# Evidence Based Economic Impacts for a Wind Farm Project: Developing Estimates Using Construction and Lifecycle Data

REMI Webinar

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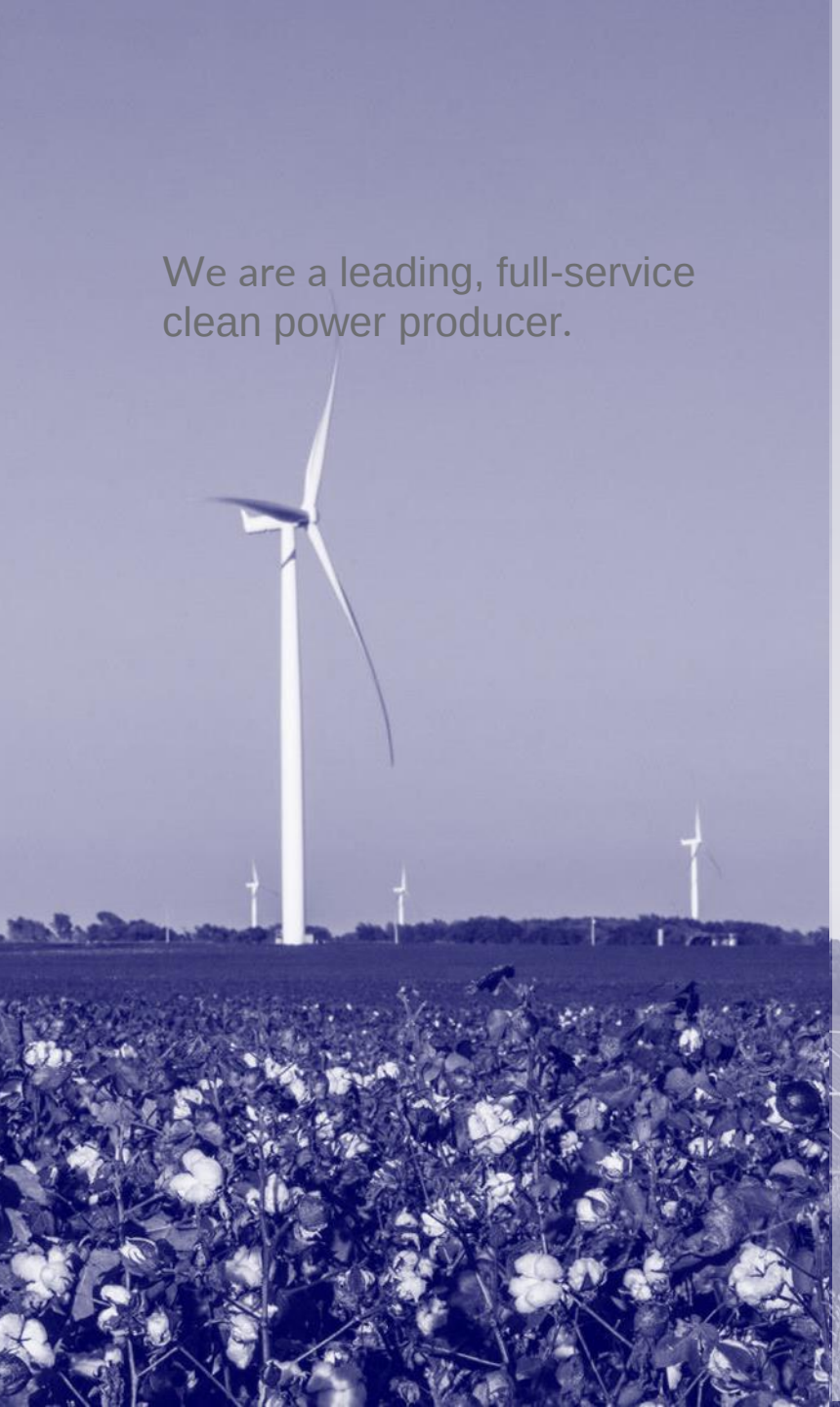
Accelerating the Shift
to Clean Energy
APEX
CLEAN ENERGY

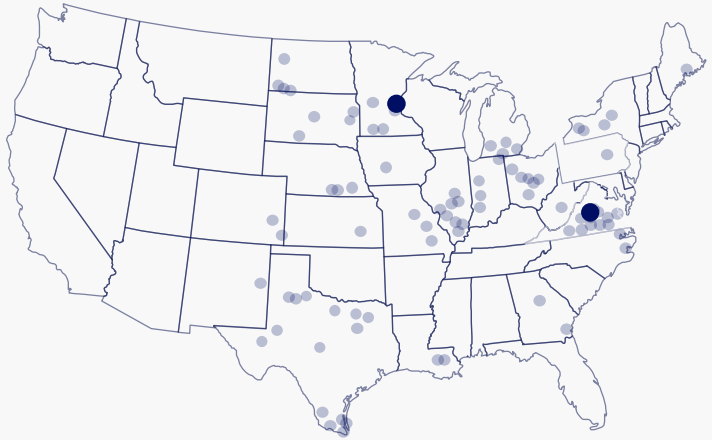
# We are Apex.

We are a leading, full-service clean power producer.



We provide clean energy solutions of all types and sizes: utility-scale wind and solar, battery storage, distributed energy resources, and green fuels.

We are headquartered in Charlottesville and supported by a national presence. Apex's 300+ clean energy professionals are capable of managing every aspect of the project life cycle.



We develop, construct, and operate clean energy assets across North America.

APEX CLEAN ENERGY

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# Apex Is a Clean Energy Company

- Apex is leading the renewable energy transition across the United States


clean energy development portfolio, the largest in the United States


of commercialized production capacity across more than 30 financed projects


tons of $CO_2$ displaced over the lifetime of built projects


of utility-scale projects completed, in construction, or financed


of assets that we operate and manage


acres under lease, an area larger than of the state of Rhode Island



Robey Analytics

# About the project: Montcalm Wind

- Located in various sites in Montcalm County
  - Estimated that more than 400 families will be involved
- Initial project discussions began pre-pandemic in 2019
- Apex Clean Energy
  - Project developer
  - Source of data for inputs
- A 31-year project timeline*
  - Year 1: Construction
  - Years 2 through 31: Operations

* The easement agreement includes two potential 10-year extension options for a total of up to 50-years of operations.

# Estimating economic impacts

- Utilized a REMI (www.REMI.com) model for *estimating* economic impacts
- The model is multi-regional and was custom designed for this project
- Customization allowed for inputs and outputs to be used and estimated for
  - Montcalm County
  - The rest of Michigan: a combination of data for the other 82 counties in the state
  - All of Michigan's 83 counties combined
  - The rest of the United States

# Why REMI?

- The lead researcher has more than 26 years modeling with REMI and estimating economic impacts across a spectrum of activities
- See more about REMI at www.REMI.com
  - Used by consulting firms, state and federal governments, and economic development organizations as well as MEDC and University of Michigan
- Upjohn started the project and currently owns the model (version 2.4.3)
  - Reduced costs to the MEA
- Alternatives were less robust:
  - RIMS II
  - IMPLAN
  - National Renewable Energy Labs (NREL) JEDI model
    - Custom designed for creating these types of estimates
    - Free (https://www.nrel.gov/analysis/jedi/)

# Why REMI (continued)?

- Has the ability to forecast impacts through 2060
  - Optimal for a 31-year event horizon such as the Montcalm County Wind Farm
- Is a dynamic model
  - As “shocks” or changes in regions occur, demand for workers, industries, occupations, and associated prices also change
  - Uses a “trade flow” approach that does not assume that supply chains are static
  - Uses an iterative approach to estimating impacts
    - While based on an underlying input/output model, the estimates are created using interactive equations based on regional conditions
  - Establishing a baseline forecast for the economies
    - National economy
    - Regional economies

# Apex Clean Energy

- Apex was instrumental in estimating the impacts of the project on Montcalm County and the state of Michigan
- It provided evidence-based proformas
  - Apex had recently completed a similar project in Isabella County
- Working with Apex and using evidence-based proformas created more accurate estimates
- The proformas included estimates of
  - Construction costs, including distribution of supply chain and labor (Year 1)
  - Operations and maintenance costs (Years 2 through 31)
  - Payments to community partners (Years 2 through 31)
  - Payments to local and state units of governments (Years 2 through 31)
- The proformas were used at face value
  - Significant dialogue with Apex partners on
    - Use of the expenditures
    - Where those expenditures would be *likely* to occur

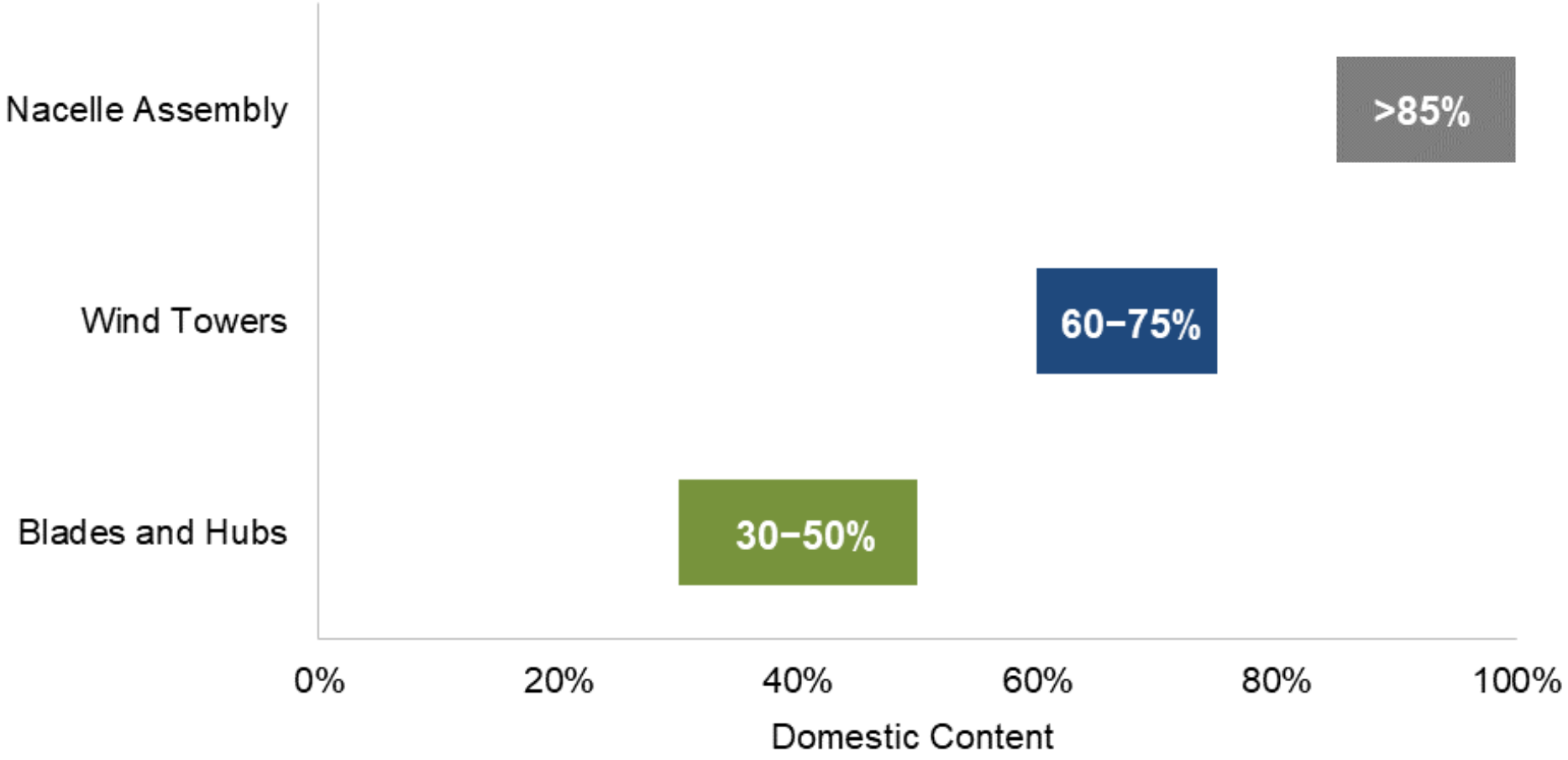
# Inputs: Construction

- Project:
  - 375 Megawatts (MW)
    - 75 units
    - 5MW each
  - *Current (2022)* project cost estimate: $463 million
- Project impacts and returns are estimated for a single year
  - REMI is an annual model
  - It is acknowledged that
    - Some soft costs included will occur in prior periods
    - Actual construction could occur in up to an 18-month period
    - Actual costs could change from current estimates
      - Mostly on the materials side (at least that is what was thought at the beginning)

# Inputs: Construction (continued)

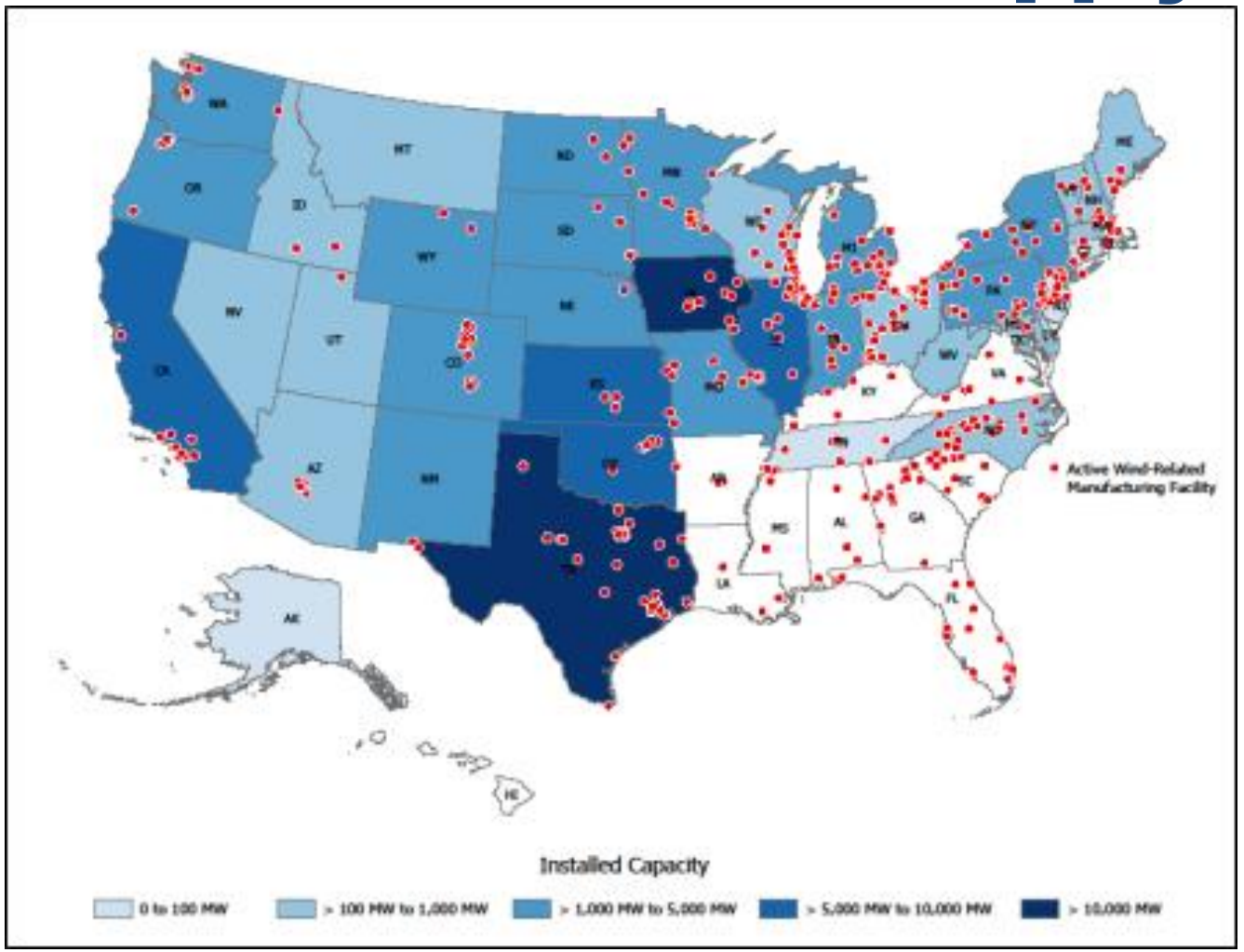
- Based on Isabella County project, inputs were allocated to
  - Montcalm County
  - Rest of Michigan
  - Rest of the United States (noting that some materials may come from outside of the country
- REMI has regional purchase coefficients (RPCs) that account for imports into a region, including the national or macro economy
- Inputs into the rest of the domestic economy may have economic impacts to both Montcalm County as well as the rest of the state

# Domestic supply chain




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

# Establishment-based supply chain




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

# Operations and maintenance

- Years 2 through 31
- Estimated operations and maintenance expenditures
  - Event horizon: $115 million
  - Annualized average: $3.8 million
- Caveats
  - Dollars are in nominal values
  - Annual costs are “bumpy” and will vary year-over-year; time based on the maintenance schedule
  - The maintenance schedule and associated costs will be dependent on the actual equipment chosen at time of construction for the project

# Payments to leaseholders and others

- Years 2 through 31
- Estimated expenditures distributed to over 400 families in Montcalm County
  - Event horizon: $118 million
  - Annualized average: just under $4 million
- Caveats
  - Dollars are in nominal values
  - Actual expenditures will be based on project locations
  - Payments were treated as income rather than windfall profits

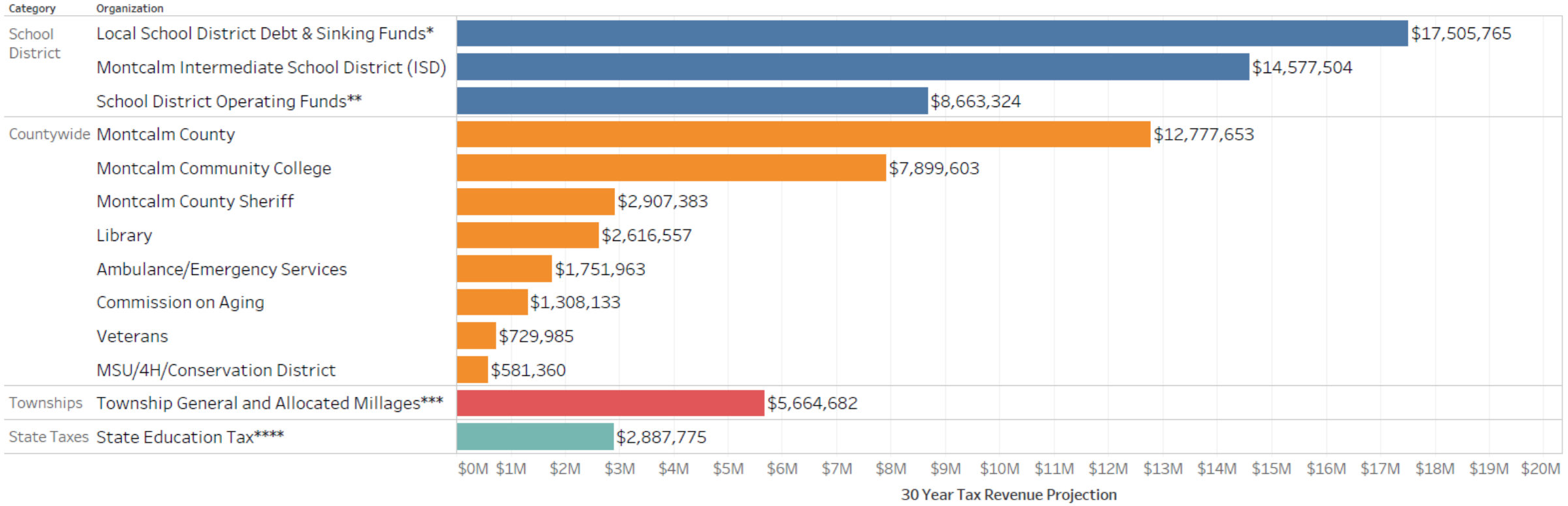
# Payments to units of government

- Years 2 through 31
- Estimated expenditures distributed to local and state governments
  - Event horizon: $80 million
  - Annualized average: about $2.66 million
  - Based in change in personal property tax in the county due to the project

- Caveats
  - Dollars are in nominal values
  - Estimated  expenditures: Average rate for townships was utilized as specific site locations are still under development
  - Proformas assume a steady state for sources and millages, increasing or decreasing rates as well as the sunsetting of or additions to the tax collections would affect the total economic impact
  - Payments are based on current depreciation schedules

# Payments to units of governments: $80 million

## Total Property Taxes Paid By Montcalm Wind




* 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).

# Investment summary

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.

| Input Use | Time Span | Amount (mil$) |
|---|---|---|
| Construction | Year 1 | $463 |
| Operations & maintenance | Years 2 to 31 | $115 |
| Payments to leaseholders | Years 2 to 31 | $118 |
| Payments to units of governments | Years 2 to 31 | $80 |
| Totals | Years 1 to 31 | $776 |

# Economic impact measures

- **Jobs**
  - 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 reported as:
    - Total: all jobs in all industries in the economy
    - Private non-farm excludes
      - Farm-based employment
      - Public sector employment including all publicly-provided education such as K-12 and community and four-year colleges
  - 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.

# Economic impact measures

- **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.

- **Gross Domestic Product**
  - Gross domestic product 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).

# Montcalm County economic impact estimates: Construction

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

# Montcalm County economic impact estimates: Construction

| Measure | 2024 |
|---|---|
| Direct | 690 |
| Indirect (supplier chain) | 33 |
| Induced (households) | 153 |
| | |
| Total | 876 |

# Montcalm County economic impact estimates: Operations and maintenance

| Measure | Years 2 through 31 | Horizon |
|---|---|---|
| Total employment | 15.5 | Annual Average |
| Private non-farm employment | 14.3 | Annual Average |
| Output | $111,820,300 | 30-year Total |
| Value-added | $59,910,800 | 30-year Total |
| Personal income | $53,693,900 | 30-year Total |

# Montcalm County economic impact estimates: Payments to families

| Measure | Years 2 through 31 | Horizon |
|---|---|---|
| Total employment | 11.9 | Annual Average |
| Private non-farm employment | 10.6 | Annual Average |
| Output | $85,836,000 | 30-year Total |
| Value-added | $50,410,000 | 30-year Total |
| Personal income | $177,386,000 | 30-year Total |

# Impacts from outside of the study

- University of Michigan: Sarah Mills
  - https://seas.umich.edu/research/faculty/sarah-mills
  - Dissertation research on wind energy in Michigan (2015)
    - *Farming the Wind: The Impact of Wind Energy on Farming*
- Survey-based findings found 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."
    - $41,970 in improvements to their homes, versus $26,897 for those without turbines
    - $72,780 in investments in outbuildings for those with turbines and $36,521 for those without turbines
    - $279,539 on new or used farm equipment versus $125,027 for those without turbines
  - "are more likely to believe their land will be farmed in the future"
  - "are more likely to have a succession plan in place"

# Montcalm County economic impact estimates: Payments to units of governments

| Measure | Years 2 through 31 | Horizon |
|---|---|---|
| Total employment | 20.4 | Annual Average |
| Private non-farm employment | 10.4 | Annual Average |
| Output | $123,683,900 | 30-year Total |
| Value-added | $76,822,700 | 30-year Total |
| Personal income | $68,458,200 | 30-year Total |

# Montcalm County economic impact estimates: Summary years 1 to 31

| Measure | Year 1 | Years 2 through 31 | Project totals |
|---|---|---|---|
| Total employment | 876 | 47.8 | N/A |
| Private non-farm employment | 813 | 35.4 | N/A |
| 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

- The data supplied for use in the REMI by Apex Clean Energy was evidence-based and from a recent project in Michigan in nearby Isabella County
- The data supplied by Apex provide a more accurate set of *estimates* but do not necessarily bias the results in either a positive or negative direction
- The REMI model is state-of-the-art and the best model for creating economic impact estimates over a long-event horizon
- "But for" the investment in the wind farm, most of the new economic activity in Montcalm County would not be likely to occur
- The impacts on Montcalm County for the 31-year event horizon are estimated to be
  - Output: $454.2 million
  - Value-added: $265.0 million
  - Personal income: $346.8 million
- Full report: https://research.upjohn.org/reports/274/

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