



## GREEN POWER ON THE UTILITY GRID

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The transition from fossil fuel generation to green power in the U.S. is moving slowly through the nation's highly complex legislative, regulatory and market-based electric utility structure. Forward-looking political leaders, regulators and utility owners recognize the inevitability of rising costs for both accessing conventional fuels and meeting tougher environmental standards. This factsheet briefly describes available renewable energy generation resources and the primary tools used to develop and promote green power in the North Central Region.

### **Renewable Energy Resources**

As of 2011, about 10 percent of total generation in the U.S. was green power, with hydropower providing about six percent of that. About 45 percent of the nation's electricity is currently generated by burning coal, about 24 percent by natural gas, and 19 percent by nuclear energy, although the generation mix in each state differs. Every state has some form of renewable energy available for development but their resources differ based on latitude, climate and topography.

In the USDA North Central Region, North and South Dakota, Kansas, Nebraska and western Minnesota and Iowa have substantial wind energy resources, with Iowa currently in second place nationally in wind power development. The entire region is also rich in bioenergy resources including animal manure from hogs and cattle; corn stover and other crop waste; energy crops such as corn and switch grass; and forestry resources. Solar energy is available in all states.

The primary green power resources currently in use in the North Central Region are wind, hydropower and bioenergy. The latter includes combustion of wood or biomass crops (often burned in combination with coal), and biogas technologies including harvesting methane from anaerobic digesters, wastewater treatment plants or landfills to generate power. The region has long relied on its well-developed hydropower resources. The region also uses its bioenergy resources for space heat and industrial processes, and exports biofuels such as ethanol and biodiesel nationally to power vehicles.

Table 1: Renewable Energy Production, by States in the USDA North Central Region<sup>1</sup>

STATE	Percent of green power in state generation mix	Percent of renewable energy source in green power mix (19% or greater)
IL	2	wind (77%), biomass waste (19%)
IN	2	wind (64%), hydro (23%)
IA	17	wind (87%)
KS	6	wind (99.5%)
MI	4	biomass waste (58%), hydro (34%)
MN	14	wind (67%), biomass waste (22%)
MO	3	hydro (76%), wind (21%)
NE	3	hydro (49%), wind (43%)
ND	13	wind (67%), hydro (33%)
OH	1	biomass waste (53%), wind (45%)
SD	59	hydro (91%)
WI	6	hydro (37%), biomass waste (35%), wind (28%)

**The government, the utilities, and renewable energy**

The structure of the electric utility industry in the U.S. is comprised of a complex division of responsibilities at the federal, state and local levels.

- Federal – The Federal government oversees the national transmission grid and determines environmental regulations that impact the industry.
- State – State legislatures pass legislation and make policy about energy, working more or less in tandem with their state regulatory commissions.
- Local – Local governments oversee installation permits, siting requirements and zoning ordinances.
- Investor-owned utilities are overseen by state regulatory commissions, and in some states, municipal and cooperative utilities are as well.
- Individual utilities also promote the development of green power within their state’s regulatory structure, based on their own vision and goals.

Even though it would appear that state governments are the drivers of green power regulation and policy, it was the federal Public Utility Regulatory Policies Act (PURPA) enacted in 1978 that requires utilities to allow small energy generation systems to be interconnected with the grid. This law laid the foundation for Renewable Portfolio Standards, interconnection standards, and net metering, the primary policy tools currently used by states to remove regulatory and other barriers to mainstream adoption of renewable energy.

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<sup>1</sup>Data derived from U.S. Energy Information Administration (EIA): <http://www.eia.gov/renewable/>

Table 2: Renewable Portfolio Goals and Net Metering limits, by States in the USDA North Central Region

STATE	Renewable Portfolio Goals and Standards	Net Metering kilowatt limits
IL	RPS: 25% by 2025	40*
IN	Goal: 15% by 2025	1000*
IA	RPS: 105 megawatts total	500*
KS	RPS: 20% by 2020	25/200*
MI	RPS: 10% and 1,100 megawatts by 2015	150*
MN	RPS: 25% by 2025	40
MO	RPS: 15% by 2021	100
NE	No goal or RPS	25
ND	Goal: 10% by 2015	100*
OH	RPS: 25% by 2025	No limit*
SD	Goal: 10% by 2015	none
WI	RPS: Varies by utility; ~10% by 2015	20/100*

\*State policy applies to certain utility types only.

\*\* RPS goals and standards are designed to encourage development of new renewable energy resources. Most states do not allow inclusion of existing hydropower resources to meet RPS requirements.

**Renewable Portfolio Standards (RPS):** Twenty-nine states have established legally binding requirements that regulated utilities meet a specified percentage of green power in their portfolio of generation resources by a certain date. Eight additional states have set official portfolio goals that are stated but not legally binding. Renewable portfolio standards are designed to promote new development of renewable energy resources and do not generally allow inclusion of existing hydropower generation in meeting the goals.

**Interconnection standards and guidelines:** For utility purposes, renewable energy systems are categorized as owner-sited or utility scale systems. System size is the important factor here because different regulations and procedures apply to small or large systems. For example, a 20- kilowatt wind turbine powering a rural home would be interconnected to the local distribution grid and guided by state standards, while a wind farm development comprised of numerous 2.5 megawatt turbines would connect to the national transmission grid, overseen by the Federal Energy Regulatory Commission standards.

Forty-three states have adopted interconnection policies as either guidelines or standards. These policies often set a system size limit and generally provide consistent statewide safety and scheduling rules for interconnecting systems, which also helps lower system installation costs. Once again, each state adopts policies in tune with its own energy and utility priorities.

**Net metering:** Forty three states have net metering policies in place.<sup>2</sup> Net metering allows electric customers who produce their own electric energy (i.e. solar panels) to sell excess power back to the electric grid. The law requires the utility to purchase the “net energy” at specific rates established by the state.

### **Financial incentives and utility customer programs**

Financial incentives for renewable energy installations have been made available by federal, state and local government programs, and by utilities to their customers in all sectors. Federal incentive programs have been the least comprehensive or consistent, but in recent years the USDA has provided grants to farms and rural businesses for energy efficiency and renewable energy projects.

**State government incentives** – State programs frequently focus on residential and small commercial or institutional projects, often in combination with energy efficiency programs. Incentives can be in the form of grants or loans, and programs are funded in a variety of ways by the state legislature.

**Public benefits funds** – Many states have funds called public benefits funds, which are supported through a small charge on utility bills of electric customers. Generally the funds promote energy efficiency and renewable energy and research. Renewable energy and energy efficient installations are generally provided in the form of rebates, grants and loans to the customers of participating utilities. Four states have established public benefits funds for renewable energy in the North Central Region: Minnesota, Wisconsin, Michigan and Illinois.

**Green power programs** – Some utilities offer their own incentive programs as special rates or grants to encourage customer adoption of grid-connected renewable energy systems. Many utilities offer green power purchasing programs where customers can choose to pay a premium for green power to their homes or businesses. These programs are generally subject to regulatory oversight, and might be part of agreements made as part of a rate case.

### **Market-based renewable energy development strategies**

One of the primary market-based renewable energy development strategies is the Renewable Energy Certificate (REC). RECs essentially serve as green power credits for utilities. If a utility has more than the required percentage of green power in its portfolio, it can sell its excess green power as Renewable Energy Certificates to other utilities that are short. By purchasing these certificates as credits, a utility will not have to purchase or generate green power itself to meet the portfolio standard. Issues surrounding RECs are still being debated within the industry.

Utilities wishing to build or own green power generating capacity have created a variety of partnerships with land or building owners to create utility scale systems. They have leased space both in farm fields to site wind turbines and on big box store rooftops for solar arrays. Utilities have partnered with farms to build anaerobic digesters for manure management, supplying the generator that operates on the methane produced. Some utilities have worked with communities to use urban forestry waste and other organic feedstock in co-firing generation plants (combining the biomass with coal), or for powering combined heat and power plants.

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<sup>2</sup> Database of State Incentives for Renewables and Efficiency (DSIRE)  
<http://www.dsireusa.org/solar/solarpolicyguide/?id=17>

**Buy Back Rates** - Another utility strategy is offering attractive buy-back rates (sometimes called feed in tariffs) for the power from dedicated customer-sited systems. This helps the system become economical for the owner and the utility gets the RECs for the power generated. Also, a utility might make a power purchase commitment to a renewable energy developer who then builds, manages and owns a generation facility such as a wind farm.

### **Primary roadblocks to development of the green power industry**

The greatest roadblocks to the green power transition are political, social and economic, not technological. Fossil fuels have driven the U.S. economy for almost two centuries and commitment to the fossil fuel industry from both major political parties remains high. Also, people are slow to change and to accept new technologies. These factors are reflected in energy economics as currently accounted. For example, conventional energy accounting does not include costs for environmental impacts of fossil fuel use as they have been regarded as unquantifiable. As environmental costs are better understood, and as the cost of renewable energy technologies goes down and the cost of fossil fuels rises, renewable energy sources are becoming more economical.

The greatest technological issue is the consistency of renewable energy generation as some sources cannot serve as the reliable, baseload power utilities need. The wind does not always blow nor does the sun shine. Possible solutions may lie in new energy storage technologies or in more refined applications of bioenergy.

There are roadblocks that apply to specific renewable energy sources currently used in the North Central Region:

- **Wind energy:** The primary roadblock for the wind industry is the continuous short term renewal of the federal Renewable Electricity Production Tax Credit for wind energy. This credit helps create parity for renewable energy with federal fossil energy subsidies. Political controversy prevents it from being renewed for more than one or two years at a time, which discourages major manufacturing investment in the U.S., keeping installation costs unnecessarily high. Other roadblocks occur locally or regionally, including local opposition by residents that can result in lawsuits, prohibitive siting requirements or moratoria on new projects, and transmission issues. Also, ongoing studies continue looking at wind turbine impact on birds and bats.
- **Solar energy:** The greatest roadblock for solar photovoltaics is the installation cost, and the second greatest is the space required to generate electricity at utility scale. Prices for solar electricity continue to drop as new technology and more efficient manufacturing processes are developed. Utilities and energy developers continue seeking available urban space for siting new systems as installation prices drop.
- **Anaerobic digestion:** Anaerobic digestion is a series of processes that naturally breakdown organic matter in the absence of oxygen. Anaerobic digesters are large, capital intensive and site specific in their design, making them most economical for large farming, food processing and wastewater treatment operations. As smaller and more flexible system designs are developed, smaller farms, seasonal food processors and other operations producing organic waste will find them to be an economical option.

- Biomass combustion and gasification: Biomass, forestry waste (forest residues from logging or chips from saw lumber production) and energy crops such as fast growing trees (hybrid poplar or willow) and perennial grasses can be combusted or gasified to create heat, electricity and gas. Primary challenges center on low fossil fuel prices and developing a reliable and sustainable supply of biomass for a given generation plant. There are currently local and regional agencies in the North Central Region addressing development of infrastructure for sustainable forestry practices and energy cropping methods in order to tap the rich bioenergy resources of the region.

### **General issues and challenges**

In addition to its environmental benefits, renewable energy has established itself as an effective economic development tool, particularly in rural areas where farmers can harvest wind and methane along with their other crops. Solar energy has the potential to provide a similar economic boost in urban environments. Renewable energy offers a range of system size and investment levels, opening up opportunities to a broader pool of investors.

Challenges to a national transition to renewable energy include an inconsistent commitment to funding or research at the federal government level. Also, state-level regulation and oversight of utilities means individual state governments vacillate on renewable energy depending on the politics of the current state administration. State legislatures might bow to pressure from utilities to weaken or delay updating existing laws. The importance of green power has recently dimmed somewhat in the public mind because of the global economic depression, the lack of capital and a precipitous drop in natural gas prices. Despite these barriers, the future of the renewable energy industry continues to grow and create new jobs.

### **RESOURCES**

1. DSIRE (Database of State Incentives for Renewables & Efficiency), funded by U.S. DOE and managed by the University of North Carolina Solar Center, offering a comprehensive listing of incentives and regulatory policies for each state along with summary maps and a useful glossary: <http://www.dsireusa.org/>
2. National renewable Energy Laboratory (NREL), National Wind Map  
[http://www.windpoweringamerica.gov/wind\\_maps\\_none.asp](http://www.windpoweringamerica.gov/wind_maps_none.asp)
3. National renewable Energy Laboratory (NREL) National solar resource maps  
<http://www.nrel.gov/gis/solar.html>
4. U.S EPA AgSTAR Program, providing information about methane production and use from animal manure: <http://www.epa.gov/agstar/>
5. U.S. Energy Information Administration, Renewable and Alternative Fuels, offering statistics and data about renewable energy in the U.S.: <http://www.eia.gov/renewable/>
6. Other internet search possibilities:
  - a. State electric utility regulatory commission web site
  - b. State and local organizations and non-profit advocates promoting renewable energy