Produced in partnership with the Midwest Wind Energy Center and Windustry, with funding from the National Renewable Energy Laboratory and the US Department of Energy
The original version of this presentation was given at the Illinois Renewable Energy Conference on July 20, 2016. The purpose is to get a sense for the impacts of a large wind buildout in Illinois. This presentation has been modified from the original to reflect a change to the value used for the size of the wind buildout. The original version of this presentation used a value of 26,000 MW added to the Illinois wind fleet. This version uses the less ambitious value of 20,000 MW. The general conclusions are unchanged.
To evaluate the jobs and economic development impact (JEDI) of wind projects, NREL has developed a **JEDI model**, which is based on the standard and well-regarded IMPLAN model for such evaluations developed by economists primarily at the University of Minnesota.

The JEDI model provides estimates of the jobs and economic development **impacts of a project in a defined region**.
Illinois Wind Possible Future

- Illinois has huge untapped wind resources.
- The Wind Vision report (from the Department of Energy), envisages tapping a portion of that resource in the future, about 20,000 MW between now and 2030.
- What would be the economic impacts for Illinois if that should happen?
Measures Defined

- **Jobs** = full-time equivalents (FTE) for 1 year (2,080 hours)
- **Earnings** = total of labor income
- **Output** = the total value of all economic activity due to the project (sometimes called sales)
- **Value Added** = the value created above the value of the “external” inputs used
These are specific to Illinois. All results are what would be projected in IL only. Thus, the jobs, earnings, output, and value added outside of IL are not provided.

In what follows, only wind projects are modeled, not upgrades to the transmission system that would accompany the addition of large amounts of wind power. Such transmission system upgrades would add to the economic benefits calculated here.

The latest version of the JEDI model uses assumptions that are slightly outdated. The results that follow use more up-to-date values. The outdated values include:

- Overestimates of project costs and interest rates
- Underestimates of landowner payments and other operating costs
Two Representative Projects Modelled

- **Model Project 1**: A 100 MW project with updated assumptions adjusted to correct the identified outdated JEDI default assumptions; this project consists of 50 2-MW turbines.

- **Model Project 2**: Like Project 1 but sized to 200 MW (100 2-MW turbines).
## Project 1: 100 MW Summary Results

<table>
<thead>
<tr>
<th></th>
<th>Jobs</th>
<th>Earnings</th>
<th>Output</th>
<th>Value Added</th>
<th>Sales Taxes</th>
<th>Property Taxes</th>
<th>Land Lease Pymts</th>
</tr>
</thead>
<tbody>
<tr>
<td>During Construction</td>
<td>392</td>
<td>$26,990,000</td>
<td>$64,320,000</td>
<td>$37,750,000</td>
<td>$9,377,500</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yearly During Operating Years</td>
<td>21</td>
<td>$1,480,000</td>
<td>$4,240,000</td>
<td>$3,180,000</td>
<td>$161,850</td>
<td>$690,000</td>
<td>$400,000</td>
</tr>
<tr>
<td>Total over 20 Operating Years</td>
<td>820 Job-years</td>
<td>$56,610,000</td>
<td>$149,050,000</td>
<td>$101,320,000</td>
<td>$12,614,500</td>
<td>$13,800,000</td>
<td>$8,000,000</td>
</tr>
</tbody>
</table>

Capital Investment:  $177 million

NOTE: “Total over 20 Operating Years” also includes the benefits during the construction period.
Jobs Created by 100 MW Project

Total over 20 operating years = 820 Job-Years

Each Icon = 80 Job-Years
Job-Year = 1 job for 1 year
## Project 2: 200 MW Summary Results

<table>
<thead>
<tr>
<th>200 MW Project</th>
<th>Jobs</th>
<th>Earnings</th>
<th>Output</th>
<th>Value Added</th>
<th>Sales Taxes</th>
<th>Property Taxes</th>
<th>Land Lease Pymts</th>
</tr>
</thead>
<tbody>
<tr>
<td>During Construction</td>
<td>736</td>
<td>$50,690,000</td>
<td>$122,780,000</td>
<td>$71,380,000</td>
<td>$18,327,000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yearly During Operating Years</td>
<td>41</td>
<td>$2,770,000</td>
<td>$8,180,000</td>
<td>$6,110,000</td>
<td>$332,000</td>
<td>$1,380,000</td>
<td>$800,000</td>
</tr>
<tr>
<td>Total over 20 Operating Years</td>
<td>1,547 Job-years</td>
<td>$106,140,000</td>
<td>$286,360,000</td>
<td>$193,580,000</td>
<td>$24,960,000</td>
<td>$27,600,000</td>
<td>$16,000,000</td>
</tr>
</tbody>
</table>
Jobs Created by 200 MW Project

Total over 20 operating years = 1,547 Job-Years

Each Icon = 80 Job-Years
Job-Year = 1 job for 1 year
Scenario evaluated is a mixture of 100- and 200-MW projects: Eighty 100-MW projects and sixty 200-MW projects.

Results over 20 years for IL:

<table>
<thead>
<tr>
<th>Job-Years</th>
<th>Earnings</th>
<th>Output</th>
<th>Value Added</th>
</tr>
</thead>
<tbody>
<tr>
<td>158,441</td>
<td>$10,898,000,000</td>
<td>$29,105,000,000</td>
<td>$19,720,000,000</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Sales Taxes</th>
<th>Property Taxes</th>
<th>Land Lease Payments</th>
</tr>
</thead>
<tbody>
<tr>
<td>$2,507,000,000</td>
<td>$2,760,000,000</td>
<td>$1,600,000,000</td>
</tr>
</tbody>
</table>


Jobs Comparison

That is more than **190 times** as many jobs as illustrated for **Project 1**.

Each icon = 80 Job-Years

**158,441 Job-Years**
About the Jobs Created

- The jobs created by wind development tend to be **good-paying** jobs, with wages ranging from about $17.50/hour to over $43.50/hour. The study here uses typical field salaries for technicians averaging about $27.30/hour.

- Additionally, these **skilled** jobs are rewarding and relevant, diversifying Illinois’s economy and building a strong, sustainable future.
Illinois produces a lot of livestock, with hogs and cattle comprising most of it. In a recent year the total sales of livestock in Illinois was nearly $2.32 billion\(^1\). The average annual output of the wind development envisaged here, $1.455 billion, would be nearly 2/3 of that amount.

Moreover, the number of jobs involved in the livestock production was 9,123, while the average annual number of jobs created by the wind development would be 7,922, nearly 87% of the livestock number. Lastly, the value added by the livestock industry was $972 million, while the average annual value added by the wind development would be $986 million, exceeding that of the livestock industry by 1.4\%\(^2\).

\(^1\) Based on 2012 sales and adjusted for inflation.
\(^2\) All values for the livestock industry from the Illinois Agriculture Economic Contribution Study, 2015, by Decision Innovation.
Other Comparisons

- Chicago draws many tourists. The Chicago Park District, whose assets include Soldier Field (Bears), the great Chicago museums, parks, and harbors, estimated the direct and “incremental” tourist spending to its attractions in 2013 to be $1,098 million\(^1\). The average annual output from the wind development envisaged here, $1,455 million, exceeds this by 33%.

- The Chicago music scene is well-known and diverse, employing about 13,000 with a total earnings of about $357 million\(^2\). The average annual earnings from the wind development here, $545 million, exceeds this by over 50%.

- The entertainment industry as a whole in Illinois in a recent year was estimated to generate sales of $2,704 million\(^3\). The average annual output of the wind development explored here would be about 54% of that.

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\(^1\) [Link to NRPA presentation](https://www.nrpa.org/uploadedFiles/nrpaorg/Professional_Development/Innovation_Labs/Chicago_IL-Innovation-Lab-Slides.pdf)

\(^2\) University of Chicago study based on 2004 data, adjusted for inflation.

Lessons

- Even without factoring in the value of the positive environmental impacts, the favorable economic impacts of wind development in Illinois are considerable.

- This is perhaps most evident by comparing the value added to the output of these projects: almost 70% of the output of Illinois wind farms is value added – that is, it exceeds the cost of the inputs. In the livestock industry, the comparable figure from the 2015 Illinois Agriculture Economic Contribution Study was 42%.
Greenhouse Gas Impacts

- Unlike fossil-fuel-fired power plants, wind power provides electricity without producing greenhouse gases.
- Therefore, the greenhouse gas reduction benefit from wind power is equivalent to the emissions associated with the fossil fuel combustion that the wind power replaces.
- Because Illinois’ largest electricity source is nuclear (coal is second), the state’s power plants, as a whole, produce CO$_2$ at a relatively low rate. But Illinois still produces a large amount of CO$_2$ from coal-fired plants, 95 million short tons in 2013, at a rate of more than 2,000 lbs/MWh.
- Using a conservative estimate of 30% for capacity factor for Illinois wind and 1,500 lbs/MWh CO$_2$ reduction rate, this would mean that the envisaged wind buildout analyzed here, when completed, could reduce annual CO$_2$ emissions by more than 38 million short tons, which would be a reduction of about 40% from IL power plants.
The EPA has proposed a **Clean Power Plan (CPP)** for all states to reduce their CO\(_2\) emissions from their power plants.

- The goals for each state are given in three categories: a rate-based goal, expressed in lbs of CO\(_2\) emitted per MWh of electricity produced, and two mass-based goals, expressed in terms of total tons of CO\(_2\) emitted annually. A state is free to choose which goal it aims to achieve. The deadline to meet the final goal is 2030.

- For Illinois the rate-based goal is 1,245 lbs/MWh, while the 2012 baseline rate was 2,208 lbs/MWh, for a reduction from baseline of about 44%.

- The mass-based goal, excluding the “New Source Complement,” is 66,477,157 short tons, while the baseline 2012 total emission was 96,106,169 short tons, a reduction of nearly 31% (29,629,012 tons).

- The mass-based goal and New Source Complement is 67,199,174 short tons, a reduction of just over 30% (28,906,995 tons).

Just from the wind buildout considered here, IL would be expected to blow past the CPP’s CO\(_2\) reduction goals by **more than 30%**.
Cost to Consumers

Wind power is a **low-cost option**.

- In a conservatively plausible wind and financial environment, *(no production tax credit)* the values used for the 100-MW project here should be able to show a 10% return to private investors over 20 years, while selling electricity for **6.0 cents/kWh**, and that price will not increase over those 20 years\(^1\).

- For Illinois the average price for residential electricity in April 2016 was 12.78 cents/kWh, for commercial customers it was 8.67 cents/kWh, and for industrial customers it was 6.27 cents/kWh.\(^2\)
Wind power is a **win-win-win** option, with tremendous potential to benefit Illinois:

- **Economically**, in terms of jobs, value-added, taxes generated, landowner payments, etc.
- **Environmentally**, in terms of reducing greenhouse gas emissions on a large scale.
- **Cost-effectively**, in that a large wind buildout could actually be expected to save consumers money in the long run.
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