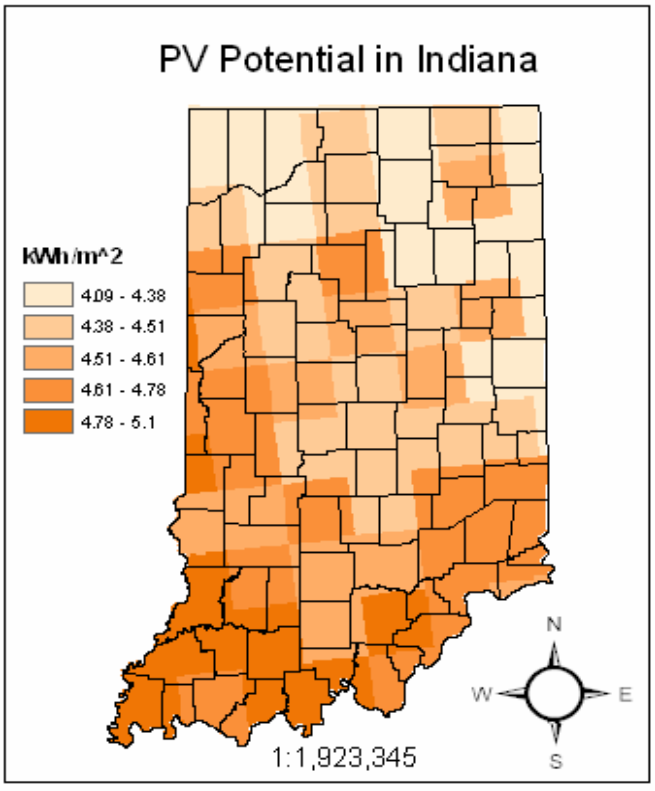
The Potential for Photovoltaic Electric Generation in Indiana

Why is Solar Energy a Good Energy Resource for Indiana?

- Solar energy in the form of photovoltaic electricity (PV).
  - Advantages: :
    - Free and abundant sunlight
    - Very low operation and maintenance costs
    - Minimal transmission losses
    - Incremental additivity
  - Disadvantages:
    - Sunlight fluctuates during the day and across seasons
    - High start-up costs.
- Indiana has high quality solar resources in several southern counties of Indiana,
- Three types of solar technologies are commercially viable in Indiana:
  - Crystalline silicon
  - Amorphous silicon
  - Concentrating solar power based cells

What Parts of Indiana Have Good Solar Resources?

- The darker hues on the map represent better solar resources for flat plate (crystalline and amorphous/thin –film modules).
- The lighter hues tend to indicate promising areas for wind and PV hybrid systems, since the solar resource is strongest in the summer and at midday while wind resources are higher during the winter months and at off peak times.



Data Source: (NREL)

Is Solar Energy Cost Competitive in Solar-Rich Areas of Indiana? [1]

- PV system costs, including installation, range from approximately $5/watt to$11/watt depending on the size of the system as well as the components used (The average household requires a 20kW to 30kW system to cover their electricity demand). Operation and maintenance costs are only between $0.005/kWh and $0.0063/kWh. Therefore, startup and operation costs over the lifetime of the system are equivalent to between $0.20/kWh and $0.50/kWh.
- By 2020 the energy cost is expected to be below $0.20/kWh.

- The PV roadmap, a framework outlining PV industry growth, holds as an objective, that by 2030, PV should provide for 10% of US peak production capacity. This increase in the domestic PV capacity is largely dependent on projections of increased grid tied applications.
- Presently, for residential applications it may be more affordable to install a PV system than to extend the utility grid 0.25 miles.

Does Indiana Have Solar Projects on the Ground?

- Utilities have not invested in any commercial-scale (megawatt-level) solar installations anywhere in the state.
- Utilities, homeowners and schools have, however, installed small-scale solar projects[13].
    - PV systems were installed at eight schools and at least six homes in 2003 and 2004. [1]
    - Merry Lea Environmental Learning Center at Goshen College has installed a 4.8 kW PV system.[2]
    - Duke Energy (formerly Cinergy) used the proceeds of its Green Power Program to pay for a 7.5 kW PV system in Bloomington, IN [3]
    - Indiana has a total capacity of 21.8 kW at several locations within the state."[14]

How do other Midwest States Fare in Solar Capacity?

- Chicago, IL has over 2 MW of solar installations —nearly 100 x Indiana's capacity. [4]
    - This success is in large part due to the cooperation of organized labor, local government and the private sector through the Chicago Solar Partnership.
    - Three Chicago ComEd-Excelon facilities alone have a combined PV capacity of 108kW.
- Other Midwest States Have a More Modest Solar Capacity:
    - Ohio: Oberlin College of Ohio has an installed rated PV production capacity of 145 kW. [5] Ohio has 163 PV projects totaling an installed PV capacity of 900 kW.[6]
    - Michigan: The Michigan Alternative and Renewable Energy Center (MAREC) has a 30 kW project which serves as a demonstration project, business incubator, and research and development center[7]. Michigan presently has over 475 kW of installed photovoltaic capacity.[8]
    - Wisconsin: The Urban Ecology Center in Milwaukee, is installing an almost 40 kW array of Kyocera panels. Wisconsin presently has well over 600 kW of installed PV capacity. [9]

Industry

- United Solar Ovonic (USO):

- [13] It is difficult to monitor the amount of installed PV capacity in a large area because projects are not necessarily recorded. Larger grid-tied projects often get a good deal of publicity, however many residential stand alone systems function in Indiana, but can not be easily recorded.

- [14] The solar schools program had an initial round of 23 installations in three states including Indiana. The next round has just been approved for another 22 installations.("Heliotronics Awarded Two Dozen School Solar Programs" August 28, 2006. www.heliotronics.com)

http://www.southbendtribune.com/

    - Two plants in Auburn Hills, MI; one plant alone is annually producing 28MW worth of thin-film solar cells,
    - By the end of 2007 (USO) may be producing 175 MW of generating capacity.[10]
- Hemlock Semiconductor of Hemlock, MI
    - Produces and sells semiconductor grade polycrystalline silicon. [11]
- First Solar
    - Has a thin film solar module plant in Ohio with an annual manufacturing capacity of 25 MW. [12]

Incentives for Photovoltaic Projects in Indiana

- Section 9006 of the Farm Bill is the Renewable Energy Systems and Energy Efficiency Improvements Program. It provides grants and loan guarantees to farmers, ranchers, rural small businesses, and electric cooperatives for renewable energy systems. The minimum grant amount is $2,500 and the maximum amount is $500,000 with a total of $11.5 million allocated to grants and another $11.5 million set aside for loan guarantees .[13]
- The President's Advanced Energy Initiative (DOE) has allotted $148 million towards the goal of making solar energy cost competitive by 2015 through advancing partnerships amongst industry, universities, national laboratories, states, and other public entities. [14]
- The Renewable Energy Production Incentive (REPI) provides financial incentive payments of $0.015/kWh to qualifying renewable energy generation facilities. [14]
- Green Power Purchasing/Aggregation Commercialization, Section 203 of the Federal Energy Policy Act of 2005, requires that the amount of renewable electrical energy used in federal buildings should not be less than 3% in FY 2007-2009, 5% in FY 2010-2012, and 7.5% in FY 2013. [14, 15]
- The Alternative Power and Energy (APE) Grant Program, administered by The Indiana Office of Energy and Defense Development, contributes up to $30,000 towards the installation and study of PV systems at businesses and institutions in Indiana. [1, 16]
- The Distributed Generation Grant Program provides up to $30,000 for commercial, industrial and governmental applications of PV technology. [1]
- The Indiana Nitrogen Oxides Control Rule intended to reduce nitrogen oxide emissions from fossil-fueled power plants also establishes a system of tradable emissions credits of which 2% will be set aside to create incentives for RE/EE projects. $2.1 million in incentives is estimated. [16, 17]
- Net Energy Credits, provided by the state government, allow PV facilities to sell excess energy to the utility. If generation exceeds 1000kWh/month, permission is necessary. [1]
- Net Metering in Indiana allows the owners of systems under 10kW to have excess electricity credited to their next monthly utility bill. [1]
- Green Pricing Programs allow consumers to purchase renewable energy and are available from many Indiana utilities. [1]

Bibliography:

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15. http://www.dsireusa.org/documents/Incentives/US01Ra2.htm
16. http://www.in.gov/energy/grants/pastawards.html
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Appendix 1: List of Indiana based Solar Energy Products and Services

East Central Indiana Wind and Solar*
Retail sales, installation
9005 East 1125 South
Fairmont, IN 46928
765-702-0231
http://www.eciwindandsolar.com
Send Email to East Central Indiana Wind and Solar

Home Energy
Installation & distribution systems
Leon Bontrager
10980 CR 32
Goshen, IN 46527
(574)536-9483
leonb@homenrg.net

Hurshton Alternative Power*
Retail sales, wholesale supplier
14701 Hurshtown Road
Grabill, IN 46741
260-438-5250
http://www.hurshtown.com
Send Email to Hurshtown Alternative Power

Morton Energy, LLC
Retail sales, design and installation
4620 Weaver Road
Evansville, IN 47711
812-490-3600
http://www.mortonenergy.com
Send Email to Morton Energy, LLC

Millenium Systems Inc.*
PV Retail Sales, Service
3784 N. Tillotson #116
Muncie, Indiana USA 47304
(765)285-9132

Saver*
Solar system retail sales, consulting, engineering design, project development services, financial services
350 Woodland Trail Drive, Indianapolis, Indiana USA 46239
317-465-8496

Solar Systems of Indiana
785 East Sample Road
Bloomington, IN 47408
United States
Home: (812) 336-2785

Xantrex
Elkhart, IN
1-408-987-6030
800.670.0707

*more detail can be found at
http://energy.sourceguides.com/businesses/byGeo/US/byP/solar/pvM/byS/IN/IN.shtml

- PV module costs reflect their efficiency. For example, a concentrator based cell use lenses to focus light on the cell surface, thus making these modules the most efficient, followed by monocrystalline (which requires growth from a single pure silicon atom), and then amorphous or thin film which have the largest range of applications considering durability, but are the least efficient. Efficiency ranges between 10 and over 20% for crystalline based cells, and potentially over 40% for concentrating photovoltaic modules. (State Utility Forecasting Group. "2006 Indiana Renewable Energy Resources Study" Purdue University. September 2006.)
- There are three main types of installations.
    - A stand-alone system is usually used in remote locations and requires a battery bank to store energy.

- A grid-tied system allows the system owner to sell excess energy to the local utility and to buy energy from the utility when the PV system is not providing for all of the owner's needs. This type of system does not function when the utility grid is down, such as in black outs.
- A grid interactive system functions like a grid-tied system, but can revert to a battery bank when the grid is down.

Solar Energy Technical Training Programs in the Midwest can be found at http://www.glrea.org/education/PSETT/wisconsin.php

(Source: www.dearborncounty.org/maps.html)