Renewable Energy in the 50 States: Northeast Region

2014 Edition

American Council On Renewable Energy (ACORE)

About ACORE

ACORE, a 501(c)(3) non-profit membership organization, is dedicated to building a secure and prosperous America with clean, renewable energy. ACORE seeks to advance renewable energy through finance, policy, technology, and market development and is concentrating its member focus in 2014 on National Defense & Security, Power Generation & Infrastructure, and Transportation. Additional information is available at www.acore.org.

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Executive Summary

What's New in the Northeast in 2014:

- **EPA Clean Power Plan:** The Northeast Region has helped lead the reduction of carbon dioxide emissions in the U.S. over the past decade, driven by the Regional Greenhouse Gas Initiative (RGGI), the region's cap-and-trade program; its transition away from coal; and other factors such as urbanization. Notably, RGGI states have reduced emissions of CO_2 and other pollutants by 29% since the program launched in 2009, while electricity prices declined (Environment Northeast). This success heralds promise of positive results from U.S. Environmental Protection Agency's (EPA) proposed Clean Power Plan rule under section 111(d) of the Clean Air Act, issued June 2, 2014, which introduces state-by-state CO_2 reduction targets for existing electric power generating units that must be met by 2030.

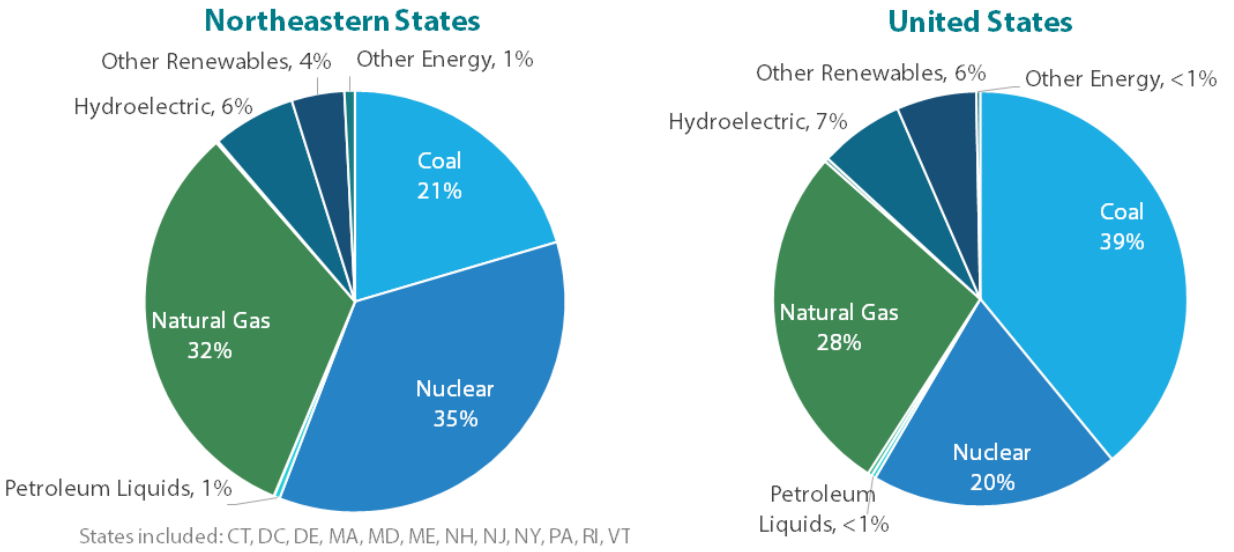
  The EPA plan would help drive the broader adoption of renewable energy in the Northeast. It supports the attainment of renewable generation targets set by state renewable portfolio standard (RPS) programs and may encourage some states to increase what they have planned. Additionally, EPA will allow states participating in RGGI to include their participation as part of their statewide or multi-state CO_2 reduction strategies. This may encourage other Northeastern states that are not presently members of RGGI to consider joining, which would be a boon for renewables. More than $700 million of RGGI proceeds have already been invested in renewable energy, energy efficiency, and other strategic energy programs since the program began.

- **Growth of Solar:** The Northeast added more than 800 MW of new, renewable energy capacity in 2013, mostly from solar power installations, with nearly $1 billion in asset finance, venture capital, and private equity investment. Massachusetts' solar market grew 76% in 2013 to rank fourth in the country for new installations, adding 237 MW of capacity. The state also launched the second phase of its solar renewable energy credit (SREC) program in early 2014 to achieve its goal of 1.6 GW of solar power. While New Jersey's solar market fell to fifth place for new installations in 2013, it jumped to second in the first quarter of 2014. New York rose to the ninth position for new solar installations in 2013, recently amending an incentive program for non-residential PV that should ease large-scale commercial developers' access to financing. Together, these states have been particularly instrumental in strengthening the country's commercial solar market (Solar Energy Industries Association).

- **State Policy Leadership:** While states across the U.S. have begun considering whether to limit or repeal their net metering policies, Vermont quadrupled its net metering cap in early 2014 with significant bipartisan support. New York's Green Bank and other renewable energy commitments – such as its $1 billion commitment to solar power through 2023 – continue to make it a national hub for renewable energy investment and deployment. Additionally, Connecticut lifted its three-year moratorium on large-scale wind energy projects in April 2014, providing an opportunity for the state to reach its full renewable energy generation potential.

With high electricity prices, a reliance on imported energy, and ongoing retirements of fossil-fueled power plants, the Northeast has strong incentives to develop local, renewable sources of energy. Aided by a well-established, supportive portfolio of policies in nearly every Northeastern state, the region ranks second in the nation for both cumulative solar power capacity and cumulative biomass power capacity. However, renewable energy capacity overall is lower than in the other regions profiled by ACORE's *Renewable Energy in the 50 States* report, with fewer large-scale renewable energy facilities such as wind farms.

ELECTRICITY GENERATION BY SOURCE, 2013



Source: EIA

An array of policies and incentive programs – including feed-in tariffs, renewable energy credits (RECs), green banks, and rebates – support the development of renewable power, heat, and fuels in the Northeast. A cooperative effort among nine states in the region, the Regional Greenhouse Gas Initiative (RGGI) aims to reduce regional greenhouse gas emissions and spur investment in renewable energy and energy efficiency. Importantly, New York's emergent $1 billion Green Bank relies in part on RGGI funding revenues. In addition, eleven of the twelve states[1] profiled in this report have binding renewable portfolio standards (RPS) to support continued market growth. Not to be overlooked, the twelfth state, Vermont, drives demand for renewables via a "feed-in tariff"-like standard contract program – the first statewide program of its kind in the country – and through a renewable portfolio goal.

Many Northeastern states have set targets for solar energy generation, which, coupled with financial incentives, are largely responsible for driving more solar power capacity in the Northeast than in the Midwest or the Southeast. In fact, ISO New England, the regional transmission organization serving six Northeastern states, anticipates distributed generation installations within its territory to increase from 250 MW in 2012 to 2 GW by the end of 2021, with generation forecast to be mostly solar power.[2]

The Northeast's wind power market has grown more slowly than other regions', but this fact could change soon. Coastal states in the region have identified immense offshore wind power potential, and developers are in the advanced stages of planning what would be the first offshore wind projects in the country.

To reduce reliance on expensive heating oil, some states, such as New Hampshire, have set goals for renewable thermal energy use. With the availability of wood waste from the forestry sector, homes in New England use wood for space heating, water heating, and cooking at nearly twice the national rate,[3] and growth in this sector is expected to continue.

Other renewable energy technologies also help to diversify the Northeast's energy portfolio. Most of the states in the region, especially New York, Massachusetts, and Maine, are major producers of biomass and waste energy,

[1] Including the District of Columbia
[2] http://www.renewgridmag.com/e107_plugins/content/content.php?content.10514
[3] http://www.eia.gov/forecasts/steo/report/winterfuels.cfm

using a number of available feedstocks such as municipal solid waste, wood, and landfill gas. While renewable liquid transportation fuel production is not as prevalent as in other regions, Pennsylvania, New York, and a few other states produce biodiesel and ethanol to reduce their reliance on petroleum. Hydropower has long been a major player in the Northeast's power market, imported to the region from Canada and produced at a large scale in Maine, New York, and other states.

Renewable energy is steadily becoming more cost competitive in the Northeast. In February 2014, Massachusetts approved 12 long-term power purchase agreements (PPAs) for wind power projects that have a weighted average price of less than $0.08 per kilowatt hour, below the price of most conventional sources, which will save residents about $853 million over the contracted projects' lifetimes. Likewise, if it doubles the amount of wind power it plans to build, the PJM Interconnection could actually reduce wholesale energy market prices and save nearly $7 million per year in the mid-2020s.[4]

Companies and institutions in the Northeast specialize in the research and innovation of renewable energy. Maine is home to the country's first tidal energy device to generate electricity for the power grid as well as its first working offshore wind turbine. A number of cleantech companies in Massachusetts are on the cutting edge of technology development, with about $291.6 million in venture capital and private equity investment raised for renewable energy in 2012-2013. New York has upped the regional ante with the formation of a Green Bank, designed to bring lower-cost capital into the renewable energy space. In addition, damage caused by Hurricane Sandy has motivated energy infrastructure development in the region; the New Jersey Transit System is now working with the U.S. Department of Energy to create one of the largest civilian microgrids, which would be able to operate when the central grid is compromised.

With RGGI, strong RPS programs, distributed generation incentives, innovative institutions, and efforts underway to build larger-scale renewable energy facilities, the future of renewable energy in the Northeast is bright.

NORTHEASTERN STATE INSTALLED CAPACITY RANKINGS, 2013

	Renewable Power (w/hydro)	Renewable Power (w/o hydro)	Renewable Fuels
1.	**New York***: 7,207 MW	**New York***: 2,551 MW	**Pennsylvania**: 221 mGy
2.	**Pennsylvania***: 2,996 MW	**Pennsylvania***: 2,213 MW	**New York**: 189 mGy
3.	**Maine***: 1,776 MW	**New Jersey***: 1,538 MW	**New Jersey**: 90 mGy
4.	**New Jersey***: 1,551 MW	**Maine***: 1,043 MW	**Connecticut**: 13 mGy
5.	**Massachusetts***: 1,312 MW	**Massachusetts***: 1,042 MW	**Maryland**: 8 mGy
6.	**Maryland***: 986 MW	**Maryland***: 435 MW	**New Hampshire**: 6 mGy
7.	**New Hampshire***: 810 MW	**New Hampshire***: 364 MW	**Delaware**: 5 mGy
8.	**Vermont**†**: 559 MW	**Connecticut***: 338 MW	**Maine**: 2 mGy
9.	**Connecticut***: 457 MW	**Vermont**†**: 244 MW	**Rhode Island**: 2 mGy
10.	**Delaware***: 66 MW	**Delaware***: 66 MW	**Massachusetts**: 1 mGy
11.	**Rhode Island***: 40 MW	**Rhode Island***: 37 MW	**District of Columbia**: 0 mGy
12.	**District of Columbia***: 7 MW	**District of Columbia***: 7 MW	**Vermont**: 0 mGy
	Total: 17,767 MW	**Total**: 9,878 MW	**Total**: 537 mGy

*=State has a renewable portfolio standard
†=State has a non-binding renewable portfolio goal
MW=megawatt; mGy=million gallons per year
Sources: See User's Guide

[4] The PJM interconnection is the world's largest competitive wholesale market and covers all or most of Delaware, D.C., Maryland, New Jersey, Ohio, Pennsylvania, Virginia, and West Virginia, as well as parts of Indiana, Illinois, Kentucky, Michigan, North Carolina, and Tennessee. http://www.acore.org/images/uploads/WindPowerPJM.pdf

Renewable Energy in Connecticut

Summary

An aggressive 27% renewable portfolio standard and state policies, such as tax incentives, grants, loans, and the nation's first-ever Green Bank, have led to an increase in Connecticut's renewable energy installations in recent years, particularly distributed solar generation. Additionally, the state lifted its three-year moratorium on large-scale wind energy projects in April 2014, providing an opportunity for the state to reach its full renewable energy generation potential.

Installed Renewable Energy Capacity, 2013			
Wind Power	0 MW	Marine Power	0 MW
Solar Photovoltaic	79 MW	Biomass & Waste	259 MW
Solar Thermal Electric	0 MW	Ethanol	0 mGy
Geothermal Power	0 MW	Biodiesel	13 mGy
Hydropower	119 MW	**Totals**	457 MW; 13 mGy

Sources: See User's Guide for details

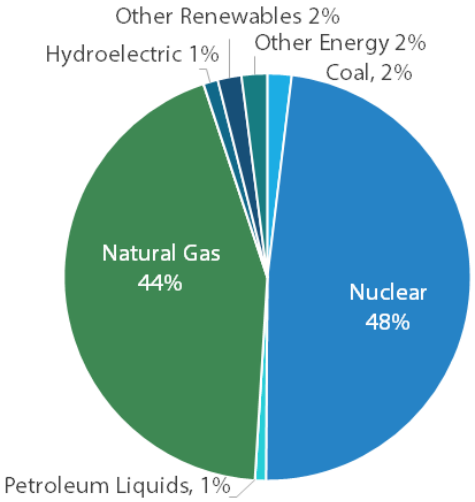
Market Spotlight

- A $225 million, 37.5 MW biomass project entered into commercial operation in December 2013 in Plainfield. The plant, which uses recycled wood waste to produce energy, is sited on 27 acres of former brownfield land. It is the largest wood energy facility in the state, powering the equivalent of 37,000 homes.
- A 5 MWac solar module system began commercial operations at the Somers Solar Center in Somers in November 2013. The system, the state's first utility-scale project, will produce enough electricity to power about 5,000 homes.
- The towns of Manchester and Canton recently expressed interest in developing their hydropower resources. Manchester approved a bid waiver in January 2014 allowing New England Hydropower Company to perform a feasibility study of an Archimedes Screw hydropower project at Union Pond Dam. In March 2014, Canton announced that it is seeking to redevelop two previously licensed small hydro facilities.
- In December 2013, what could be the first wind farm in the state qualified for the federal production tax credit.[5] The Coye Hill Wind Farm, located in the Union, would be a four turbine, 20 MW project, slated to be commissioned by 2015.

Economic Development

Employment	**2011**	
Green Goods & Services Jobs	43,722	
Investment (Grossed-up)	**2012**	**2013**
Asset Finance	$228m	$17.4m
Venture Capital & Private Equity	$0.2m	$0.6m

Sources: Bureau of Labor Statistics (BLS); Bloomberg New Energy Finance (BNEF). See User's Guide for details.



Electricity Generation, 2013 (EIA)

[5] Bloomberg New Energy Finance Desktop

Renewable Energy in Connecticut

State Policy

Renewable Portfolio Standard	▸ 27% by 2020
	  ○ Class I (20% by 2020): Solar, wind, fuel cells, geothermal, biogas, ocean, certain biomass, certain hydro, low-emission renewable energy conversion devices
	  ○ Class II (3% by 2010, Class I may also be used to meet requirement): Trash-to-energy, certain biomass, older run-of-river hydro
	  ○ Class III (4% by 2010): Certain combined heat and power (CHP), energy efficiency, waste heat
	▸ All electric suppliers and electric distribution company wholesale suppliers
	▸ Renewables in some neighboring states are also eligible
	▸ The Clean Energy Finance and Investment Authority must develop a residential solar incentive program that will result in at least 30 MW before 2023
	▸ Utilities must enter into long-term contracts for renewable energy credits (RECs) from zero-emission Class I facilities up to 1 MW and low-emission Class I facilities up to 2 MW

Net Metering	▸ Investor-owned utilities (IOUs) ▸ System capacity limit of 2 MW for standard net metering (Class I resources only), or 3 MW for virtual net metering (Class I or Class III resources) ▸ Net excess generation carried over to next bill as a kWh credit; paid to customer at end of 12 months at the avoided cost of wholesale power ▸ Customer owns RECs
Interconnection Standards	▸ IOUs; system capacity limit of 20 MW ▸ External disconnect switch required; insurance requirements vary by system size/type
Tax Incentives	**Sales and Use Tax Exemptions:** ▸ For the equipment and labor to install solar energy and geothermal resource systems ▸ For the equipment, machinery, and fuels used to manufacture solar electric, solar thermal, wind power, or geothermal systems **Property Tax Exemption:** For Class I systems and certain hydropower facilities that serve farms and residences limited to four units
Other Financial Incentives	**Residential Solar PV:** ▸ Expected Performance-Based Buydown: Lump-sum payment based on design characteristics of customer-owned systems 10 kW and under (max. incentive: $7,500) ▸ Performance-Based Incentive: Payment for actual performance of a third-party owned system over six years, paid to system owner **Solar Hot Water:** ▸ Grants and loans for customers of Connecticut Light & Power or The United Illuminating Company who install residential or commercial solar hot water systems ▸ For residential, incentives cover approximately 30% of an average system's cost **CT Solar Lease:** Allows homeowners to lease solar systems on their homes with a fixed or escalated monthly payment; no down payment required if the total system cost is less than or equal to $4.50 a watt **CHP and Anaerobic Digestion (AD) Incentives:** Grants, loans, or power purchases for CHP projects 5 MW and less or for AD projects up to 3 MW **Biofuels Research Grants:** For higher education or agricultural research institutions for biofuel production from agricultural products, algae, and waste grease and testing
More Info	▸ DSIRE Database: www.dsireusa.org/incentives/index.cfm?state=CT ▸ Clean Energy Finance and Investment Authority (Green Bank): www.ctcleanenergy.com ▸ Energize Connecticut: www.energizect.com ▸ Public Utilities Regulatory Authority (RPS): www.ct.gov/pura/cwp/view.asp?a=3354&q=415186

Renewable Energy in Delaware

Summary

Delaware's renewable portfolio standard of 25% by 2025, with a 3.5% target for solar, helps to reduce the state's reliance on imported coal and natural gas. Net metering policy, a solar renewable energy credit (SREC) program, and other financial incentives also provide a foundation for renewable energy development – particularly distributed generation. Additionally, proceeds from the Regional Greenhouse Gas Initiative fund the state's Sustainable Energy Utility, which supports energy efficiency and renewable energy programs across the state. However, to date, Delaware's other renewable energy sectors remain relatively underdeveloped.

Installed Renewable Energy Capacity, 2013			
Wind Power	2 MW	Marine Power	0 MW
Solar Photovoltaic	56 MW	Biomass & Waste	8 MW
Solar Thermal Electric	0 MW	Ethanol	0 mGy
Geothermal Power	0 MW	Biodiesel	5 mGy
Hydropower	0 MW	**Totals**	66 MW; 5 mGy

Sources: See User's Guide for details

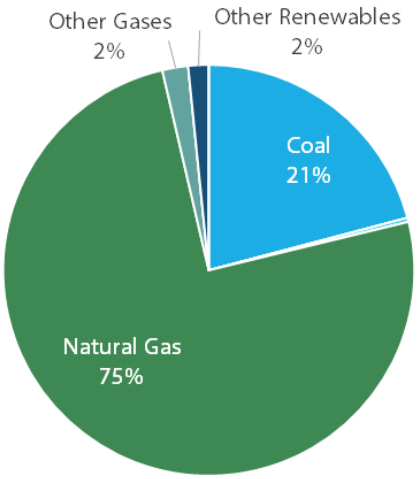
Market Spotlight

- In May 2014, an electric cooperative began purchasing power produced at a landfill in Sandtown. The utility will purchase 2 MW of power produced from the biogas facility, enough to power 1,200 homes.
- The University of Delaware launched the Special Initiative on Offshore Wind in January 2014 to catalyze the development of the offshore wind industry in the U.S. The initiative will facilitate information-sharing between U.S. developers and European experts, and is being supported by a $250,000 seed fund in addition to additional donations.
- Wilmington ranked third in solar capacity per capita in 2013, with more installed than Houston, Texas, a city 55 times its size. The city's solar capacity has grown from 0.5 MW in 2008 to 7 MW in 2013.[6]

Economic Development

Employment	**2011**	
Green Goods & Services Jobs	9,872	
Investment (Grossed-up)	**2012**	**2013**
Asset Finance	$50m	$17.2m
Venture Capital & Private Equity	-	$100m

Sources: Bureau of Labor Statistics (BLS); Bloomberg New Energy Finance (BNEF). See User's Guide for details.



Electricity Generation, 2013 (EIA)

[6] http://www.dnrec.delaware.gov/News/Pages/Wilmington-ranked-No-3-city-in-US-for-solar-energy.aspx

Renewable Energy in Delaware

State Policy

Renewable Portfolio Standard	▸ 25% by compliance year 2025-2026 ▸ Investor-owned utilities (IOUs), retail electric suppliers, municipal utilities, and rural electric cooperatives (representing 70% of state's electric load) ○ Municipal utilities and rural electric cooperatives may opt out of the standard if they implement a comparable RPS of their own ▸ Includes 3.5% solar PV minimum; utilities must purchase solar renewable energy credits (SRECs) to comply ▸ Renewable energy credits (RECs) from eligible customer-sited systems may be used for compliance ▸ Penalty of $25/MWh of shortfall for suppliers who fail to comply ▸ Generation from certain energy systems eligible for credit multipliers, such as certain customer-sited PV or fuel cell systems, certain wind turbines, and systems using equipment manufactured in state
Net Metering	▸ All utilities ▸ System capacity limit differs by utility (maximum limit of 2 MW); aggregate capacity limit of 5% of electric supplier's aggregated customer monthly peak demand ▸ Net excess generation is credited to customer's next bill at retail rate (excluding some community-owned facilities); customer may opt to roll credit over indefinitely or receive payment at end of 12 months at the energy supply rate ▸ Virtual net metering allowed
Interconnection Standards	▸ All utilities ▸ System capacity limit of 10 MW; 1 MW limit for non-renewable co-generators and small power producers ▸ External disconnect switch required; insurance requirements vary by system size/type
Public Benefits Fund	**Green Energy Fund:** ▸ Collects ~$3.2m annually ▸ Provide grants for the installation of renewable energy systems ▸ Programs operated by Delmarva Power, Delaware Electric Cooperative, and DEMEC ▸ Program regulations currently under revision
Performance Incentives	**SREC Procurement Program:** ▸ Public solicitation for SRECs, with different tiers of solar generators based on capacity ▸ Seeks SRECs from new systems, existing systems, spot market purchases ▸ Subject to competitive bid pricing; 20-year terms; contract terms non-negotiable
Loans	**Revolving Loan Fund:** ▸ $10,000-$1,000,000 for customer-sited renewable generation that can lower customers' bills and reduce environmental impacts ▸ Funding source: Regional Greenhouse Gas Initiative (RGGI)
More Info	▸ DSIRE Database: www.dsireusa.org/incentives/index.cfm?state=DE ▸ Division of Energy and Climate (Green Energy Program): www.dnrec.delaware.gov/energy/services/GreenEnergy/Pages/default.aspx ▸ Public Service Commission (RPS): www.depsc.delaware.gov/electric/delrps.shtml ▸ Delaware SREC Program: www.srecdelaware.com

Renewable Energy in the District of Columbia

Summary

There are currently no utility-scale renewable energy systems installed in the District of Columbia. Renewable energy credits purchased from producers in other states mostly satisfy the state's renewable portfolio standard (RPS). However, distributed generation has been increasing in significance within the District, with an RPS carve-out for solar energy and a solar rebate program for residential and commercial customers. Given the federal government's commitment to generating and purchasing renewable energy, the District's suitable solar and wind resources, its supportive policies, and the large amount of unused roof space, renewable energy is positioned for further growth.

Installed Renewable Energy Capacity, 2013			
Wind Power	0 MW	Marine Power	0 MW
Solar Photovoltaic	7 MW	Biomass & Waste	0 MW
Solar Thermal Electric	0 MW	Ethanol	0 mGy
Geothermal Power	0 MW	Biodiesel	0 mGy
Hydropower	0 MW	**Totals**	7 MW; 0 mGy

Sources: See User's Guide for details

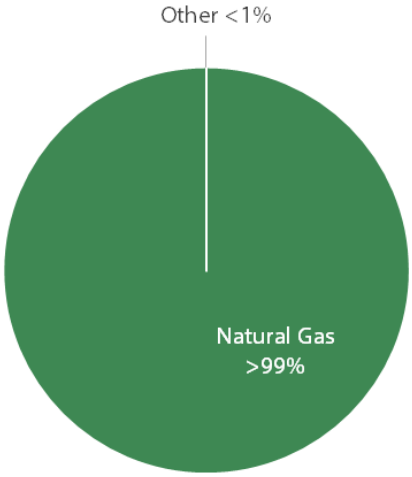
Market Spotlight

- The DC Department of General Services issued a request for proposals in March 2014 to build 10 MW of solar PV located on 49 city-owned buildings. The electricity will be sold to the local utility through 20-year power purchase agreements (PPAs).
- The Blue Plains wastewater treatment plant, the largest consumer of electricity in D.C., is constructing an anaerobic digester capable of producing enough biogas to generate up to 10 MW of electricity. The digester has the potential to reduce electricity bills by $10 million per year, and when completed in 2014, it will be the largest thermal hydrolysis plan in the world. The Blue Plains campus also aims to install up to 11.6 MWac of solar panels by 2016.
- Washington, D.C. government agencies began operating using 100% wind power in 2013 by purchasing renewable energy credits generated in other states. This increase added to the District's already impressive use of clean energy, ranking it among the U.S. Environmental Protection Agency's list of top local governments for green power purchasing.

Economic Development

Employment	**2011**	
Green Goods & Services Jobs	35,799	
Investment (Grossed-up)	**2012**	**2013**
Asset Finance	-	-
Venture Capital & Private Equity	-	$2m

Sources: Bureau of Labor Statistics (BLS); Bloomberg New Energy Finance (BNEF). See User's Guide for details.



Electricity Generation, 2013 (EIA)

Renewable Energy in the District of Columbia

State Policy

Renewable Portfolio Standard	▸ 20% by 2020 ▸ All utilities ▸ Includes a 2.5% solar requirement by 2023 ○ Qualifying solar energy systems must not exceed 5 MW and be located in D.C. or in a location with a distribution feeder serving D.C. ▸ For noncompliance, suppliers must generally pay $0.05/kWh of shortfall, or $0.50/kWh of shortfall for failing to meet solar energy requirements (these payments may be used by D.C. to provide support to renewable energy projects) ▸ Solar thermal (non-electric) energy is also counted as a qualifying resource
Net Metering	▸ Investor-owned utilities (IOUs) ▸ System capacity limit of 1 MW ▸ Net excess generation credited to customer's next bill at the retail rate (for systems 100 kW or less) or the generation rate (for systems 101 kW-1 MW), indefinitely ▸ Customer owns renewable energy credits (RECs)
Interconnection Standards	▸ IOUs ▸ System capacity limit of 10 MW ▸ External disconnect switch and extra insurance required for certain systems
Rebates	**Renewable Energy Incentive Program (REIP):** ▸ 20% of the total cost of non-residential solar thermal systems, up to $6,000 ▸ 30% of the total cost of residential solar thermal systems, up to $5,000 for water heating and combination systems, or up to $2,000 for space heating systems ▸ $0.50/watt for non-residential PV systems, up to $10,000 ▸ $3.00/watt for residential PV systems, up to $10,000
Tax Incentives	**Property Tax Exemption:** ▸ Solar energy and co-generation systems are exempt from personal property taxes
Public Benefit Fund	**Sustainable Energy Utility:** ▸ Collects about $20m/year to support energy efficiency and renewable energy programs in the District
More Info	▸ DSIRE Database: www.dsireusa.org/incentives/index.cfm?state=DC ▸ Department of the Environment (Energy): www.ddoe.dc.gov/energy ▸ Sustainable Energy Utility: www.dcseu.com ▸ Public Service Commission (RPS): www.dcpsc.org/electric/renewable.asp

Renewable Energy in Maine

Summary

Maine is endowed with plentiful bioenergy, wind, hydropower, ocean, and other renewable energy resources. Non-hydro renewables are responsible for 32% of in-state generation, a higher percentage than in any other state in the nation. Through sustained research and development, supportive policies, and eased permitting requirements, the state is developing strong, nationally-recognized markets. Notably, offshore renewable energy development could create hundreds of megawatts of clean energy to meet both mainland demand and the demand of Maine's numerous offshore islands.

Installed Renewable Energy Capacity, 2013			
Wind Power	431 MW	Marine Power	0.24 MW
Solar Photovoltaic	2.8 MW[7]	Biomass & Waste	609 MW
Solar Thermal Electric	0 MW	Ethanol	0 mGy
Geothermal Power	0 MW	Biodiesel	2 mGy
Hydropower	733 MW	**Totals**	1,776 MW; 2 mGy

Sources: See User's Guide for details

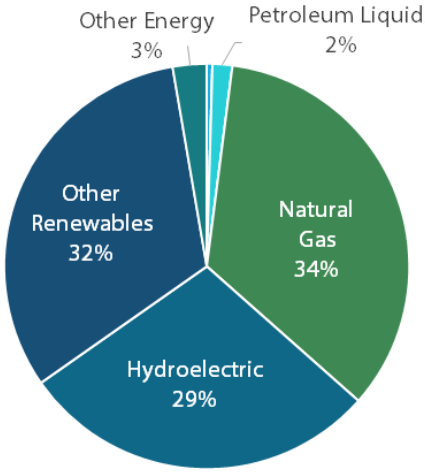
Market Spotlight

- A 148 MW wind farm in Aroostook County received financing in May 2014. Once constructed, the project will provide $27 million in tax and community benefit payments over 20 years and produce power to supply 50,000 New England homes.
- A developer plans to build a $140 million renewable wood pellet plant at a paper mill in Millinocket, which would export pellets to European markets and create 55 domestic jobs directly. If the air emissions permit is approved, construction on the facility could start in late 2014.
- Maine is home to the country's first tidal energy device to generate electricity for the power grid and first working offshore wind turbine. The tidal device is stationed on the bottom of Cobscook Bay and can power approximately 30 homes. The floating offshore wind turbine is 65 feet high and can power five homes. Additionally, the University of Maine-led, 12 MW floating wind turbine project off of Monhegan Island received a $3 million grant from the U.S. Department of Energy in May 2014 to continue design and engineering work for a full-scale test.
- According to a report released in May 2014 by Environment Maine, Portland lags behind most major cities in solar PV capacity, with only 0.2 MW installed.[8]

Economic Development

Employment	**2011**	
Green Goods & Services Jobs	16,951	
Investment (Grossed-up)	**2012**	**2013**
Asset Finance	$76m	-
Venture Capital & Private Equity	-	-

Sources: Bureau of Labor Statistics (BLS); Bloomberg New Energy Finance (BNEF). See User's Guide for details.



Electricity Generation, 2013 (EIA)

[7] Figure from Interstate Renewable Energy Council, 2012
[8] http://www.environmentmaine.org/news/mee/new-report-portland-lags-behind-solar-power-among-us-cities

Renewable Energy in Maine

State Policy

Renewable Portfolio Standard	▸ 40% by 2017 (including 10% from new resources that came online after 9/1/2005) ▸ Investor-owned utilities (IOUs), retail electric suppliers (representing 98.7% of state's electric load) ▸ Eligible facilities must not exceed 100 MW (excluding new wind), and may include certain "small power production facilities" such as combined heat and power ▸ Certain community-based projects may receive a credit multiplier ▸ Utilities may pay an alternative compliance payment in lieu of meeting the standard ▸ In addition to the RPS target, the state has a goal to install 8 GW of wind power by 2030 (ramping up from goals of 3 GW by 2015 and 5 GW by 2020), including 5 GW from facilities in coastal waters or offshore
Net Energy Billing	▸ All utilities ▸ System capacity limit of 660 kW for IOU customers or 100 kW for municipal and co-op customers (or up to 660 kW if utility decides to allow it) ▸ Net excess generation credited to next bill at retail rate; excess credit granted to utility at end of 12 months ▸ Virtual net metering allowed
Interconnection Standards	▸ Transmission and distribution utilities ▸ No system capacity limit specified ▸ Insurance requirements for certain systems
Tax Incentives	**Biofuels Production Tax Credit:** ▸ Income tax credit of $0.05/gasoline gallon equivalent of biofuel produced ▸ Commercially-produced ethanol, biodiesel, hydrogen, methanol, or other transportation fuels derived from agricultural or forest feedstocks ▸ Unused credit may be carried forward for up to 10 years **Biodiesel Fuel Tax Exemption:** ▸ Individuals that produce biodiesel for personal use or use by an immediate family member are exempt from the state fuel excise tax
Production Incentive	**Community-Based Renewable Energy Pilot Program:** ▸ Program will permit up to 50 MW of generating capacity; individual systems may not exceed 10 MW ▸ 10 MW of total program must be reserved for systems under 100 kW or for systems located in the territory of a co-op transmission and distribution utility ▸ Systems must be 51% locally-owned and located in state ▸ Participants may choose between a long-term contract option (for no more than $0.10/kWh on average per year for 20 years) and a renewable energy credit (REC) multiplier for 150% of the amount of electricity produced)
More Info	▸ DSIRE Database: www.dsireusa.org/incentives/index.cfm?state=ME ▸ Public Utilities Commission: www.maine.gov/mpuc/electricity/rps-class-I-list.shtml ▸ Efficiency Maine: www.efficiencymaine.com ▸ Governor's Energy Office: www.maine.gov/energy

Renewable Energy in Maryland

Summary

Maryland imports approximately 30% of its electricity from nearby states. To help stabilize its electricity prices, the state is investing in clean sources of energy, driven by a 20% renewable portfolio standard. As it seeks to install the majority of its 1.2 GW solar energy goal within the next six years, the state's solar market will attract attention from investors and developers from around the country. In addition, the state has begun to incentivize renewable thermal energy projects to reduce the fossil fuel consumption of buildings, through programs like its Clean Burning Wood Stove Grant Program. In December 2013, the U.S. Interior Department and Maryland announced the proposed notice of sale for nearly 80,000 acres offshore Maryland for commercial wind energy leasing, which could potentially support between 850 MW to 1.45 GW of wind generation and power up to 300,000 homes.[9]

Installed Renewable Energy Capacity, 2013			
Wind Power	120 MW	Marine Power	0 MW
Solar Photovoltaic	152 MW	Biomass & Waste	163 MW
Solar Thermal Electric	0 MW	Ethanol	0 mGy
Geothermal Power	0 MW	Biodiesel	8 mGy
Hydropower	551 MW	**Totals**	986 MW; 8 mGy

Sources: See User's Guide for details

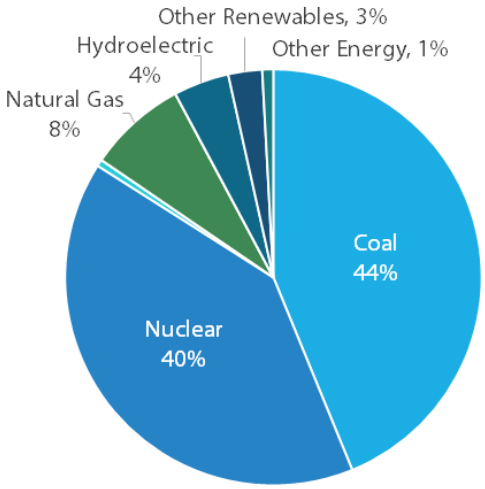
Market Spotlight

- Several facilities produce energy from Maryland's waste products. A planned 55 MW waste-to-energy facility in Frederick County received environmental permits in February 2014. Once constructed, the facility will process 1,500 tons of residual municipal solid waste annually.
- In May 2014, the governor vetoed a bill that would have imposed a one-year moratorium on wind farm construction near U.S. Naval Air Station Patuxent River, helping to clear the way for the planned $200 million, 150 MW Great Bay Wind Energy Center.
- Site preparation for the 40 MW Fourmile Ridge wind project in eastern Garrett County began in April 2014. The project is expected to begin commercial operations by December 2014.
- An electric cooperative entered into a 20-year power purchase agreement for the 10 MW Rockfish Solar facility in Charles County in April 2014. The system is expected to produce approximately 21,000 MWh of electricity, enough to power 1,300 homes, per year.

Economic Development

Employment	**2011**	
Green Goods & Services Jobs	91,489	
Investment (Grossed-up)	**2012**	**2013**
Asset Finance	$82.1 m	$5.9m
Venture Capital & Private Equity	$1.1m	$7.5m

Sources: Bureau of Labor Statistics (BLS); Bloomberg New Energy Finance (BNEF). See User's Guide for details.



Electricity Generation, 2013 (EIA)

[9] http://www.interior.gov/news/pressreleases/secretary-jewell-announces-milestone-for-commercial-wind-energy-development-in-federal-waters.cfm

Renewable Energy in Maryland

State Policy

Renewable Portfolio Standard	▸ 20% by 2022 ▸ All electricity suppliers ▸ Includes targets for 2% solar by 2020 and up to 2.5% cost-effective offshore wind ▸ Renewable energy credits (RECs) from the PJM region may be used for compliance; solar RECs (SRECs) must come from systems connected to the state's grid ▸ If targets not met, utilities must pay an alternative compliance payment
Net Metering	▸ All utilities ▸ System capacity limit of 2 MW (30 kW for micro-CHP); aggregate capacity limit of 1.5 GW ▸ Net excess generation credited to next bill at retail rate; reconciled after 12 months at the commodity energy supply rate ▸ Customer owns RECs; virtual net metering allowed for some entities
Interconnection Standards	▸ All utilities ▸ System capacity limit of 10 MW ▸ Insurance requirements vary by system size/type; external disconnect switch required
Tax Incentives	**Property Tax Incentives:** ▸ Real property tax exemption for solar and wind energy property ▸ Solar and geothermal heating and cooling systems assessed for property tax at no more than the value of a conventional system **Sales and Use Tax Exemptions:** ▸ For purchase of geothermal, wind, and solar energy equipment ▸ For sale of electricity from qualifying solar energy and residential wind energy systems ▸ For wood or "refused-derived" fuel used for heating **Cellulosic Ethanol Research and Development Tax Credit:** State income tax credit for 10% of qualified research and development expenses for cellulosic ethanol; may not exceed $250,000 per calendar year; credit may be applied for up to 15 years **Bioheat Tax Credit** *(Personal or Corporate)***:** Income tax credit of $0.03/gallon for purchase of biodiesel for space or water heating; maximum incentive of $500/year **Clean Energy Production Tax Credit** *(Personal or Corporate)***:** $0.0085/kWh for electricity generated from qualified renewable resources or $0.0050/kWh for systems co-fired with coal; maximum incentive of $2.5m over five years; credits are refundable
Grants	**Clean Energy Grant Program:** ▸ Commercial: $30-$60/kW for PV (must not exceed 200 kW); $10-$20/sq. ft. for solar water heating (SWH); $90-$180/ton for geothermal heating and cooling (GHC) **Windswept Grant Program:** ▸ Residents, businesses, nonprofits that install wind energy systems up to 750 kW ▸ $3,000/kW, up to $100,000 (for individual grants) or 50% of the installation's net cost (for community grants) ▸ $1.1 million available for the community program in FY14 **Market Entry Program:** Reduces costs for associated with establishing commercial offshore wind sector exports; provides Administrative Costs Grants up to $25,000 and Capital Equipment and Facility Upgrades Grants up to $500,000 **Clean Burning Wood Stove Grant Program:** ▸ $500 for residential stick-burning stoves and $700 for residential pellet-burning stoves
Fuel Production Incentive	▸ Biodiesel: $0.20/gallon from soybean oil; $0.05/gallon from other feedstocks ▸ Ethanol: $0.20/gallon from small grains; $0.05/gallon from other agricultural products
More Info	▸ DSIRE Database: www.dsireusa.org/incentives/index.cfm?state=MD ▸ Maryland Energy Administration: www.energy.maryland.gov ▸ Public Service Commission (RPS): http://webapp.psc.state.md.us/intranet/ElectricInfo/home_new.cfm

Renewable Energy in Massachusetts

Summary

Massachusetts spends about 80% of its annual energy expenditures on procuring energy from outside of the state, but it is steadily replacing imported fossil fuels with renewables. By leveraging its scientific expertise, academic and innovation resources, and highly educated workforce, the state has developed a supportive policy portfolio to become an early leader in clean energy research, innovation, and deployment. In spring 2014, the state launched the second phase of its solar renewable energy credit program, adding a new round of financial incentives to help reach its overall goal of goal of 1,600 MW of installed solar capacity by 2020. In a boon for offshore wind, the U.S. Department of the Interior and Massachusetts announced the availability of more than 742,000 acres offshore Massachusetts in June 2014 for commercial energy leasing.

Installed Renewable Energy Capacity, 2013			
Wind Power	106 MW	Marine Power	0 MW
Solar Photovoltaic	464 MW	Biomass & Waste	472 MW
Solar Thermal Electric	0 MW	Ethanol	0 mGy
Geothermal Power	0 MW	Biodiesel	1 mGy
Hydropower	270 MW	**Totals**	1,312 MW; 1 mGy

Sources: See User's Guide for details

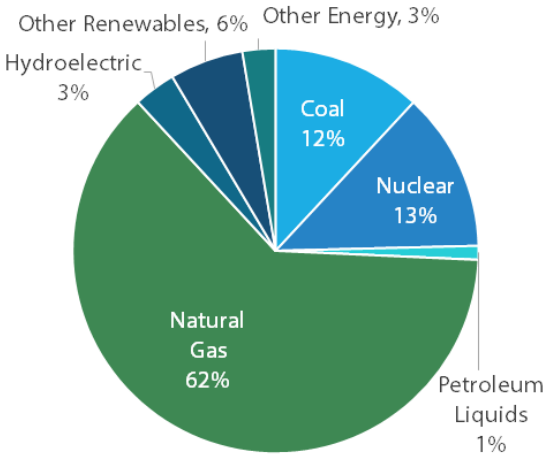
Market Spotlight

- Cape Wind, a planned 468 MW offshore wind project more than a decade in the making, is now in its financing and final commercial contracting stage. Project financing for the $2.6 billion project is expected to be completed in the second half of 2014, and it could be commissioned in 2016.
- In February 2014, the state approved 12 long-term power purchase agreements with four Massachusetts utilities for 409 MW of wind projects in Maine and New Hampshire. The projects are expected to begin operations between 2015 and 2016 and provide power to 122,000 homes, accounting for about 2.5% of each utility's total electricity sales. The projects have a weighted average price of less than $0.08/ kWh, less than most conventional sources, and will help residents save about $853 million over their lifetimes.[10]
- Massachusetts installed 237 MW of solar energy capacity in 2013, ranking fourth nationally. Construction on the state's first two community-owned solar projects began in April 2014, located in Hadley and Rehoboth.
- Nine municipalities announced a partnership to deliver 25,000 tons of municipal solid waste to the Springfield waste-to-energy facility beginning in July 2014. The plant will provide enough electricity to power 5,000 homes.

Economic Development

Employment	**2011**	
Green Goods & Services Jobs	88,924	
Investment (Grossed-up)	**2012**	**2013**
Asset Finance	$247.2m	$254.6m
Venture Capital & Private Equity	$224.1m	$67.5m

Sources: Bureau of Labor Statistics (BLS); Bloomberg New Energy Finance (BNEF). See User's Guide for details.



Electricity Generation, 2013 (EIA)

[10] http://www.nawindpower.com/e107_plugins/content/content.php?content.12664

Renewable Energy in Massachusetts

State Policy

Renewable Portfolio Standard	▸ *Class I (new resources)*: 15% by 2020 and an additional 1% each year; *Class II (existing resources)*: 7.1% in 2009 and thereafter (3.6% renewables and 3.5% waste-to-energy) ▸ Investor-owned utilities (IOUs), retail suppliers (covering 86% of state's electric load) ▸ 400 MW must come from in-state solar PV systems; included in Class I requirement ▸ Additional goals to procure 50 MW of solar PV on landfills and brownfields by 2020, three anaerobic digesters and/or CHP projects by 2014 ▸ Electric distribution companies must solicit 10-15 year contracts for renewable energy in two solicitations between January 2013 and December 2016 ▸ Solar energy clearinghouse program responds to market conditions for solar renewable energy credits (SRECs) and provides price support ▸ State goals of 2 GW from wind power and 1.6 GW from solar power by 2020
Net Metering	▸ Investor-owned utilities (IOUs) ▸ System capacity limit of 10 MW for government systems or 2 MW or lower for other systems depending on size/type; aggregate capacity limit of 6% utility's peak load ▸ Net excess generation treatment varies by system type and customer class ▸ Customer owns renewable energy credits (RECs); neighborhood net metering allowed
Interconnection Standards	▸ IOUs ▸ No system capacity limit specified ▸ Insurance and external disconnect switch requirements vary by system size/type
Rebates and Grants	**Massachusetts Clean Energy Center (MassCEC):** ▸ Provides a number of programs for residents, businesses, nonprofits, and government agencies to finance clean energy projects ▸ Technologies eligible for incentives include biomass boilers, hydropower, anaerobic digesters, biomass thermal energy, solar hot water, appropriately-sited wind, district energy, geothermal heating and cooling, solar PV, and woodstoves ▸ Incentives also provided for research, development, and/or commercialization of clean energy technologies, as well as for clean energy job creation **Commonwealth Solar Hot Water Financing Program:** Provides incentives with aim to install residential, commercial, government, and non-profit solar hot water installations; budget of $10m until the end of 2016 **Solarize Mass:** Competitive-tiered pricing structure that increases savings for communities that install small-scale solar electricity systems
Tax Incentives	**Excise Tax Incentives:** Business may deduct the expense of installing a solar or wind energy system from net income for state excise tax purposes; systems are also exempt from the tangible property measure of the state's corporate excise tax **Alternative Energy and Energy Conservation Patent Exemption** *(Personal or Corporate)*: For the sale, lease, or royalty income from a renewable energy-related patent **Income Tax Credit for Residential Systems** *(Personal)*: 15% credit, up to $1,000, for the net expenditure of a renewable energy system; may be carried forward three years **Property Tax Exemption:** For the value added by solar, wind, and certain hydro systems **Sales Tax Exemption:** For residential solar, wind, or geothermal system equipment **Cellulosic Biofuel Tax Exemption:** From the state's $0.21/gallon fuel tax
Public Benefit Fund	▸ Provides grants, contracts, loans, equity investments, energy production credits, bill credits and rebates to support renewable energy ▸ Funded by a surcharge on electric bills collecting $23m/year
More Info	▸ DSIRE Database: www.dsireusa.org/incentives/index.cfm?state=MA ▸ Massachusetts Clean Energy Center: www.masscec.com ▸ Department of Energy Resources: www.mass.gov/doer

Renewable Energy in New Hampshire

Summary

To reduce its reliance on imported energy, New Hampshire has set an aggressive renewable portfolio standard (RPS) of 24.8% by 2025 and is the first state to require a portion of its RPS come from thermal energy. With its strong biomass resources, particularly in the forestry sector, the state has the opportunity to increase its role in the production of bioenergy. Despite recent legislative attempts to impose a moratorium on wind power and ban the use of gasoline blends containing more than 10% ethanol, a majority of New Hampshire voters favor renewable energy and are willing to pay more on their utility bills to finance its development.[11]

Installed Renewable Energy Capacity, 2013			
Wind Power	171 MW	Marine Power	0 MW
Solar Photovoltaic	2 MW	Biomass & Waste	191 MW
Solar Thermal Electric	0 MW	Ethanol	0 mGy
Geothermal Power	0 MW	Biodiesel	6 mGy
Hydropower	446 MW	**Totals**	810 MW; 6 mGy

Sources: See User's Guide for details

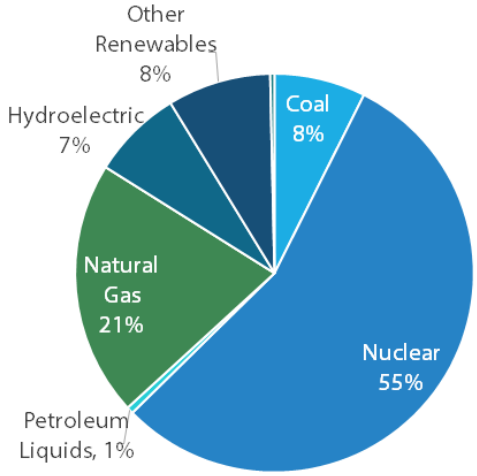
Market Spotlight

- A 75 MW biomass plant at a closed paper mill in Berlin began commercial operations in 2014. The project will inject approximately $25 million per year into northern New Hampshire's economy.
- A waste-to-energy plant in Concord marked 25 years of operation in May 2014. The project has processed more than 4 million tons of waste and has generated more than 2.5 million megawatts of electricity since it opened. It serves more than two dozen communities in southern and central New Hampshire.
- A project developer abandoned its planned $150 million, 75.9 MW Wind Meadows wind farm in May 2014, which was to be located in Merrimack and Grafton counties, citing an "unfavorable political and regulatory climate." However, another project developer seeking to develop a 50 MW project in the Groton area stated that, despite this setback for wind energy in New Hampshire, it remains committed to building this project.[12]
- A proposed transmission line that would carry hydroelectric power from Canada to the state, the Northern Pass project, is expected to be operational by mid-2017. According to the developer, the $1.4 billion project will provide an estimated $28 million annually in new state, local, and county tax revenues and create an estimated 1,200 new jobs in the state.

Economic Development

Employment	**2011**	
Green Goods & Services Jobs	16,244	
Investment (Grossed-up)	**2012**	**2013**
Asset Finance	-	$150m
Venture Capital & Private Equity	$5m	$0.3m

Sources: Bureau of Labor Statistics (BLS); Bloomberg New Energy Finance (BNEF). See User's Guide for details.



Electricity Generation, 2013 (EIA)

[11] www.commonwealthmagazine.org/Voices/Perspective/Online-Perspectives-2014/Spring/014-Candidates-take-note-NH-backs-clean-energy.aspx (According to a poll conducted by Suffolk University Political Research Center in March 2014)
[12] www.concordmonitor.com/news/nation/world/12150881-95/ibredrola-abandons-wild-meadows-wind-farm-raising-questions-about-future-of-wind-power-in

Renewable Energy in New Hampshire

State Policy

Renewable Portfolio Standard	▸ 24.8% by 2025 ○ *Class I (new renewables)*: 15% by 2025 (including 2% renewable thermal energy by 2025); *Class II* (*new solar electric)*: 0.3% by 2014; *Class III* (*existing biomass/methane up to 25 MW)*: 8% by 2015; *Class IV (existing hydro up to 5 MW)*: 1.5% by 2015 ▸ All retail electric suppliers, excluding municipal suppliers (totaling 98.2% of state's electric load) ▸ Certain behind-the-meter generation may be eligible to meet RPS targets ▸ Utilities may make payments into a renewable energy fund in lieu of meeting targets ▸ In April 2014, the Public Utilities Commission published proposed amendments to the RPS, which set a 2% requirement for Class I renewable thermal energy by 2023
Net Metering	▸ All utilities ▸ System capacity limit of 1 MW; aggregate capacity limit of 50 MW ▸ Net excess generation credited to next bill at kWh credit; carried forward indefinitely; customer may receive payment at avoided-cost rate at end of 12 months ▸ Customer owns renewable energy credits (RECs), but not those associated with utility-purchased net excess generation ▸ Virtual net metering allowed
Interconnection Standards	▸ All utilities ▸ Net metering required
Other Financial Incentives	**Commercial & Industrial Solar Rebates:** ▸ *PV (100 kW or smaller)*: $0.80/watt, up to $50,000; *solar thermal*: $0.07-$0.12/thousand BTU per year, up to $50,000 ▸ $2.3m in rebates available for FY2014 **Residential Small Renewable Energy Rebates:** ▸ Residential PV or wind power systems 10 kW or less ▸ $0.75/watt; maximum incentive of the lesser of $3,750 or 50% of system costs **Residential Bulk-Fed Wood-Pellet Central Boilers and Furnaces:** ▸ 30% of the system and installation cost, up to $6,000; $575,819 in funding for FY2014 **Residential Solar Water Heating Program:** ▸ Residential solar water heating and space heating systems ▸ $1,500-$1,900 depending on system size ▸ $220,500 in rebates available for FY14 **Enterprise Energy Fund Grants and Revolving Loans:** ▸ Loans for commercial energy projects $10,000-$500,000; terms vary ▸ Grants for commercial renewable energy investments that yield large energy savings **Municipal Energy Reduction Fund Loans:** ▸ $5,000-$400,000 loans to encourage municipal governments to invest in clean energy ▸ Loans range from 3-7 years; 2.5-4% interest rate ▸ Program budget $1.5m (all funds currently obligated)
More Info	▸ DSIRE Database: www.dsireusa.org/incentives/index.cfm?state=NH ▸ Public Utilities Commission (RPS): www.puc.state.nh.us/Sustainable%20Energy/Renewable_Portfolio_Standard_Program.htm ▸ Community Development Finance Authority: www.nhcdfa.org ▸ Office of Energy and Planning: www.nh.gov/oep/energy/saving-energy/incentives.htm

Renewable Energy in New Jersey

Summary

By enacting a strong renewable portfolio standard (RPS), net metering, a solar renewable energy credit (SREC) financing model, and other supportive policies, New Jersey has become a nationally recognized leader for solar power development, with over 27,800 industrial, commercial, academic, and residential installations. Waste and biomass energy systems also provide electricity, power, and fuel to the state, with incentives available to encourage further development of these sectors. In early 2014, Governor Christie announced plans to launch an Energy Resilience Bank to improve and increase the energy resilience of the state's critical facilities by funding distributed generation projects, using Superstorm Sandy funds.[13]

Installed Renewable Energy Capacity, 2013			
Wind Power	9 MW	Marine Power	0.04 MW
Solar Photovoltaic	1,275 MW	Biomass & Waste	254 MW
Solar Thermal Electric	0 MW	Ethanol	0 mGy
Geothermal Power	0 MW	Biodiesel	90 mGy
Hydropower	13 MW	**Totals**	1,551 MW; 90 mGy

Sources: See User's Guide for details

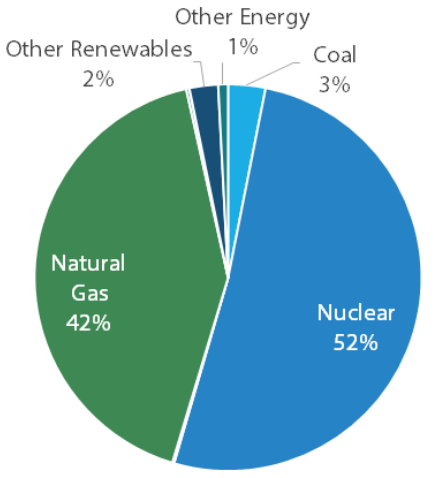
Market Spotlight

- New Jersey achieved 1.28 GW of operating solar capacity in 2013, installing 236 MW. Solar accounted for a full 100% of the state's new electric generating capacity installed that year.[14] The New York and New Jersey Port Authority unveiled a solar PV installation at Newark Liberty International Airport in April 2014. The 3,200 panel installation will produce 817 MWh of electricity per year and is expected to save the airport $60,000 on electricity bills annually. The installation is one of four PV installations at various locations owned and operated by the Port Authority.
- The U.S. Department of Energy (DOE) awarded a $47 million grant in May 2014 to help finance the development of the 25 MW Fishermen's offshore wind energy project near Atlantic City. Although the project is mired in a legal battle with the New Jersey Board of Public Utilities, the DOE expects the project to eventually be approved, with commercial operation expected in 2016 or 2017.
- In January 2014, the State of New Jersey's Business Tax Certificate Transfer Program awarded $1.75 million to an ocean energy developer to help finance the development of technologies to boost the state's nascent marine energy sector.

Economic Development

Employment	2011	
Green Goods & Services Jobs	81,018	
Investment (Grossed-up)	**2011**	**2012**
Asset Finance	$297m	$27.9m
Venture Capital & Private Equity	$45.4m	$4.8m

Sources: Bureau of Labor Statistics (BLS); Bloomberg New Energy Finance (BNEF). See User's Guide for details.



Electricity Generation, 2013 (EIA)

[13] http://www.state.nj.us/bpu/commercial/erb/
[14] Solar Energy Industries Association (SEIA)

Renewable Energy in New Jersey

State Policy

Renewable Portfolio Standard	▸ 20.38% Class I and II resources by 2020-2021 and 4.1% solar electric by 2027-2028 ○ Offshore wind must account for 1,100 MW of main target ▸ Investor-owned utilities (IOUs), retail electric suppliers (98.3% of state's electric load) ▸ Class I resources include solar, wind, ocean, geothermal, landfill gas, anaerobic digestion, fuel cells using renewable fuels, new hydropower under 3 MW, and certain sustainable biomass ▸ Class II resources include hydropower facilities 3-30 MW and waste-to-energy ▸ Requirements may be met by Class I renewable energy credits (RECs), Class II RECs, solar RECs (SRECs), and offshore wind RECs (ORECs) ▸ Utilities must make an alternative compliance payment (ACP) or solar ACP for the amount of RECs not submitted
Net Metering	▸ IOUs, electric suppliers ▸ System capacity and aggregate limits not specified ▸ Net excess generation credited to customer's next bill at retail rate; excess purchased by utility at end of 12 months at avoided-cost rate ▸ Customer owns RECs
Interconnection Standards	▸ IOUs (Class I renewable energy resources) ▸ External disconnect switch not required; additional liability insurance not required for systems meeting certain technical standards
Grants and Loans	**Sustainable Biopower Incentives:** ▸ Sustainable biopower systems that produce electricity from organic material ▸ Competitive solicitation program for businesses; paid based on annual output of energy generated by facility **Solar Water Heaters:** ▸ $1,200 for new, qualifying solar water heating systems on single-family homes **Geothermal Heat Pumps:** ▸ $500 for new, qualifying geothermal heat pumps on residences ▸ Extra incentive for victims of Hurricane Sandy **Edison Innovation Clean Energy Manufacturing Fund (CEMF):** ▸ For project assessment and design, and project construction and operation, associated with the construction or expansion of a Class I renewable energy manufacturing line ▸ Assessment and Design Grant: Up to $300,000 or 10% of total project funds ▸ Construction and Operation Loan: Up to $3m as a 10-year, 2% interest loan **Edison Innovation Green Growth Fund:** ▸ For technology companies with Class I products or certain emerging technologies ▸ Must meet certain employment thresholds ▸ 2% interest rate; five-year loan term; up to $2m ▸ 50% loan conversion to a performance grant may occur after five years
Tax Incentives	**Wind Manufacturing Tax Credit:** ▸ For 100% of a qualified capital investment (at least $50m) in a qualifying wind energy facility that employs at least 300 new full-time employees **Solar Energy Sales Tax Exemption:** ▸ Full exemption from state sales tax for all solar energy equipment **Property Tax Exemption for Renewable Energy Systems:** For local property taxes
More Info	▸ DSIRE Database: www.dsireusa.org/incentives/index.cfm?state=NJ ▸ Economic Development Authority: www.njeda.com/web/Aspx_pg/Templates/Pic_Text.aspx?Doc_Id=1080 ▸ Clean Energy Program: www.njcleanenergy.com ▸ Energy Master Plan: www.nj.gov/emp

Renewable Energy in New York

Summary

Renewable energy technologies are at the center of New York's concerted strategy to develop its clean energy economy. The state has a significant amount of installed wind and solar generation capacity and is also one of the nation's top generators of electricity from hydropower, landfill gas, and municipal solid waste. With its diverse array of incentives, New York is well positioned to further increase its market share of the renewable energy industry. The state's new "Green Bank" aims to leverage private sector capital to finance renewable energy projects and spur economic development.[15] The state is also considering the development of a Clean Energy Fund, which would drive continued investment in renewable energy beyond the renewable portfolio standard target of 30% in 2015.[16]

Installed Renewable Energy Capacity, 2013			
Wind Power	1,722 MW	Marine Power	0 MW
Solar Photovoltaic	271 MW	Biomass & Waste	558 MW
Solar Thermal Electric	0 MW	Ethanol	164 mGy
Geothermal Power	0 MW	Biodiesel	25 mGy
Hydropower	4,656 MW	**Totals**	7,207 MW; 189 mGy

Sources: See User's Guide for details

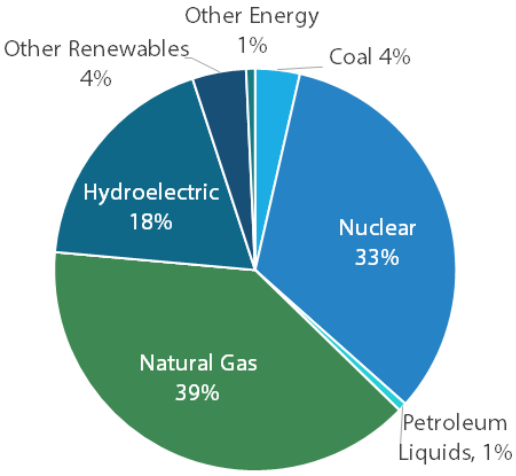
Market Spotlight

- New York regularly ranks within the top ten states for annual solar photovoltaic capacity additions. In June 2014, a major solar company announced plans to build a 1 GW solar panel manufacturing plant in New York, to be one of the largest in the world and much bigger than any existing solar panel manufacturing facility in the U.S.[17]
- The Global Wind Turbine Drivetrain Repair Innovation Lab opened in February 2014 in Albany. The facility will help expedite the development and innovation of repairs to wind turbine gearboxes and rotors.
- The 94 MW Orangeville Wind farm began commercial operation in March 2014. The project is expected to generate $667,000 in payments for the Town of Orangeville annually for 20 years.
- In February 2014, the U.S. Army announced that it would award a contract to purchase up to 28 MW of power from the Black River biomass facility located at Fort Drum, a 60 MW, wood-fueled facility that opened in June 2013.

Economic Development

Employment	**2011**	
Green Goods & Services Jobs	266,308	
Investment (Grossed-up)	**2012**	**2013**
Asset Finance	$449.4m	$246.1m
Venture Capital & Private Equity	$18.6m	$23.1m

Sources: Bureau of Labor Statistics (BLS); Bloomberg New Energy Finance (BNEF). See User's Guide for details.



Electricity Generation, 2013 (EIA)

[15] https://www.governor.ny.gov/press/02112014Green-Bank
[16] http://www3.dps.ny.gov/pscweb/WebFileRoom.nsf/Web/AF1CBF1910EF4C7B85257CD20063E2B2/$File/pr14030.pdf
[17] http://www.technologyreview.com/news/528466/elon-musk-needs-a-very-big-factory-for-his-new-solar-technology/

Renewable Energy in New York

State Policy

Renewable Portfolio Standard	▸ 30% by 2015 ○ ~8.4% of annual increment must come from customer-sited systems ▸ Investor-owned utilities (IOUs) (covering 84.7% of state's electric load) ▸ Certain resources may be procured through auction, requests for proposals, or standard offer contracts ▸ Encourages new systems, but certain existing systems may also be eligible ▸ NYSERDA collects an RPS surcharge from utility customer electricity bills, which supports projects and incentive programs
Net Metering	▸ IOUs ▸ System capacity limit of 25 kW for residential wind, solar, or micro-hydro; 2 MW for non-residential wind, solar, or micro-hydro; 500 kW for farm-based wind; 1 MW for farm-based biogas; 10 kW for residential fuel cells or micro combined heat and power (CHP); 1.5 MW for non-residential fuel cells ▸ Aggregate capacity limit of 3% of utility's 2005 demand for solar, biogas, fuel cells, micro-hydro, and micro-CHP; 0.3% of utility's 2005 demand for wind ▸ Net excess generation credited to next bill at retail rate for most systems; reconciled annually at avoided-cost rate or carries over indefinitely depending on the technology ▸ Meter aggregation allowed for certain systems
Interconnection Standards	▸ IOUs ▸ System capacity limit of 2 MW
Tax Incentives	**Residential Wood Heating Fuel Sales Tax Exemption:** For the retail sale of wood used for residential heating purposes **Solar Sales and Compensating Use Tax Exemption:** For the sale and installation of residential and non-residential solar energy systems **Energy Conservation Improvements Property Tax Exemption:** Qualifying improvements, like the installation of certain renewable energy systems, are exempt from real property taxation for the value added to the property **Residential Solar Tax Credit** *(Personal)***:** ▸ 25% of expenditures on homeowner-owned solar energy systems; for third-party owned systems, homeowner may claim a credit in the amount of lease or PPA payments made during the taxable year, for up to 15 years ▸ Maximum incentive of $5,000; maximum system size of 25 kW (or 50 kW for certain multi-family homes); excess credit may be carried forward five years **Refundable Clean Heating Fuel Tax Credit** (*Personal or Corporate*): $0.01/gallon for each percent of biodiesel blended with conventional home heating oil for residential space and water heating, up to $0.20/gallon **Biofuel Production Tax Credit:** $0.15/gallon of biodiesel or ethanol once state meets annual production threshold of 40,000 gallons of biofuel
Other Incentives	NYSERDA provides incentives to support the customer-sited tier of the RPS, including: ▸ For the installation of new solar electric systems; non-residential projects over 200 kW may receive one upfront rebate and a performance-based incentive for the first two years of production ▸ For the installation of end-use wind energy systems for residential, commercial, institutional, or government use, up to $1,000,000 per site/customer ▸ Also supports solar thermal, fuel cell, anaerobic digester, and other technologies
More Info	▸ DSIRE Database: www.dsireusa.org/incentives/index.cfm?state=NY ▸ NYSERDA: www.nyserda.ny.gov ▸ Public Service Commission (RPS): http://www3.dps.ny.gov/W/PSCWeb.nsf/All/1008ED2F934294AE85257687006F38BD

Renewable Energy in Pennsylvania

Summary

As a major producer and net exporter of coal and natural gas, Pennsylvania has historically relied on in-state fossil fuel generation. Energy sources have begun to shift in recent years as the state has incentivized wind, solar, biomass, and other renewable energy through loans, grants, solar alternative energy credits, and other programs. The state's 18% alternative energy portfolio standard promotes "alternative" and renewable energy sources alike, and only requires renewable energy to account for about half of the total requirement. To reduce its reliance on imported petroleum products for transportation, it has also enacted biofuels mandates and incentives to increase production of biodiesel and ethanol.

Installed Renewable Energy Capacity, 2013			
Wind Power	1,340 MW	Marine Power	0 MW
Solar Photovoltaic	236 MW	Biomass & Waste	637 MW
Solar Thermal Electric	0 MW	Ethanol	110 mGy
Geothermal Power	0 MW	Biodiesel	111 mGy
Hydropower	783 MW	**Totals**	2,996 MW; 221 mGy

Sources: See User's Guide for details

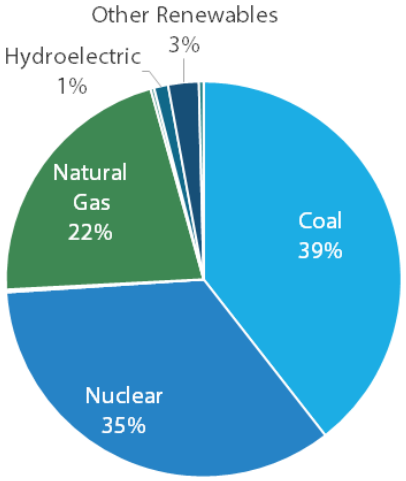
Market Spotlight

- Biomass energy facilities in Pennsylvania produce power and heat from wood scraps, sawdust, and wood chips produced from mill and forestry operations. In May 2014, the state's Alternative and Clean Energy Program awarded a $90,000 grant to upgrade the equipment at a Potter County wood pellet manufacturing facility. The facility is expected to increase its annual wood pellet production from 26,000 tons to 36,400 tons.
- The Holtwood hydropower facility along the Susquehanna River was expanded by 125 MW in December 2013 with the addition of a new powerhouse. The $440 million expansion brings the total capacity for the plant to 230 MW.
- The 5.6 MW Biogas Cogeneration Facility, located at the Northeast Water Pollution Control Plant in Philadelphia, began commercial operations on November 2014. The biogas is produced from the sewage treatment process and is turned into electricity.

Economic Development

Employment	**2011**	
Green Goods & Services Jobs	167,397	
Investment (Grossed-up)	**2012**	**2013**
Asset Finance	$435.2m	-
Venture Capital & Private Equity	$80m	$5.3m

Sources: Bureau of Labor Statistics (BLS); Bloomberg New Energy Finance (BNEF). See User's Guide for details.



Electricity Generation, 2013 (EIA)

Renewable Energy in Pennsylvania

State Policy

Alternative Energy Portfolio Standard	▸ 18% by 2020-2021
	  ○ 8% from Tier I resources, including most new and existing renewable energy systems not counted as Tier II, as well as coal-mine methane and fuel cell systems
	  ○ 10% from Tier II resources, including waste coal, distributed generation, demand-side management, large-scale hydro, municipal solid waste, certain biomass, and certain coal technology
	  ○ 0.5% from solar PV (counted under Tier I requirement)
	▸ Investor-owned utilities (IOUs) and retail suppliers (covering 97.3% of electric load)
	▸ Utilities must acquire alternative energy credits (AECs), solar AECs, or make an alternative compliance payment into a fund that supports alternative energy projects

Net Metering	▸ IOUs ▸ System capacity limit of 5 MW for microgrid and emergency systems, 3 MW for non-residential systems, and 50 kW for residential systems ▸ Net excess generation credited to customer's next bill at retail rate; purchased by utility at end of 12 months at the "price-to-compare" ▸ Customer owns renewable energy credits; allows third-party ownership models ▸ The Public Utility Commission issued proposed rulemaking in February 2014 that could limit the systems that qualify for net metering
Interconnection Standards	▸ IOUs ▸ Net metering required; external disconnect switch required
Tax Incentives	**Property Tax Exemption for Commercial Wind Farms:** Wind turbines and related equipment may not be counted by tax assessors when setting property values
Loans and Grants	**Keystone Help Loan:** Low-rate loans for most types of qualifying energy improvements to houses, including geothermal and solar energy installations; Loan maximum: $35,000, 20-year term **Grants and Loans for Advanced Energy Projects and Manufacturing:** Announced June 2014, $12.5 million in funding will be made available for advanced energy projects and for businesses locating or expanding manufacturing or production operations **Alternative and Clean Energy Program:** ▸ Loans for clean energy manufacturers of up to $40,000 for every job created within three years, and for clean energy producers of up to $5m or 50% of total project cost ▸ Grants for manufacturers for up to $10,000 for every job projected to be created within three years, and for clean energy producers of up to $2m or 30% of total project cost **High Performance Building Program** (includes renewable energy systems)**:** ▸ Loans for high performance building projects for small businesses up to $2m and for individual residence projects up to $100,000 ▸ Grants for high performance building projects up to $500,000 or 10% of total eligible building construction/renovation costs, whichever is less
Renewable Fuels Mandate	▸ All gasoline sold in state must contain at least 10% cellulosic ethanol once in-state production reaches 350 million gallons of cellulosic ethanol ▸ All diesel fuel sold in state must contain 2% biodiesel one year after in-state production reaches 40 million gallons, which will eventually increase to 20%
More Info	▸ DSIRE Database: www.dsireusa.org/incentives/index.cfm?state=PA ▸ Public Utility Commission (RPS): www.puc.pa.gov/consumer_info/electricity/alternative_energy.aspx ▸ Department of Environmental Protection: www.portal.state.pa.us/portal/server.pt/community/grants_loans_tax_credits/10395 ▸ Department of Community and Economic Development: www.newpa.com/find-and-apply-for-funding

Renewable Energy in Rhode Island

Summary

With some of the highest power prices in the nation and reliance on imported electricity, Rhode Island has implemented a number of policy measures designed to diversify its energy sources and decrease price volatility. To support its renewable portfolio standard of 16% by 2019, it implemented a distributed generation standard offer program in mid-2011 to drive the installation of 40 MW by the end of 2014. While most recent renewable energy additions have been smaller scale, offshore wind may become a major source of power in the state if developers' plans proceed as expected.

Installed Renewable Energy Capacity, 2013			
Wind Power	9 MW	Marine Power	0 MW
Solar Photovoltaic	1.9 MW[18]	Biomass & Waste	26 MW
Solar Thermal Electric	0 MW	Ethanol	0 mGy
Geothermal Power	0 MW	Biodiesel	2 mGy
Hydropower	3 MW	**Totals**	40 MW; 2 mGy

Sources: See User's Guide for details

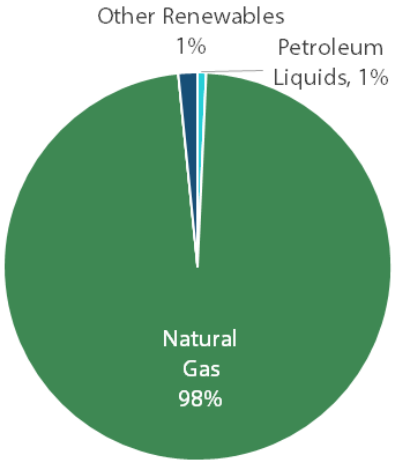
Market Spotlight

- Development is progressing on a $250 million, 30 MW offshore wind demonstration facility and associated transmission system near Block Island, which the developer plans to follow with a $5 billion, 1 GW regional offshore wind hub. In May 2014, the 30 MW project received its first major environmental permit. The electric cable for the project is expected to connect to land at the Scarborough State Beach landing.
- A 3.2 MW biogas plant is under construction in Johnston. The project will utilize 100 to 200 tons of organic waste in addition to other renewable resources to produce electricity.
- According to *The Solar Jobs Census* by The Solar Foundation, solar jobs in the state grew by 62% in 2013.[19] In April 2014, the Rhode Island Commerce Corporation approved a total of $173,700 in grants for 25 new solar PV and five new solar hot water installations in the state.

Economic Development

Employment	**2011**	
Green Goods & Services Jobs	12,327	
Investment (Grossed-up)	**2012**	**2013**
Asset Finance	$6.3m	-
Venture Capital & Private Equity	-	-

Sources: Bureau of Labor Statistics (BLS); Bloomberg New Energy Finance (BNEF). See User's Guide for details.



Electricity Generation, 2013 (EIA)

[18] Figure from Interstate Renewable Energy Council, 2012
[19] http://thesolarfoundation.org/research/national-solar-jobs-census-2013

Renewable Energy in Rhode Island

State Policy

Renewable Portfolio Standard	▸ 16% by 2019 ▸ Investor-owned utilities (IOUs) and retail suppliers (covering 99.3% of the electric load) ▸ May be met by purchasing New England Power Generation Information System certificates or paying an alternative compliance payment to the state's Renewable Energy Deployment Fund ▸ Eligible technologies include solar, wind, geothermal, ocean, hydro (up to 30 MW), biomass facilities, and fuel cells
Net Metering	▸ IOUs ▸ System capacity limit of 5 MW, or sized to 100% of annual on-site energy consumption; aggregate capacity limit of 3% (2 MW reserved for systems under 50 kW) ▸ Net excess generation credited at avoided cost rate; rolls over indefinitely or can be purchased by utility
Interconnection Standards	▸ IOUs ▸ Many requirements left unaddressed
Public Benefits Fund	**Rhode Island Renewable Energy Fund:** ▸ Nation's first public benefits fund for renewable energy and demand-side management, currently supporting small-scale solar, feasibility studies, and commercial development ▸ Supported by a surcharge on electric and gas customers' bills
Tax Incentives	**Sales and Use Tax Exemption:** ▸ For eligible renewable energy systems and equipment, including solar electric and thermal, geothermal heat pumps, and wind power **Residential Solar Property Tax Exemption:** ▸ For local municipal property tax purposes, systems are assessed at no more than a conventional energy system
Other Financial Incentives	**Commercial-Scale Grants:** ▸ $1.25-$0.50/W (depending on system size) for commercial systems, up to $75,000 ▸ Maximum incentive of $350,000 **Small-Scale Solar Grants:** ▸ Solar PV: $1.25/W, maximum of $10,000 ▸ Solar water heating: 25% of contract price, maximum $5,000 per housing/business unit **Distributed Generation Contracts Program:** ▸ National Grid must enter into 15-year renewable energy contracts with private landowners, businesses, and municipalities at a set, fixed price ▸ Wind, solar PV, and anaerobic digestion technologies are eligible to participate ▸ Contracts awarded based on price and economic factors ▸ Target to deploy 40 MW by the end of 2014
More Info	▸ DSIRE Database: www.dsireusa.org/incentives/index.cfm?state=RI ▸ Public Utilities Commission (RPS): www.ripuc.ri.gov/utilityinfo/res.html ▸ Office of Energy Resources: www.energy.ri.gov/renewable ▸ Renewable Energy Fund: www.edc.ri.gov/finance/REF.php

Renewable Energy in Vermont

Summary

Vermont's strong and diverse renewable resources, including hydropower, biomass, solar, and wind energy, are responsible for an impressive 30% of the state's total electricity generation. With almost 78% of its lands covered in forests, Vermont is well positioned to expand its wood-based energy sector to heat and power homes, businesses, and industrial facilities. It became the first state to enact a state-wide "feed-in tariff"-style legislation for renewable energy in 2009, with the goal of increasing new, qualifying renewable energy to 20% of total retail electricity sales by 2017. In early 2014, the state expanded its net metering program, nearly quadrupling the renewable energy cap the program will support.

Installed Renewable Energy Capacity, 2013			
Wind Power	119 MW	Marine Power	0 MW
Solar Photovoltaic	37 MW	Biomass & Waste	88 MW
Solar Thermal Electric	0 MW	Ethanol	0 mGy
Geothermal Power	0 MW	Biodiesel	0 mGy
Hydropower	315 MW	**Totals**	559 MW; 0 mGy

Sources: See User's Guide for detail

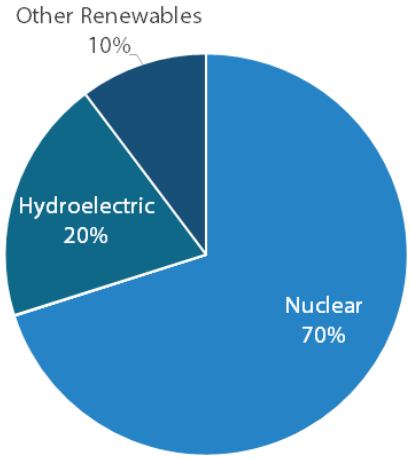
Market Spotlight

- According to the Solar Foundation, Vermont ranks first in the U.S. for solar-related jobs per capita, with roughly 1,300 jobs in the state.[20] The state's solar PV capacity continues to grow with the addition of smaller scale systems supported by state incentives. A 150 kW community-owned solar array came online in May 2014, which gives solar power to 50 Rutland residential and commercial customers at no upfront cost as well as a credit on their utility bills for the power produced at the array. Additionally, a 2.7 MW solar PV system is under construction at the only active landfill in Vermont, located in Coventry.
- The state is a leader in the research, development, and commercialization of wood energy. In June 2014, a project developer submitted a proposal to replace the Vermont Yankee nuclear power plant, which will shut down at the end of the year, with a $350 million biomass energy plant that would use wood-based fuel to generate electricity.
- Several of Vermont's schools use biomass energy for power and heat. A proposed biomass heating plant, to be located at Goddard College, received approval from the Vermont Environmental Court in January 2014. The project will involve the replacement of 23 oil-burning furnaces.

Economic Development

Employment	**2011**	
Green Goods & Services Jobs	12,159	
Investment (Grossed-up)	**2012**	**2013**
Asset Finance	$131.6m	$17.1m
Venture Capital & Private Equity	$8m	$6.5m

Sources: Bureau of Labor Statistics (BLS); Bloomberg New Energy Finance (BNEF). See User's Guide for details.



Electricity Generation, 2013 (EIA)

[20] http://thesolarfoundation.org/research/national-solar-jobs-census-2013

Renewable Energy in Vermont

State Policy

Sustainably Priced Energy Enterprise Development (SPEED) Standard Offer Program	▸ Retail electric providers must purchase electricity from eligible renewable energy facilities via long-term contracts with fixed standard offer rates ▸ Includes solar, wind, biomass, landfill gas, farm methane, and hydropower facilities, up to 2.2 MW, commissioned on or after September 30, 2009; overall target of 127.5 MW ▸ Beginning in 2013, request for proposals (RFPs) released annually until 2020 ▸ Renewable energy credits (RECs) generated through program may be sold in other states' markets ▸ Full program details can be seen at the website (see "More Info")
SPEED Program Goals and Other Targets	▸ **SPEED Goal:** 20% of total statewide electric retail sales during year 2017 must be generated by SPEED resources (see above) ▸ **Total Renewables Targets:** 55% of each retail electricity provider's annual electric sales during 2017 must consist of renewable energy, which will increase to 75% in 2032 ▸ **Comprehensive Energy Plan Goal:** 90% of state's energy needs (electric, heating, and transportation) should be met with renewable energy resources by 2050
Net Metering	▸ All utilities ▸ System capacity limit of 2.2 MW for military systems, 20 kW for micro combined heat and power (CHP), and 500 kW for other systems; aggregate capacity limit of 15% of each utility's peak demand (in 1996 or in the previous year, whichever is greater) ▸ Net excess generation credited to next bill at retail rate; granted to utility at end of 12 months ▸ Group net metering allowed
Interconnection Standards	▸ All utilities ▸ External disconnect switch required ▸ Special standards exist for systems 150 kW and under
Rebates	**Small-Scale Renewable Energy Incentive Program:** ▸ Qualifying solar electric, solar hot water, and micro-hydro systems ▸ Additional $1.4m in program funding made available in October 2013
Tax Incentives	**Renewable Energy Systems Sales Tax Exemption:** ▸ Applies to renewable energy systems up to 250 kW, CHP systems up to 20 kW, and solar water heating systems **Uniform Capacity Tax and Exemption for Solar:** ▸ Property tax exemption for solar PV equipment no more than 10 kW ▸ $4/kW charge for larger systems **Investment Tax Credit** (*Corporate*): ▸ For commercial renewable energy system installations ▸ Equal to 24% of the "Vermont-property portion" of federal business energy tax credit ▸ Unused credit may be carried forward five years **Alternative Fuel and Advanced Vehicle Research and Development Tax Credit:** ▸ High-tech businesses involved exclusively in the design, development, and manufacture of alternative fuel vehicles, hybrid electric vehicles, or energy technology involving fuel sources ▸ Eligible for a payroll income tax credit, qualified research and development income tax credit, export tax credit, small business tax credit, and high-tech growth tax credit
More Info	▸ DSIRE Database: www.dsireusa.org/incentives/index.cfm?state=VT ▸ VermontSPEED: www.vermontspeed.com ▸ Public Service Department: www.publicservice.vermont.gov/topics/renewable_energy ▸ Renewable Energy Resource Center: www.rerc-vt.org ▸ Clean Energy Development Fund: www.publicservice.vermont.gov/topics/renewable_energy/cedf

User's Guide

Overview

This report is intended to provide an executive summary on the status of renewable energy implementation at the state-level. To accomplish this objective, the report provides a two-page, high-level overview on the key developments that have shaped the renewable energy landscape in each state, including information on installed and planned capacity, market trends, economic development, resource potential, and policy.

The report does not attempt to evaluate or rank success in state utilization of renewable energy. There is no one silver bullet for success in the industry; rather, it is a combination of policies and investment in addition to resources that lead to well-established markets. All factors are not explored in this report, but there is emphasis on strong market drivers such as policies, investment trends, proximity to supply chains, resource potentials, and related factors that cause investors and companies to develop renewable energy projects, manufacturing plants, and research centers within a state's borders.

Although states have taken great strides in the advancement of many clean technologies, the technologies profiled in this report are renewable energy technologies exclusively. The report assumes some familiarity with the renewable energy industry, and technical terms are defined in glossary.

Each state summary is divided into the following sections:

- Summary
- Capacity Chart
- Market Spotlight
- Economic Development
- Electricity Generation by Source
- Policies

Capacity Chart

The capacity chart reflects the nameplate capacity of renewable energy projects that were in operation before the end of the last full year. The capacity is represented in megawatts (MW) for electricity and million gallons per year (mGy) for fuels. The information in this section is provided by public sources, and ACORE does not independently verify the data or guarantee its accuracy. The sources used are well-cited within the industry and include: the American Wind Energy Association (AWEA), the Solar Energy Industries Association (SEIA), the Renewable Fuels Association (RFA), the Geothermal Energy Association (GEA), Biodiesel Magazine, Bloomberg New Energy Finance (BNEF), and the U.S. Energy Information Agency (EIA). The sources for each section include:

- Wind data reflects utility-scale wind power installations and is from AWEA's *U.S. Wind Industry Annual Market Report*.
- Unless otherwise noted, solar photovoltaic (PV) data is from publicly-accessible information on the SEIA website, www.seia.org.
- Geothermal power data is from GEA's *Annual US Geothermal Power Production and Development Update*. Information is provided by developers or public sources, and is not independently verified by GEA.
- Ocean power data and concentrating solar power data are derived from the BNEF project database. Ocean power data includes tidal, wave, and ocean thermal energy conversion (OTEC) technologies.
- Hydropower data and biomass and waste data are derived from the Energy Information Agency's Form EIA-860. Biomass and waste power data includes capacity from biomass facilities that use combustion, anaerobic digestion, gasification, co-firing, landfill gas or pyrolysis to produce electricity.

- Bioethanol data is from RFA's *2013 Ethanol Industry Outlook* and represents nameplate capacity in million gallons per year (mGy).
- Biodiesel data is from the Biodiesel Magazine USA plants list and represents nameplate capacity in million gallons per year (mGy).

Market Spotlight

This section of the report includes highlighted characteristics and developments of the state's renewable energy industry, including information on existing and proposed projects, manufacturing, research and development, and other market trends. The information was collected from state Energy Department and Public Utility Commission websites, other state-funded resources, the Bloomberg New Energy Finance (BNEF) desktop, and news articles.

Economic Development

This section provides information about the economic impact renewable energy has had in each state. It should be noted that some of the totals in this section also reflect investment in other "green" sectors, like energy efficiency, in addition to renewable energy.

Bloomberg New Energy Finance (BNEF), a world leader in industry information and analysis, provided information on renewable energy venture capital, private equity and asset finance transactions. The report's Economic Development section indicates the grossed-up estimates for completed, BNEF-tracked deals over the past two years. Venture capital and private equity transactions reflect new investment in renewable energy technology and early stage companies. Asset finance transactions reflect the funds committed for newly-built renewable energy projects, including debt and equity finance and funding from internal company balance sheets.

Jobs data provided for the report, by the Bureau of Labor Statistics (BLS), estimates all jobs (public and private) created by the "green goods and services" (GGS) industry. BLS defines GGS jobs as: "Jobs in businesses that produce goods or provide services that benefit the environment or conserve natural resources. These goods and services are sold to customers, and include research and development, installation, and maintenance services." Jobs in this industry fall into one or more of the following five categories: energy from renewable sources; energy efficiency; pollution reduction and removal, greenhouse gas reduction, and recycling and reuse; natural resources conservation; and/or environmental compliance, education and training, and public awareness. For more information, visit: http://www.bls.gov/ggs/ggsfaq.htm.

Electricity Generation

These pie charts indicate the percentage of power generation from each energy source in 2013. The data is from EIA's *Monthly Energy Review: February 2014*, using the generation totals from January to December 2013.

Policies

The policies profiled in this report reflect major state-level rules, regulations, financial incentives, and other policies for renewable energy that were enacted and operating as of the date of the most recent update. Information was derived from the websites of state energy departments, public utility commissions, public benefits funds, the Database of State Incentives for Renewables & Efficiency (DSIRE), and the U.S. Department of Energy's Alternative Fuels Data Center.

Not all of the renewable energy policies in each state are included. Preference is given to policies implemented at the state-level with the most significant impact. The policies highlighted include: renewable portfolio standards (RPS) and goals, net metering programs, interconnection standards, rebates, tax incentives, production incentives, public benefit funds, grants, loans, renewable fuel mandates/standards, and other major state-level policies. These terms are defined in the glossary.

The highlighted policies are for informational purposes only and should not be used as legal guidance in any way. The reader should refer to state government websites, the DSIRE database, or the Alternative Fuels Data Center for more information.

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Renewable Energy in the 50 States was crafted to illustrate a snapshot of renewable energy of each state, highlighting the state's progress in utilizing its available resources to increase renewable energy's share in its existing energy mix. This report does not attempt to be fully comprehensive, forecast success or failure, or compare one state against another. Instead, it is intended to educate the reader about what each state is actively doing to tap into its renewable energy resources.

Renewable Energy in America is a "living" document that will continue to evolve with updates and periodic revision. The renewable energy landscape is changing continually at the state-level, and ACORE will strive to maintain the accuracy of the report by updating annually.

Please note that this report contains a collection of research and data from well-cited, reliable sources, which was not independently verified by ACORE. The report should not be used to make decisions on project development or for legal advice.

Glossary

Ad Valorem Taxation: A tax based on the assessed value of real estate or personal property. Property ad valorem taxes are the major source of revenues for state and municipal governments.

Alternative Compliance Payment (ACP): In lieu of standard means of compliance with renewable portfolio standards, electricity suppliers may make alternative compliance payments to make up for deficiencies (in megawatt-hours) between the amount of electricity from renewable resources mandated and the amount actually supplied. Payment amount varies among states.

American Recovery and Reinvestment Act (Recovery Act): The Recovery Act was signed into law by President Obama on February 17, 2009. A direct response to the economic crisis, the Recovery Act has three immediate goals: create new jobs and save existing ones; spur economic activity and invest in long-term growth; and foster unprecedented levels of accountability and transparency in government spending. The Recovery Act has since allocated $1.64 billion (as of August 2010) to develop clean renewable resources in order to double America's supply of renewable energy and boost domestic renewable manufacturing capacity.

Anaerobic Digestion: The complex process by which organic matter is decomposed by anaerobic bacteria. An anaerobic digester optimizes the anaerobic digestion of biomass and/or animal manure, and possibly recovers biogas for energy production.

Avoided Cost: An investment guideline describing the value of a conservation or generation resource investment by the cost of more expensive resources that a utility would otherwise have to acquire.

Bagasse: The fibrous material remaining after the extraction of juice from sugarcane. It is often burned by sugar mills as a source of energy.

Bi-Directional Meter: A single meter used in net metering that allows for the monitoring of energy consumption by a residential system and the amount of excess energy exported back into the grid.

Biodiesel: A biodegradable transportation fuel for use in diesel engines that is produced according to strict quality specifications. Biodiesel is produced through the transesterification of organically-derived vegetable or animal oils or fats. It may be used either as a replacement for or as a component of diesel fuel.

Bioenergy: Useful, renewable energy produced from organic matter, which may either be used directly as a fuel or processed into liquids and gases.

Bioethanol: Ethanol produced from biomass feedstocks. This includes ethanol produced from the fermentation of crops, such as corn, as well as cellulosic ethanol produced from woody plants or grasses.

Biofuels: Liquid fuels and blending components produced from biomass (plant) feedstocks, used primarily for transportation. Biofuels include ethanol, biodiesel, and methanol.

Biogas: A combustible gas derived from decomposing biological waste under anaerobic conditions. Biogas normally consists of 50 to 60 percent methane. See also landfill gas.

British Thermal Unit (Btu): A measure of the heat content of fuels. It is the quantity of heat required to raise the temperature of 1 pound of liquid water by 1°F at the temperature that water has its greatest density (approximately 39°F). 1 kilowatt hour of electricity equals 3,412 Btu.

BXX (i.e. B20): A blend of petroleum diesel with a percentage of biodiesel. For example, B20 contains 20% biodiesel and 80% petroleum diesel. B100 is pure biodiesel and contains no petroleum diesel.

Camelina Feedstock: A rapid growth, omega-3 rich oilseed and non-food feedstock.

Capacity: The load that a power generation unit or other electrical apparatus or heating unit is rated by the manufacture to be able to meet or supply. Installed generator nameplate capacity is commonly expressed in megawatts (MW) and is usually indicated on a nameplate physically attached to the generator (referred to as "nameplate capacity").

Cellulosic Ethanol: While conventional ethanol is derived from soft starches (corn for example), cellulosic ethanol is derived from a wide variety of sources of cellulose (cell wall) plant fiber. These range from stalks and grain straw to switchgrass and quick-growing trees (poplar and willow)—and even municipal waste.

Combined Cycle: An electric generating technology in which electricity is produced from otherwise lost waste heat exiting from one or more gas (combustion) turbines. The exiting heat is routed to a conventional boiler or to a heat recovery steam generator for utilization by a steam turbine in the production of electricity. Such designs increase the efficiency of the electric generating unit.

Combined Heat & Power (CHP): Also known as cogeneration, CHP is the simultaneous production of electricity and heat from a single fuel source such as natural gas, biomass, biogas, coal, waste heat or oil.

Concentrated Solar Thermal (CSP): A solar energy conversion system characterized by the optical concentration of solar rays through an arrangement of mirrors to generate a high temperature working fluid which generates steam to drive a turbine to produce electricity .

Conservation Reserve Program (CRP): The Conservation Reserve Program (CRP) provides technical and financial assistance to eligible farmers and ranchers to address soil, water, and related natural resource concerns on their lands in an environmentally beneficial and cost-effective manner. The program provides assistance to farmers and ranchers in complying with Federal, State, and tribal environmental laws, and encourages environmental enhancement. The program is funded through the Commodity Credit Corporation (CCC). CRP is administered by the Farm Service Agency, with NRCS providing technical land eligibility determinations, conservation planning and practice implementation.

Consumer-Owned Utility: A municipal electric utility, a people's utility district or an electric cooperative.

Cord: The measure of an amount of wood that is 4 x 4 x 8 feet, or 128 cubic feet.

Crop Residue: Agricultural crop residues are the plant parts, primarily stalks and leaves, not removed from the fields with the primary food or fiber product. Examples include corn stover (including stalks, leaves, husks, and cobs), wheat straw, and rice straw.

Distributed Generation (DG): Small, modular, decentralized, grid–connected or off–grid energy systems located in or near the place where energy is used.

Electric Cooperative: A member-owned electric utility company serving retail electricity customers. Electric cooperatives may be engaged in the generation, wholesale purchasing, transmission, and/or distribution of electric power to serve the demands of their members on a not-for-profit basis.

EXX (i.e. E15): A blend of gasoline with a percentage of ethanol. For example, E15 contains 15% ethanol and 85% gasoline. E100 is pure ethanol without any added gasoline. The U.S. Environmental Protection Agency has approved E15 for use in model year 2001 and newer cars, light-duty trucks, medium duty passenger vehicles (SUVs), and all flex-fuel vehicles (FFVs).

Feasibility Project: Analysis and evaluation of a proposed project to determine if it (1) is technically feasible, (2) is feasible within the estimated cost, and (3) will be profitable. Feasibility studies are almost always conducted where large sums are at stake.

Federal Energy Regulatory Commission (FERC): An independent federal agency that regulates the interstate transmission of electricity, natural gas, and oil. FERC also reviews proposals to build liquefied natural gas (LNG) terminals and interstate natural gas pipelines as well as licensing hydropower projects. The Energy Policy Act of 2005 gave FERC additional responsibilities as outlined in FERC's Top Initiatives and updated Strategic Plan.

Feed-in Tariff: A policy that requires utilities to pay a fixed, premium rate for renewable energy generation

Feedstock: Any material used as a fuel directly or converted to another form of fuel or energy product.

Flat Plate Collector: A solar thermal collection device in which heat collection takes place through a thin absorber sheet backed by an array of tubing that is placed within an insulated casing.

Forest Residue: Logging residues and other removable material left after carrying out silviculture operations and site conversions. Forest slash or logging residues are the portions of the trees that remain on the forest floor or on the landing after logging operations have taken place.

Fuel Cells: One or more cells capable of generating an electrical current by converting the chemical energy of a fuel directly into electrical energy. Fuel cells differ from conventional electrical cells in that the active materials such as fuel and oxygen are not contained within the cell but are supplied from outside.

Gasification and Catalytic Processes: A method for converting coal, petroleum, biomass, wastes, or other carbon-containing materials into a gas that can be burned to generate power or processed into chemicals and fuels. A refining process using controlled heat and pressure with catalysts to rearrange certain hydrocarbon molecules, there by converting paraffinic and naphthenic type hydrocarbons (e.g., low octane gasoline boiling range fractions) into petrochemical feedstocks and higher octane stocks suitable for blending into finished gasoline.

Geothermal Heat Pumps (GHP): A heat pump in which the refrigerant exchanges heat (in a heat exchanger) with a fluid circulating through an earth connection medium (ground or ground water). The fluid is contained in a variety of loop (pipe) configurations depending on the temperature of the ground and the ground area available. Loops may be installed horizontally or vertically in the ground or submersed in a body of water.

GW(h): One billion watt-hours (gigawatt-hour).

Independent Power Producer (IPP): A corporation, person, agency, authority, or other legal entity or instrumentality that owns or operates facilities for the generation of electricity for use primarily by the public, and that is not an electric utility.

Interconnected: Two or more electric systems having a common transmission line that permits a flow of energy between them. The physical connection of the electric power transmission facilities allows for the sale or exchange of energy.

Interconnection Standards: The technical and procedural process by which a customer connects an electricity-generating system to the grid. Interconnection standards include the technical and contractual arrangements that system owners and utilities must abide by. Standards for systems connected at the distribution level are typically adopted by state public utility commissions, while the Federal Energy Regulatory Commission (FERC) has adopted standards for systems connected at the transmission level. Most states have adopted interconnection standards, but some states' standards apply only to investor-owned utilities - not to municipal utilities or electric cooperatives.

Investment Tax Credit (ITC): The ITC is a federal tax credit based on a percentage of a taxpayer's investment in qualifying energy property. For example, if the taxpayer's investment in qualifying energy property is $100 and the credit rate is 30%, the amount of the ITC is $30. In general, the investment in energy property is the cost of the facility.

Investor-Owned Utility (IOU): A privately-owned electric utility whose stock is publicly traded. An IOU is rate regulated and authorized to achieve an allowed rate of return.

Kinetic Energy Capture: Energy available as a result of motion that varies directly in proportion to an object's mass and the square of its velocity.

kW(h): One thousand watt-hours (kilowatt-hour).

Landfill Gas: Gas that is generated by decomposition of organic material at landfill disposal sites.

mGy: Million gallons per year.

Municipal Solid Waste – Any organic matter, including sewage, industrial and commercial wastes, from municipal waste collection systems. Municipal waste does not include agricultural and wood wastes or residues.

Municipal Utility: A provider of utility services owned and operated by a city government.

MW(h): One million watt-hours (megawatt-hour).

Nacelle: The back-end of a wind turbine that houses the gearbox, drive train and control electronics.

Net Excess Generation (NEG): The amount of gross generation less the electrical energy consumed at the generating station(s) for station service or auxiliaries.

Net Metering: For electric customers who generate their own electricity, net metering allows for the flow of electricity both to and from the customer – typically through a single, bi-directional meter. When a customer's generation exceeds the customer's use, electricity from the customer flows back to the grid, offsetting electricity consumed by the customer at a different time during the same billing cycle.

Original Equipment Manufacturer (OEM): An OEM manufactures products or components that are purchased by a company and retailed under the purchasing company's brand name.

Perennial Grasses: Unlike corn, which must be replanted every year, perennial grasses, such as switchgrass and Miscanthus, preserve and increase carbon stores in the soil. These and other grasses have been proposed as high-energy alternative feedstocks for biofuel production.

Photovoltaic (PV) Module: An integrated assembly of interconnected photovoltaic cells designed to deliver a selected level of working voltage and current at its output terminals, packaged for protection against environment degradation, and suited for incorporation in photovoltaic power systems. It is also known as a solar module or solar panel.

Polyitaconic Acid: A water soluble polymer with a 2 million metric ton per year market potential as a replacement for petrochemical dispersants, detergents, and super-absorbents.

Power Purchase Agreement (PPA): A legal contract in which a power purchaser purchases the energy produced, and sometimes the capacity and/or additional services, from an electricity generator.

Primary Mill Resource: Mill residues that include wood materials (coarse and fine) and bark generated at manufacturing plants (primary wood-using mills) when round wood products are processed into primary wood products, such as slabs, edgings, trimmings, sawdust, veneer clippings and cores, and pulp screenings.

Production Incentives/Performance-Based Incentives: Performance-based incentives (PBIs), also known as production incentives, provide cash payments based on the number of kilowatt-hours (kWh) or BTUs generated by a renewable energy system. A "feed-in tariff" is an example of a PBI.

Production Tax Credit (PTC): A federal tax credit based on the per kWh of electricity sold by a taxpayer from a qualifying facility to an unrelated entity. For facilities selling electricity generated from wind, closed-loop biomass and geothermal sources, the PTC rate is 1.5 cents per kWh, which is adjusted for inflation and is 2.1 cents per kWh in 2009. For persons selling electricity generated from open-loop biomass, landfill gas, trash, qualified hydropower or marine and hydrokinetic sources, the credit rate is half the credit rate for wind (1.1 cents per kWh in 2009). The PTC can be made for sales in the first 10 years from the time the facility is originally placed in service.

Property-Assessed Renewable Energy (PACE) Financing: A Property Assessed Clean Energy loan program provides residential and commercial property owners with a loan for energy efficiency and renewable energy measures which is subsequently paid back over a certain number of years via an annual charge on their property tax bill.

Public Benefit Funds (PBF): Public benefits funds (PBFs), or clean energy funds, are typically created by levying a small fee or surcharge on electricity rates paid by customers (i.e., system benefits charge [SBC]). The resulting funds can be used to support clean energy supply (i.e., renewable energy, energy efficiency, and combined heat and power [CHP]).

Renewable Energy Credit (REC): A REC, also known as a green tag or renewable energy certificate, represents the property rights to the environmental, social, and other non-power qualities of renewable electricity generation. A REC, and its associated attributes and benefits, can be sold separately (unbundled) from the underlying physical electricity associated with a renewable-based generation source or together (bundled). When unbundled, it is also known as a tradable renewable energy certificate (TREC). A solar renewable energy credit (SREC) is a REC specifically generated by solar energy.

Renewable Energy Resources: Energy resources that are virtually inexhaustible in duration but limited in the amount of energy that is available per unit of time. Renewable energy resources include: biomass, hydro, geothermal, solar, wind, ocean thermal, wave action, and tidal action.

Renewable Energy Zones (REZ): Renewable energy zones are special areas designated for renewable energy generation based on land suitability, resource potential, and existing renewable energy generation. Electric transmission infrastructure is constructed in those zones to move renewable energy to markets where people use energy.

Renewable (Green) Diesel: Renewable diesel is produced by hydrotreating or hydrocracking plant oils or animal fats. Unlike biodiesel, it has chemical properties identical to petroleum diesel.

Renewable Portfolio Standard (RPS): A regulatory mechanism requiring that retail electricity suppliers procure a minimum quantity of eligible renewable energy by a specific date, in percentage, megawatt hour, or megawatt terms.

Revolving Loan Fund: A capitalized fund, typically maintained by a state government, that provides low–interest loans for energy efficiency improvements, renewable energy, and distributed generation. As the loans are repaid, they are deposited back into the fund for redistribution as subsequent loans.

Salvage Value: The estimated value that an asset will realize upon its sale at the end of its useful life.

Secondary Mill Resource: Materials leftover after the processing of wood scraps and sawdust from woodworking shops, furniture factories, wood container and pellet mills, and wholesale lumberyards.

Solar and Wind Access Laws: Solar and wind access laws are designed to establish a right to install and operate a solar or wind energy system at a home or other facility. Some solar access laws also ensure a system owner's access to sunlight.

Solar Thermal: A solar energy system that collects or absorbs solar energy for heat or electricity. Solar thermal systems can be used to generate high temperature heat (for electricity production and/or process heat), medium temperature heat (for process and space/water heating and electricity generation), and low temperature heat (for water and space heating and cooling).

Switchgrass: A native warm-season, perennial grass indigenous to the Central and North American tall-grass prairie into Canada. The plant is an immense biomass producer that can reach heights of 10 feet or more. Its high cellulosic content makes switchgrass a candidate for ethanol production as well as a combustion fuel source for power production.

Systems Benefit Charge: See **Public Benefit Fund**.

Metric Ton: A metric unit of measurement equal to 1000 kilograms, used to measure biomass.

Ton: An imperial unit of measurement equal to 2240 pounds.

Waste Heat to Power (WH2P): Capturing industrial waste heat for power generation.

Wood Pellet: Saw dust compressed into uniform diameter pellets to be burned in a heating stove.

*Glossary sources**:** Database of State Incentives for Renewables & Efficiency (DSIRE), Department of Energy Office of Energy Efficiency and Renewable Energy (EERE), Energy Information Administration (EIA), Environmental Protection Agency (EPA), National Renewable Energy Laboratory (NREL), International Energy Agency (IEA).*