000	3,118,000	3,171,000	83,914,000	Total
Personal income ($)	6,772,000	6,895,000	7,024,000	7,161,000	7,303,000	7,453,000	7,611,000	7,778,000	7,955,000	185,269,000	Total

APPENDIX TABLE 8: PERSONAL PROPERTY TAXES

Panel A

	Build out	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Total employment	0	82	71	66	60	51	41	35	30	26	22
Private nonfarm employment	0	54	46	43	39	32	25	21	17	14	12
Output ($)	0	11,993,700	11,740,900	11,505,400	10,857,200	9,539,700	8,020,000	6,959,600	6,022,100	5,202,400	4,471,600
Value-added ($)	0	7,325,200	7,108,000	6,969,200	6,596,100	5,821,500	4,923,300	4,302,200	3,744,900	3,253,300	2,810,100
Personal income ($)	0	4,869,700	4,743,800	4,862,000	4,773,000	4,374,900	3,884,200	3,546,500	3,214,800	2,913,200	2,631,900

Panel B

	Year 11	Year 12	Year 13	Year 14	Year 15	Year 16	Year 17	Year 18	Year 19	Year 20	Year 21
Total employment	20	20	19	18	18	18	17	17	17	16	16
Private nonfarm employment	11	11	10	10	10	10	10	10	10	9	9
Output ($)	4,287,200	4,224,300	4,223,100	4,252,200	4,314,100	4,414,200	4,501,300	4,571,600	4,622,300	4,653,900	4,659,000
Value-added ($)	2,695,800	2,649,600	2,635,300	2,637,400	2,659,000	2,703,400	2,741,200	2,769,400	2,785,200	2,790,000	2,781,100
Personal income ($)	2,563,400	2,534,900	2,532,800	2,545,400	2,577,800	2,629,900	2,679,100	2,726,100	2,765,600	2,798,900	2,824,800

Panel C

	Year 22	Year 23	Year 24	Year 25	Year 26	Year 27	Year 28	Year 29	Year 30	2025–2054	
Total employment	15	15	14	14	13	13	13	12	12	27	Average
Private nonfarm employment	9	8	8	8	8	8	7	7	7	16	Average
Output ($)	4,662,100	4,663,300	4,667,300	4,677,300	4,701,000	4,728,400	4,761,700	4,802,000	4,851,000	177,549,900	Total
Value-added ($)	2,770,200	2,758,600	2,748,900	2,743,000	2,744,100	2,748,000	2,754,200	2,765,000	2,779,500	107,512,700	Total
Personal income ($)	2,854,400	2,885,200	2,922,000	2,965,200	3,014,100	3,068,100	3,127,500	3,195,300	3,272,700	96,297,200	Total

About the Upjohn Institute

The W.E. Upjohn Unemployment Trustee Corporation was incorporated on October 24, 1932, as a Michigan 501(c)(3) nonprofit corporation, and is doing business as the W.E. Upjohn Institute for Employment Research. The W.E. Upjohn Institute for Employment Research has been conducting economic research and consultation for 75 years, since its founding in 1945.

The Upjohn Institute is governed by a Board of Trustees, which employs a President who is responsible for the overall operation of the Institute. The President of the Upjohn Institute is Dr. Michael Horrigan.

The Upjohn Institute currently employs 104 individuals. Upjohn's research and consultation program is conducted by a resident staff of professional social scientists, 12 of whom are Ph.D.-level economists (senior staff). Senior staff is supported by a staff of research analysts and additional support staff. Upjohn also administers the federal and state employment programs for its four-county area through the local Workforce Investment Board. Upjohn also publishes books on economic development, workforce development, and other employment-related topics.

The Ph.D.-level economists have more than 175 years of collective experience, conducting research on a broad variety of economic and employment topics. Their experience includes, but is not limited to, employment program evaluation, labor market dynamics, labor- management relations, employment and training programs, economic and workforce development, income replacement policy, worker adjustment, the role of education in labor markets, employment and compensation, disability, international comparison of labor adjustment policies, site selection experience, and state, regional, and local economic analysis.

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