

# Renewable Energy in the 50 States: Northeastern Region



2013 Edition





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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 2013 on National Defense & Security, Power Generation & Infrastructure, and Transportation. Additional information is available at [www.acore.org](http://www.acore.org).

## Acknowledgements

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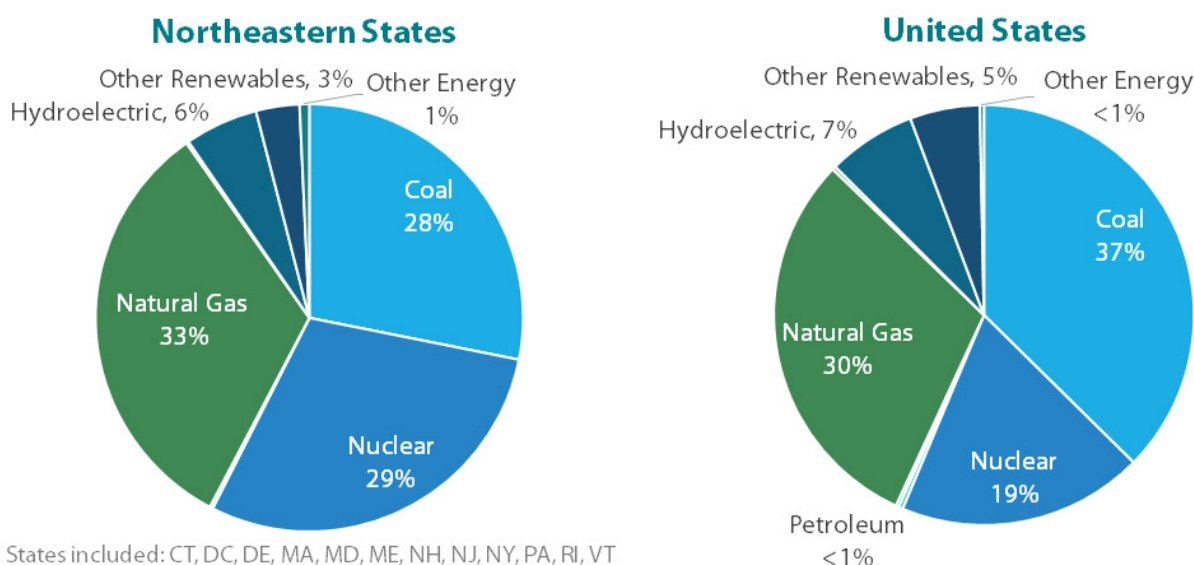
# Table of Contents

<b>Executive Summary .....</b>	<b>3</b>
<b>State Profiles .....</b>	<b>6</b>
Connecticut.....	6
Delaware .....	8
District of Columbia.....	10
Maine .....	12
Maryland .....	14
Massachusetts .....	16
New Hampshire .....	18
New Jersey.....	20
New York.....	22
Pennsylvania .....	24
Rhode Island .....	26
Vermont.....	28
<b>Appendix .....</b>	<b>30</b>
User's Guide .....	30
Glossary .....	33

## Executive Summary

With high electricity prices, a reliance on imported energy, and ongoing retirements of fossil fuel power plants, the Northeast has a strong incentive 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 solar power capacity and 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 like wind farms.

### ELECTRICITY GENERATION BY SOURCE, 2012



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<sup>1</sup> 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. Nevertheless, a wind moratorium in Connecticut and recent cutbacks to state incentives in other states threaten to prevent the region from meeting its full renewable energy potential.

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.<sup>2</sup>

<sup>1</sup> Including the District of Columbia

<sup>2</sup> [http://www.renewgridmag.com/e107\\_plugins/content/content.php?content.10514](http://www.renewgridmag.com/e107_plugins/content/content.php?content.10514)

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. In August 2013, the U.S. Department of the Interior held the nation's first offshore wind lease sale off the coast of Rhode Island and Massachusetts, the scale of which could support enough turbines to power one million homes.<sup>3</sup>

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,<sup>4</sup> 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, using a number of available feedstocks like 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. Three large utilities in Massachusetts recently signed long-term contracts to purchase renewable energy at less than \$0.08 per kilowatt hour, below the cost of most conventional sources. If the contracts are approved by state regulators, they would save customers between \$0.75 and \$1.00 a month.<sup>5</sup> 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.<sup>6</sup>

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 \$229.1 million in venture capital and private equity investment raised for renewable energy in 2012. 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.

<sup>3</sup> <http://ecowatch.com/2013/08/01/first-offshore-wind-sale-new-england>

<sup>4</sup> <http://www.eia.gov/forecasts/steo/report/winterfuels.cfm>

<sup>5</sup> <http://www.bostonglobe.com/business/2013/09/22/suddenly-wind-competitive-with-conventional-power-sources/g3RBhfV440kJwC6UyVCjhI/story.html>

<sup>6</sup> 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>

## NORTHEASTERN STATE INSTALLED CAPACITY RANKINGS

	Renewable Power (w/hydro)	Renewable Power (w/o hydro)	Renewable Fuels
1.	<b>New York*</b> : 6,991 MW	<b>New York*</b> : 2,335 MW	<b>Pennsylvania</b> : 221 mGy
2.	<b>Pennsylvania*</b> : 2,925 MW	<b>Pennsylvania*</b> : 2,142 MW	<b>New York</b> : 189 mGy
3.	<b>Maine*</b> : 1,775 MW	<b>New Jersey*</b> : 1,219 MW	<b>New Jersey</b> : 90 mGy
4.	<b>New Jersey*</b> : 1,232 MW	<b>Maine*</b> : 1,042 MW	<b>Maryland</b> : 8 mGy
5.	<b>Massachusetts*</b> : 1,053 MW	<b>Massachusetts*</b> : 783 MW	<b>New Hampshire</b> : 6 mGy
6.	<b>Maryland*</b> : 951 MW	<b>Maryland*</b> : 400 MW	<b>Delaware</b> : 5 mGy
7.	<b>New Hampshire*</b> : 814 MW	<b>New Hampshire*</b> : 368 MW	<b>Connecticut</b> : 4 mGy
8.	<b>Vermont†</b> : 550 MW	<b>Connecticut*</b> : 260 MW	<b>Maine</b> : 2 mGy
9.	<b>Connecticut*</b> : 379 MW	<b>Vermont†</b> : 235 MW	<b>Rhode Island</b> : 2 mGy
10.	<b>Delaware*</b> : 56 MW	<b>Delaware*</b> : 56 MW	<b>Massachusetts</b> : 1 mGy
11.	<b>Rhode Island*</b> : 40 MW	<b>Rhode Island*</b> : 37 MW	<b>District of Columbia</b> : 0 mGy
12.	<b>District of Columbia*</b> : 14 MW	<b>District of Columbia*</b> : 14 MW	<b>Vermont</b> : 0 mGy
	<b>Total</b> : 16,780 MW	<b>Total</b> : 8,891 MW	<b>Total</b> : 528 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

# Renewable Energy in Connecticut

## Summary

An aggressive 27% renewable portfolio standard and state policies, like 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. However, the state continues to uphold its moratorium on large-scale wind energy projects, limiting Connecticut from reaching its full renewable energy generation potential. New solar, fuel cell, and biomass projects continue to be constructed, with several expected to commence operations within the next year.

### Installed Renewable Energy Capacity, 2012

Wind Power	0 MW	Marine Power	0 MW
Solar Photovoltaic	39.6 MW	Biomass & Waste	221 MW
Solar Thermal Electric	0 MW	Ethanol	0 mGy
Geothermal Power	0 MW	Biodiesel	4 mGy
Hydropower	119 MW	<b>Totals</b>	<b>379 MW; 4 mGy</b>

Sources: See User's Guide for details

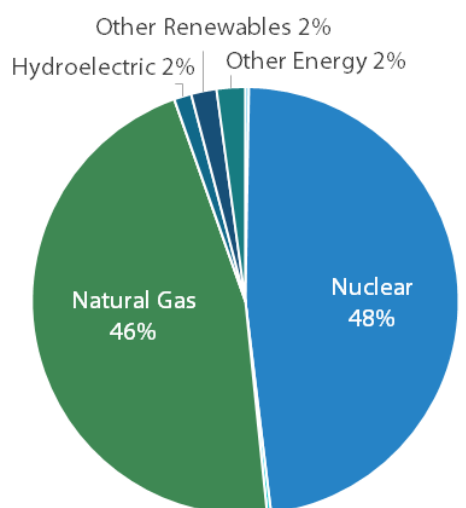
## Market Spotlight

- ▶ A 250 MW wind farm in Maine and a 20 MW solar photovoltaic system in Sprague and Lisbon will provide clean power to Connecticut's grid by the end of 2016. The price of power from the two projects will average under \$0.08/kWh, close to the price of power from conventional fossil fuel generation.<sup>7</sup>
- ▶ An alternative fuel jet center will conduct feasibility studies on converting organic waste and other forms of biomass into useable jet fuel. Funded by the U.S. Department of Agriculture, the center will benefit surrounding farmers and foresters, while creating 150 new permanent jobs.
- ▶ The \$100 million Montville Renewable Energy Park, which will have two fuel cell generators, a solar energy farm, and a biomass power plant, is scheduled to begin construction by the end of the year. The park will create up to 200 jobs in the local and regional economy and have a capacity of 50 MW.
- ▶ A \$225 million, 38 MW biomass project is under development on industrial-zoned land in Plainfield, which will use recycled wood waste to produce energy. It is expected to be completed by January 2014.

## Economic Development

Employment	2011	
Green Goods & Services Jobs	43,722	
Investment (Grossed-up)	2011	2012
Asset Finance	\$13.3m	\$228m
Venture Capital & Private Equity	\$0.2m	\$0.2m

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



Electricity Generation, 2012 (EIA)

<sup>7</sup> [http://www.renewgridmag.com/e107\\_plugins/content/content.php?content.10330](http://www.renewgridmag.com/e107_plugins/content/content.php?content.10330)

# Renewable Energy in Connecticut

## State Policy

<b>Renewable Portfolio Standard</b>	<ul style="list-style-type: none"> <li>▶ 27% by 2020               <ul style="list-style-type: none"> <li>○ Class I (20% by 2020): Solar, wind, fuel cells, geothermal, biogas, ocean, certain biomass, certain hydro, low-emission renewable energy conversion devices</li> <li>○ Class II (3% by 2010, Class I may also be used to meet requirement): Trash-to-energy, certain biomass, older run-of-river hydro</li> <li>○ Class III (4% by 2010): Certain combined heat and power (CHP), energy efficiency, waste heat</li> </ul> </li> <li>▶ All electric suppliers and electric distribution company wholesale suppliers</li> <li>▶ Renewables in some neighboring states are also eligible</li> <li>▶ The Clean Energy Finance and Investment Authority must develop a residential solar incentive program that will result in at least 30 MW before 2023</li> <li>▶ 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</li> </ul>
<b>Net Metering</b>	<ul style="list-style-type: none"> <li>▶ Investor-owned utilities (IOUs)</li> <li>▶ 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)</li> <li>▶ 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</li> <li>▶ Customer owns RECs</li> </ul>
<b>Interconnection Standards</b>	<ul style="list-style-type: none"> <li>▶ IOUs; system capacity limit of 20 MW</li> <li>▶ External disconnect switch required; insurance requirements vary by system size/type</li> </ul>
<b>Tax Incentives</b>	<p><b>Sales and Use Tax Exemptions:</b></p> <ul style="list-style-type: none"> <li>▶ For the equipment and labor to install solar energy and geothermal resource systems</li> <li>▶ For the equipment, machinery, and fuels used to manufacture solar electric, solar thermal, wind power, or geothermal systems</li> </ul> <p><b>Electric Generation Tax Exemption:</b></p> <ul style="list-style-type: none"> <li>▶ Renewable energy systems are exempt from a \$2.50/MWh tax imposed on electric power plants that feed electricity into the regional bulk power grid</li> </ul> <p><b>Property Tax Exemption:</b> For Class I systems and certain hydropower facilities that serve farms and residences limited to four units</p>
<b>Other Financial Incentives</b>	<p><b>Residential Solar PV:</b></p> <ul style="list-style-type: none"> <li>▶ Expected Performance-Based Buydown: Lump-sum payment based on design characteristics of customer-owned systems 10 kW and under (max. incentive: \$11,500)</li> <li>▶ Performance-Based Incentive: Payment for actual performance of a third-party owned system over six years, paid to system owner</li> </ul> <p><b>Solar Hot Water:</b></p> <ul style="list-style-type: none"> <li>▶ Grants and loans for customers of Connecticut Light &amp; Power or The United Illuminating Company that install residential or commercial solar hot water systems</li> <li>▶ For residential, incentives cover approximately 30% of an average system's cost</li> </ul> <p><b>CHP and Anaerobic Digestion (AD) Incentives:</b> Grants, loans, or power purchases for CHP projects 5 MW and less or for AD projects up to 3 MW; \$5m program budget for CHP program and for AD program</p> <p><b>Biofuels Research Grants:</b> For higher education or agricultural research institutions for biofuel production from agricultural products, algae, and waste grease and testing</p>
<b>More Info</b>	<ul style="list-style-type: none"> <li>▶ DSIRE Database: <a href="http://www.dsireusa.org/incentives/index.cfm?state=CT">www.dsireusa.org/incentives/index.cfm?state=CT</a></li> <li>▶ Clean Energy Finance and Investment Authority (Green Bank): <a href="http://www.ctcleanenergy.com">www.ctcleanenergy.com</a></li> <li>▶ Energize Connecticut: <a href="http://www.energizect.com">www.energizect.com</a></li> <li>▶ Public Utilities Regulatory Authority (RPS): <a href="http://www.ct.gov/pura/cwp/view.asp?a=3354&amp;q=415186">www.ct.gov/pura/cwp/view.asp?a=3354&amp;q=415186</a></li> </ul>



# 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 – placing the state within the top ten nationally for solar energy capacity per capita. However, to date, Delaware's other renewable energy sectors remain relatively underdeveloped.

Installed Renewable Energy Capacity, 2012			
Wind Power	2 MW	Marine Power	0 MW
Solar Photovoltaic	46.1 MW	Biomass & Waste	8 MW
Solar Thermal Electric	0 MW	Ethanol	0 mGy
Geothermal Power	0 MW	Biodiesel	5 mGy
Hydropower	0 MW	<b>Totals</b>	56 MW; 5 mGy

Sources: See User's Guide for details

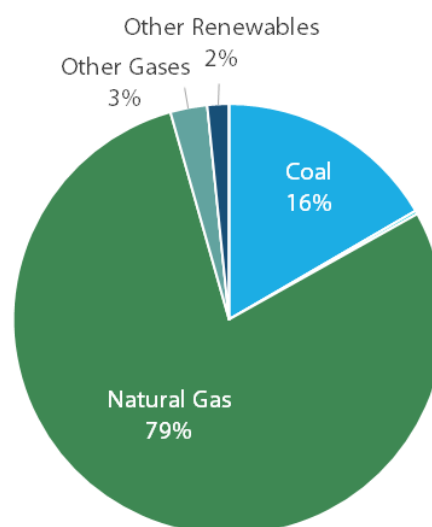
## Market Spotlight

- ▶ A 15 MW solar farm, the state's largest, was dedicated in April 2013 in Milford. The \$50 million project secured a 20-year power purchase agreement with a local utility, and has the ability to power 9,000 homes and displace approximately 12,000 tons of greenhouse gas emissions annually (equivalent to removing about 2,300 cars from the road).
- ▶ A new landfill gas-to-energy project is under construction in Kent County and is expected to be completed by the end of the year. Delaware Electric Cooperative will purchase 2 MW of power produced, enough to power 1,000 homes.
- ▶ In October 2012, the U.S. Department of the Interior and the Bureau of Ocean Energy Management issued a lease for a 450 MW commercial wind development off the coast of Delaware. It is uncertain when construction on the project will begin.

## Economic Development

Employment		2011	
Green Goods & Services Jobs		9,872	
Investment (Grossed-up)		2011	2012
Asset Finance		\$676.2m	\$50m
Venture Capital & Private Equity		\$2.5m	-

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



Electricity Generation, 2012 (EIA)

# Renewable Energy in Delaware

## State Policy

<b>Renewable Portfolio Standard</b>	<ul style="list-style-type: none"> <li>▶ 25% by compliance year 2025-2026</li> <li>▶ Investor-owned utilities (IOUs), retail electric suppliers, municipal utilities, and rural electric cooperatives (representing 70% of state's electric load)               <ul style="list-style-type: none"> <li>○ Municipal utilities and rural electric cooperatives may opt out of the standard if they implement a comparable RPS of their own</li> </ul> </li> <li>▶ Includes 3.5% solar PV minimum; utilities must purchase solar renewable energy credits (SRECs) to comply</li> <li>▶ Renewable energy credits (RECs) from eligible customer-sited systems may be used for compliance</li> <li>▶ Penalty of \$25/MWh of shortfall for suppliers who fail to comply</li> <li>▶ 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</li> </ul>
<b>Net Metering</b>	<ul style="list-style-type: none"> <li>▶ All utilities</li> <li>▶ 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</li> <li>▶ Net excess generation 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</li> <li>▶ Virtual net metering allowed</li> </ul>
<b>Interconnection Standards</b>	<ul style="list-style-type: none"> <li>▶ All utilities</li> <li>▶ System capacity limit of 10 MW; 1 MW limit for non-renewable co-generators and small power producers</li> <li>▶ External disconnect switch required; insurance requirements vary by system size/type</li> </ul>
<b>Public Benefits Fund</b>	<b>Green Energy Program:</b> <ul style="list-style-type: none"> <li>▶ Collects ~\$3.2m annually</li> <li>▶ Provide grants for the installation of renewable energy systems</li> <li>▶ Programs operated by Delmarva Power, Delaware Electric Cooperative, and DEMEC</li> <li>▶ Grants of up to \$48,000 provided through Delmarva Power</li> <li>▶ Program regulations currently under revision</li> </ul>
<b>Performance Incentives</b>	<b>SREC Procurement Program:</b> <ul style="list-style-type: none"> <li>▶ Public solicitation for SRECs, with different tiers of solar generators based on capacity</li> <li>▶ Seeks SRECs from new systems, existing systems, spot market purchases</li> <li>▶ Subject to competitive bid pricing; 20-year terms; contract terms non-negotiable</li> </ul>
<b>Other Rebates</b>	<b>Green for Green Home Rebate:</b> <ul style="list-style-type: none"> <li>▶ \$1,000-\$2,500 for newly-constructed, "green" homes, which may incorporate renewable energy systems</li> </ul>
<b>More Info</b>	<ul style="list-style-type: none"> <li>▶ DSIRE Database: <a href="http://www.dsireusa.org/incentives/index.cfm?state=DE">www.dsireusa.org/incentives/index.cfm?state=DE</a></li> <li>▶ Division of Energy and Climate (Green Energy Program): <a href="http://www.dnrec.delaware.gov/energy/services/GreenEnergy/Pages/default.aspx">www.dnrec.delaware.gov/energy/services/GreenEnergy/Pages/default.aspx</a></li> <li>▶ Public Service Commission (RPS): <a href="http://www.depsec.delaware.gov/electric/delrps.shtml">www.depsec.delaware.gov/electric/delrps.shtml</a></li> <li>▶ Delaware SREC Program: <a href="http://www.srecdelaware.com">www.srecdelaware.com</a></li> </ul>

# 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, 2012

Wind Power	0 MW	Marine Power	0 MW
Solar Photovoltaic	14 MW	Biomass & Waste	0 MW
Solar Thermal Electric	0 MW	Ethanol	0 mGy
Geothermal Power	0 MW	Biodiesel	0 mGy
Hydropower	0 MW	<b>Totals</b>	14 MW; 0 mGy

Sources: See User's Guide for details

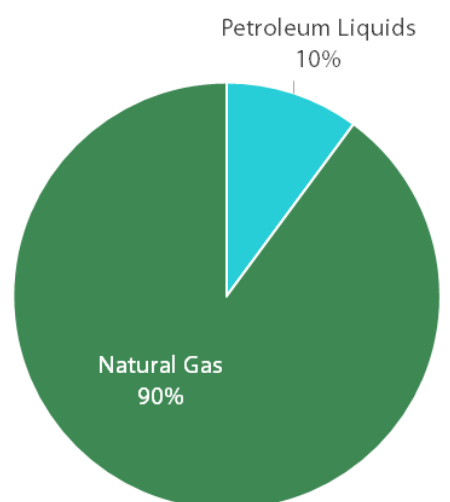
## Market Spotlight

- ▶ D.C. ranks 29<sup>th</sup> among states for solar energy capacity, impressive given its area and population.
- ▶ A 7.5 mGy biodiesel plant, which will convert used cooking oil collected from restaurants and food outlets in D.C. into high-quality biofuel, is expected to be completed by the end of 2013. The fuel will be sold to local, centrally-fueled fleets.
- ▶ Washington, D.C. government agencies began operating using 100% wind power in early 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 top U.S. cities for green power purchasing.

## Economic Development

<b>Employment</b>	<b>2011</b>	
Green Goods & Services Jobs	35,799	
<b>Investment (Grossed-up)</b>	<b>2011</b>	<b>2012</b>
Asset Finance	-	-
Venture Capital & Private Equity	-	-

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



Electricity Generation, 2012 (EIA)

# Renewable Energy in the District of Columbia

## State Policy

<b>Renewable Portfolio Standard</b>	<ul style="list-style-type: none"> <li>▶ 20% by 2020</li> <li>▶ All utilities</li> <li>▶ Includes a 2.5% solar requirement by 2023               <ul style="list-style-type: none"> <li>○ 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.</li> </ul> </li> <li>▶ 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)</li> <li>▶ Solar thermal (non-electric) energy is also counted as a qualifying resource</li> </ul>
<b>Net Metering</b>	<ul style="list-style-type: none"> <li>▶ Investor-owned utilities (IOUs)</li> <li>▶ System capacity limit of 1 MW</li> <li>▶ 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</li> <li>▶ Customer owns renewable energy credits (RECs)</li> </ul>
<b>Interconnection Standards</b>	<ul style="list-style-type: none"> <li>▶ IOUs</li> <li>▶ System capacity limit of 10 MW</li> <li>▶ External disconnect switch and extra insurance required for certain systems</li> </ul>
<b>Rebates</b>	<b>Renewable Energy Incentive Program (REIP):</b> <ul style="list-style-type: none"> <li>▶ 20% of the total cost of non-residential solar thermal systems, up to \$6,000</li> <li>▶ 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</li> <li>▶ \$0.50/watt for non-residential PV systems, up to \$10,000</li> <li>▶ \$3.00/watt for residential PV systems, up to \$10,000</li> </ul>
<b>Tax Incentives</b>	<b>Property Tax Exemption:</b> <ul style="list-style-type: none"> <li>▶ Solar energy and co-generation systems are exempt from personal property taxes</li> </ul>
<b>Public Benefit Fund</b>	<b>Sustainable Energy Utility:</b> <ul style="list-style-type: none"> <li>▶ Collects about \$20m/year to support energy efficiency and renewable energy programs</li> </ul>
<b>More Info</b>	<ul style="list-style-type: none"> <li>▶ DSIRE Database: <a href="http://www.dsireusa.org/incentives/index.cfm?state=DC">www.dsireusa.org/incentives/index.cfm?state=DC</a></li> <li>▶ Department of the Environment (Energy): <a href="http://www.ddoe.dc.gov/energy">www.ddoe.dc.gov/energy</a></li> <li>▶ Sustainable Energy Utility: <a href="http://www.dcseu.com">www.dcseu.com</a></li> <li>▶ Public Service Commission (RPS): <a href="http://www.dcpssc.org/electric/renewable.asp">www.dcpssc.org/electric/renewable.asp</a></li> </ul>



# 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. A sweeping energy bill was signed into law in summer 2013, which aims to reduce energy costs to Maine residents, increase energy efficiency funding, encourage renewable energy projects, improve electric system reliability, and protect the environment.<sup>8</sup>

### Installed Renewable Energy Capacity, 2012

Wind Power	431 MW	Marine Power	0.24 MW
Solar Photovoltaic	2.8 MW	Biomass & Waste	609 MW
Solar Thermal Electric	0 MW	Ethanol	0 mGy
Geothermal Power	0 MW	Biodiesel	2 mGy
Hydropower	733 MW	<b>Totals</b>	<b>1,775 MW; 2 mGy</b>

Sources: See User's Guide for details

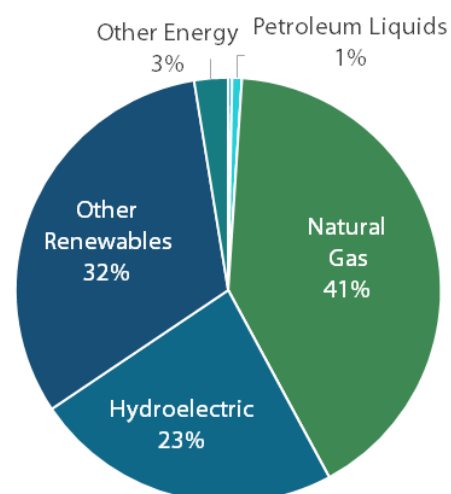
## Market Spotlight

- ▶ Four plants in Maine became the first biomass-powered facilities in the world to achieve certification under the Sustainable Forestry Initiative Standard. The plants have a combined capacity of 325 MW.
- ▶ 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.
- ▶ Two Maine wind projects, totaling 330 MW, secured long-term contracts with utilities in September 2013 to provide power to Massachusetts. The projects will complete construction as early as 2015 and together power about 120,000 homes.
- ▶ Bowdoin College's board of trustees approved a 1.3 MW solar PV project in October 2013, to be one of the largest solar projects in the state. A portion of the project will be installed off campus at a nearby former naval air station. It is expected to be complete in late 2014 or early 2015.

## Economic Development

Employment		2011	
Green Goods & Services Jobs		16,951	
Investment (Grossed-up)		2011	2012
Asset Finance		\$221.6m	\$76m
Venture Capital & Private Equity		-	-

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



Electricity Generation, 2012 (EIA)

<sup>8</sup> <http://www.preti.com/2013-Omnibus-Energy-Bill-Overview>

# Renewable Energy in Maine

## State Policy

<b>Renewable Portfolio Standard</b>	<ul style="list-style-type: none"> <li>▶ 40% by 2017 (including 10% from new resources that came online after 9/1/2005)</li> <li>▶ Investor-owned utilities (IOUs), retail electric suppliers (representing 98.7% of state's electric load)</li> <li>▶ Eligible facilities must not exceed 100 MW (excluding new wind), and may include certain "small power production facilities"</li> <li>▶ Certain community-based projects may receive a credit multiplier</li> <li>▶ Utilities may pay an alternative compliance payment in lieu of meeting the standard</li> <li>▶ 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</li> </ul>
<b>Net Energy Billing</b>	<ul style="list-style-type: none"> <li>▶ All utilities</li> <li>▶ 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)</li> <li>▶ Net excess generation credited to next bill at retail rate; excess credit granted to utility at end of 12 months</li> <li>▶ Virtual net metering allowed</li> </ul>
<b>Interconnection Standards</b>	<ul style="list-style-type: none"> <li>▶ Transmission and distribution utilities</li> <li>▶ No system capacity limit specified</li> <li>▶ Insurance requirements for certain systems</li> </ul>
<b>Tax Incentives</b>	<p><b>Biofuels Production Tax Credit:</b></p> <ul style="list-style-type: none"> <li>▶ Income tax credit of \$0.05/gasoline gallon equivalent of biofuel produced</li> <li>▶ Commercially-produced ethanol, biodiesel, hydrogen, methanol, or other transportation fuels derived from agricultural or forest feedstocks</li> <li>▶ Unused credit may be carried forward for up to 10 years</li> </ul> <p><b>Biodiesel Fuel Tax Exemption:</b></p> <ul style="list-style-type: none"> <li>▶ Individuals that produce biodiesel for personal use or use by an immediate family member are exempt from the state fuel excise tax</li> </ul>
<b>Production Incentive</b>	<p><b>Community-Based Renewable Energy Pilot Program:</b></p> <ul style="list-style-type: none"> <li>▶ Program will permit up to 50 MW of generating capacity; individual systems may not exceed 10 MW</li> <li>▶ 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</li> <li>▶ Systems must be 51% locally-owned and located in state</li> <li>▶ 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)</li> </ul>
<b>More Info</b>	<ul style="list-style-type: none"> <li>▶ DSIRE Database: <a href="http://www.dsireusa.org/incentives/index.cfm?state=ME">www.dsireusa.org/incentives/index.cfm?state=ME</a></li> <li>▶ Public Utilities Commission: <a href="http://www.maine.gov/mpuc/electricity/rps-class-l-list.shtml">www.maine.gov/mpuc/electricity/rps-class-l-list.shtml</a></li> <li>▶ Efficiency Maine: <a href="http://www.efficiencymaine.com">www.efficiencymaine.com</a></li> <li>▶ Governor's Energy Office: <a href="http://www.maine.gov/energy">www.maine.gov/energy</a></li> </ul>

# 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 energy market will attract attention from investors and developers from around the country. In addition, the state has begun to incentivize renewable thermal projects to reduce the fossil fuel consumption of buildings, through programs like its Clean Burning Wood Stove Grant Program. With the passage of the Maryland Offshore Wind Energy Act of 2013, the state has also created a mechanism to incentivize the development of up to 500 MW of offshore wind capacity.<sup>9</sup>

### Installed Renewable Energy Capacity, 2012

Wind Power	120 MW	Marine Power	0 MW
Solar Photovoltaic	116.8 MW	Biomass & Waste	163 MW
Solar Thermal Electric	0 MW	Ethanol	0 mGy
Geothermal Power	0 MW	Biodiesel	8 mGy
Hydropower	551 MW	<b>Totals</b>	<b>951 MW; 8 mGy</b>

Sources: See User's Guide for details

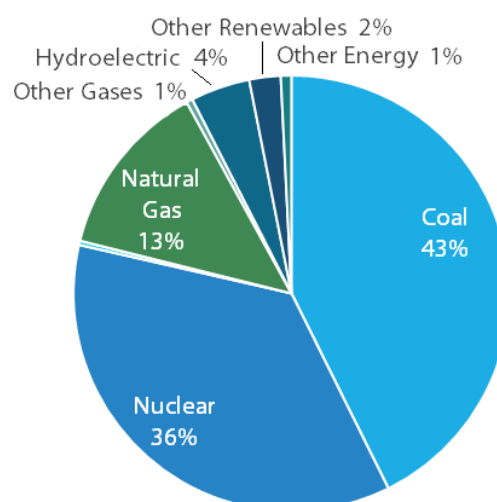
## Market Spotlight

- ▶ A request for proposals for a 15 MW solar photovoltaic facility located on Fort Detrick closed in April 2013. The PV system will be designed as "microgrid ready" to contribute to the overall energy security of the installation. A private developer for the project was selected in November 2013.
- ▶ The state experienced a 227% jump in solar PV installations in 2012 compared to 2011. The state's largest rooftop solar array, and one of the largest in the nation, came online in Perryville in May 2013 with a nameplate capacity of 2.7 MW.
- ▶ Several facilities produce energy from Maryland's waste products. Construction began on a 158 MW waste-to-energy facility in August 2013, located in South Baltimore. The facility will use trash, wood, and tires to generate power for the grid. The project is expected to take 36 months to complete and create 180 jobs.
- ▶ The Maryland Public Service Commission approved a proposal in spring 2013 to build a 24-turbine wind farm near Frostburg. It is expected to be completed by the end of 2013.

## Economic Development

Employment	2011	
Green Goods & Services Jobs	91,489	
Investment (Grossed-up)	2011	2012
Asset Finance	\$85.8m	\$82.1m
Venture Capital & Private Equity	\$6.4m	\$1.1m

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



Electricity Generation, 2012 (EIA)

<sup>9</sup> <http://www.governor.maryland.gov/wind.html>

# Renewable Energy in Maryland

## State Policy

<b>Renewable Portfolio Standard</b>	<ul style="list-style-type: none"> <li>▶ 20% by 2022</li> <li>▶ All electricity suppliers</li> <li>▶ Includes targets for 2% solar by 2020 and up to 2.5% cost-effective offshore wind</li> <li>▶ 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</li> <li>▶ If targets not met, utilities must pay an alternative compliance payment</li> </ul>
<b>Net Metering</b>	<ul style="list-style-type: none"> <li>▶ All utilities</li> <li>▶ System capacity limit of 2 MW (30 kW for micro-CHP); aggregate capacity limit of 1.5 GW</li> <li>▶ Net excess generation credited to next bill at retail rate; reconciled after 12 months at the commodity energy supply rate</li> <li>▶ Customer owns RECs; virtual net metering allowed for some entities</li> </ul>
<b>Interconnection Standards</b>	<ul style="list-style-type: none"> <li>▶ All utilities</li> <li>▶ System capacity limit of 10 MW</li> <li>▶ Insurance requirements vary by system size/type; external disconnect switch required</li> </ul>
<b>Tax Incentives</b>	<p><b>Property Tax Incentives:</b></p> <ul style="list-style-type: none"> <li>▶ Real property tax exemption for solar and wind energy property</li> <li>▶ Solar and geothermal heating and cooling systems assessed for property tax at no more than the value of a conventional system</li> </ul> <p><b>Sales and Use Tax Exemptions:</b></p> <ul style="list-style-type: none"> <li>▶ For purchase of geothermal, wind, and solar energy equipment</li> <li>▶ For sale of electricity from qualifying solar energy and residential wind energy systems</li> <li>▶ For wood or "refused-derived" fuel used for heating</li> </ul> <p><b>Cellulosic Ethanol Research and Development Tax Credit:</b> 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</p> <p><b>Bioheat Tax Credit (Personal or Corporate):</b> Income tax credit of \$0.03/gallon for purchase of biodiesel for space or water heating; maximum incentive of \$500/year</p> <p><b>Clean Energy Production Tax Credit (Personal or Corporate):</b> \$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</p>
<b>Grants</b>	<p><b>Clean Energy Grant Program:</b></p> <ul style="list-style-type: none"> <li>▶ Solar energy, geothermal heating and cooling</li> <li>▶ Residential: \$500-\$3,000 based on system type; PV systems must not exceed 20 kW</li> <li>▶ 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)</li> </ul> <p><b>Windswept Grant Program:</b></p> <ul style="list-style-type: none"> <li>▶ Residents, businesses, nonprofits that install wind energy systems up to 750 kW</li> <li>▶ \$3,000/kW of normalized capacity, up to \$100,000 or 50% of the installation's net cost</li> </ul> <p><b>Clean Burning Wood Stove Grant Program:</b></p> <ul style="list-style-type: none"> <li>▶ \$500 for residential stick-burning stoves and \$700 for residential pellet-burning stoves</li> <li>▶ Program budget: \$50,000</li> </ul> <p><b>Geothermal Heat Pump Grant Program:</b></p> <ul style="list-style-type: none"> <li>▶ \$3,000 total for residential projects; \$90-\$180/ton for non-residential projects</li> </ul>
<b>Fuel Production Incentive</b>	<ul style="list-style-type: none"> <li>▶ Biodiesel: \$0.20/gallon from soybean oil; \$0.05/gallon from other feedstocks</li> <li>▶ Ethanol: \$0.20/gallon from small grains; \$0.05/gallon from other agricultural products</li> </ul>
<b>More Info</b>	<ul style="list-style-type: none"> <li>▶ DSIRE Database: <a href="http://www.dsireusa.org/incentives/index.cfm?state=MD">www.dsireusa.org/incentives/index.cfm?state=MD</a></li> <li>▶ Maryland Energy Administration: <a href="http://www.energy.maryland.gov">www.energy.maryland.gov</a></li> <li>▶ Public Service Commission (RPS): <a href="http://webapp.psc.state.md.us/intranet/ElectricInfo/home_new.cfm">http://webapp.psc.state.md.us/intranet/ElectricInfo/home_new.cfm</a></li> </ul>



# Renewable Energy in Massachusetts

## Summary

Massachusetts spends about 80% of its annual energy expenditures on procuring energy from outside of the state. By leveraging its scientific expertise, academic and innovation resources, and highly educated workforce, Massachusetts has developed a supportive policy portfolio to become an early leader in clean energy research, innovation, and deployment. Recently, the Massachusetts Department of Energy Resources began to work with military bases in the state to identify renewable energy activities that can help reduce base operating costs, increase energy security, and help meet broader military and state energy goals.

### Installed Renewable Energy Capacity, 2012

Wind Power	103 MW	Marine Power	0 MW
Solar Photovoltaic	207.3 MW	Biomass & Waste	472 MW
Solar Thermal Electric	0 MW	Ethanol	0 mGy
Geothermal Power	0 MW	Biodiesel	1 mGy
Hydropower	270 MW	<b>Totals</b>	1,053 MW; 1 mGy

Sources: See User's Guide for details

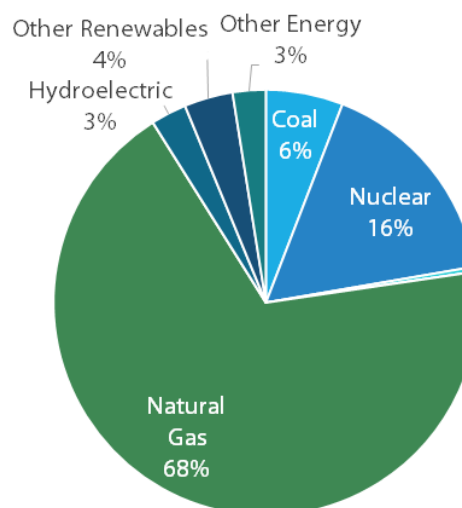
## Market Spotlight

- ▶ Massachusetts recorded its largest number of new solar power installations in 2012, as installations more than doubled the amount of solar power in the state. A 14 MW solar project in Warren broke ground in November 2013, which will sell power to the University of Massachusetts under a 30-year contract. The project is expected to save the university more than \$1 million in annual energy costs.
- ▶ In November 2012, the power purchase agreement for the offshore Cape Wind project was approved. The developer is seeking to resolve its remaining legal challenges by year's end so it can begin construction.
- ▶ Utilities in Massachusetts recently signed contracts to purchase energy generated from six wind farms in neighboring states at less than \$0.08/kWh, below the price of most conventional sources.<sup>10</sup>
- ▶ According to the Massachusetts Clean Energy Center, Massachusetts is now home to over 5,550 clean energy firms and nearly 80,000 clean energy workers.<sup>11</sup>

## Economic Development

Employment	2011	
Green Goods & Services Jobs	88,924	
Investment (Grossed-up)	2011	2012
Asset Finance	\$119.9m	\$235.9m
Venture Capital & Private Equity	\$105.1m	\$229.1m

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



Electricity Generation, 2012 (EIA)

<sup>10</sup> <http://www.bostonglobe.com/business/2013/09/22/suddenly-wind-competitive-with-conventional-power-sources/g3RBhfV440kJwC6UyVCjhl/story.html>

<sup>11</sup> [http://images.masscec.com/uploads/attachments/2013/09/MassCEC\\_2013\\_IndustryRpt.pdf](http://images.masscec.com/uploads/attachments/2013/09/MassCEC_2013_IndustryRpt.pdf)

# Renewable Energy in Massachusetts

## State Policy

<b>Renewable Portfolio Standard</b>	<ul style="list-style-type: none"> <li>▶ <i>Class I (new resources)</i>: 15% by 2020 and an additional 1% each year; <i>Class II (existing resources)</i>: 7.1% in 2009 and thereafter (3.6% renewables and 3.5% waste-to-energy)</li> <li>▶ Investor-owned utilities (IOUs), retail suppliers (covering 86% of state's electric load)</li> <li>▶ 400 MW must come from in-state solar PV systems; included in Class I requirement</li> <li>▶ Additional goals to procure 50 MW of solar PV on landfills and brownfields by 2020, three anaerobic digesters and/or CHP projects by 2014</li> <li>▶ Electric distribution companies must solicit 10-15 year contracts for renewable energy in two solicitations between January 2013 and December 2016</li> <li>▶ Solar energy clearinghouse program responds to market conditions for solar renewable energy credits (SRECs) and provides prices support</li> <li>▶ State goals of 2 GW from wind power and 1.6 GW from solar power by 2020</li> </ul>
<b>Net Metering</b>	<ul style="list-style-type: none"> <li>▶ Investor-owned utilities</li> <li>▶ 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</li> <li>▶ Net excess generation treatment varies by system type and customer class</li> <li>▶ Customer owns renewable energy credits (RECs); neighborhood net metering allowed</li> </ul>
<b>Interconnection Standards</b>	<ul style="list-style-type: none"> <li>▶ IOUs</li> <li>▶ No system capacity limit specified</li> <li>▶ Insurance and external disconnect switch requirements vary by system size/type</li> </ul>
<b>Rebates and Grants</b>	<p><b>Massachusetts Clean Energy Center (MassCEC):</b></p> <ul style="list-style-type: none"> <li>▶ Provides a number of programs for residents, businesses, nonprofits, and government agencies to finance clean energy projects</li> <li>▶ Technologies eligible for incentives include biomass boilers, hydropower, anaerobic digesters, solar hot water, appropriately-sited wind, district energy, geothermal heating and cooling, solar PV, and woodstoves</li> <li>▶ Incentives also provided for research, development, and/or commercialization of clean energy technologies, as well as for clean energy job creation</li> </ul> <p><b>Commonwealth Solar Hot Water Financing Program:</b> Provides incentives with aim to install 6-10 large commercial or non-profit solar hot water installations; budget of \$1m</p> <p><b>Solarize Mass:</b> Competitive-tiered pricing structure that increases savings for communities that install small-scale solar electricity systems</p>
<b>Tax Incentives</b>	<p><b>Excise Tax Incentives:</b> 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</p> <p><b>Alternative Energy and Energy Conservation Patent Exemption (Personal or Corporate):</b> For the sale, lease, or royalty income from a renewable energy-related patent</p> <p><b>Income Tax Credit for Residential Systems (Personal):</b> 15% credit, up to \$1,000, for the net expenditure of a renewable energy system; may be carried forward three years</p> <p><b>Property Tax Exemption:</b> For the value added by solar, wind, and certain hydro systems</p> <p><b>Sales Tax Exemption:</b> For residential solar, wind, or geothermal system equipment</p> <p><b>Cellulosic Biofuel Tax Exemption:</b> From the state's \$0.21/gallon fuel tax</p>
<b>Public Benefit Fund</b>	<p><b>Massachusetts Renewable Energy Trust Fund:</b></p> <ul style="list-style-type: none"> <li>▶ Provides grants, contracts, loans, equity investments, energy production credits, bill credits and rebates to support renewable energy</li> <li>▶ Funded by a surcharge on electric bills collecting \$23m/year</li> </ul>
<b>More Info</b>	<ul style="list-style-type: none"> <li>▶ DSIRE Database: <a href="http://www.dsireusa.org/incentives/index.cfm?state=MA">www.dsireusa.org/incentives/index.cfm?state=MA</a></li> <li>▶ Massachusetts Clean Energy Center: <a href="http://www.masscec.com">www.masscec.com</a></li> <li>▶ Department of Energy Resources: <a href="http://www.mass.gov/doer">www.mass.gov/doer</a></li> </ul>

# 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 to 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. In summer 2013, state legislators diverted \$17 million from the state's Renewable Energy Fund to cover holes in the 2013-2014 budget, which has left the state's renewable energy grant and rebate program with a budget of just \$7.8 million for this fiscal year.<sup>12</sup>

### Installed Renewable Energy Capacity, 2012

Wind Power	171 MW	Marine Power	0 MW
Solar Photovoltaic	5.4 MW	Biomass & Waste	191 MW
Solar Thermal Electric	0 MW	Ethanol	0 mGy
Geothermal Power	0 MW	Biodiesel	6 mGy
Hydropower	446 MW	<b>Totals</b>	814 MW; 6 mGy

Sources: See User's Guide for details

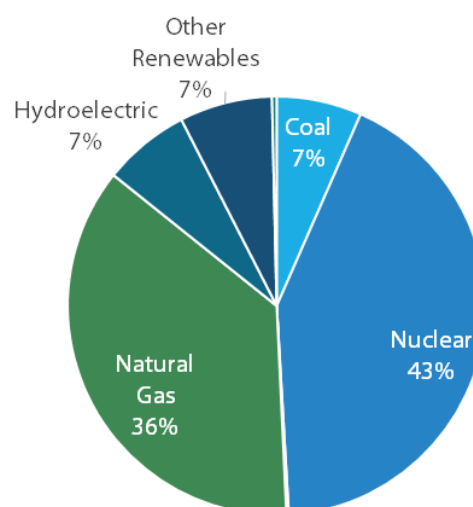
## Market Spotlight

- ▶ New Hampshire's biomass facilities produce heat and electricity from wood chips, wood waste, landfill gas, and municipal solid waste. A 75 MW biomass plant at a closed paper mill in Berlin received its first shipment of wood chips in August 2013 and is set to begin operating in December 2013. The \$275 million project will maintain 40 permanent jobs and employ former workers from the paper mill. The project will inject approximately \$25 million per year into North County.
- ▶ A 48 MW wind farm in Groton came online in December 2012 and supplies power to nearly 20,000 New Hampshire homes. The town of Groton receives about \$528,000 each year for the turbines.
- ▶ The proposed 75.9 MW Wild Meadows wind farm, to be located in Merrimack and Grafton Counties, began advanced development in fall 2013, signing contracts to sell power to utilities in Massachusetts.

## Economic Development

Employment	2011	
Green Goods & Services Jobs	16,244	
Investment (Grossed-up)	2011	2012
Asset Finance	\$650m	-
Venture Capital & Private Equity	\$11.9m	\$5m

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



Electricity Generation, 2012 (EIA)

<sup>12</sup> <http://www.unionleader.com/article/20130630/NEWS05/130639982/0/news08>

# Renewable Energy in New Hampshire

## State Policy

<b>Renewable Portfolio Standard</b>	<ul style="list-style-type: none"> <li>▶ 24.8% by 2025               <ul style="list-style-type: none"> <li>○ <i>Class I (new renewables)</i>: 15% by 2025 (including 2% renewable thermal energy by 2025); <i>Class II (new solar electric)</i>: 0.3% by 2014; <i>Class III (existing biomass/methane up to 25 MW)</i>: 8% by 2015; <i>Class IV (existing hydro up to 5 MW)</i>: 1.5% by 2015</li> </ul> </li> <li>▶ All retail electric suppliers, excluding municipal suppliers (totaling 98.2% of state's electric load)</li> <li>▶ Certain behind-the-meter generation may be eligible to meet RPS targets</li> <li>▶ Utilities may make payments into a renewable energy fund in lieu of meeting targets</li> </ul>
<b>Net Metering</b>	<ul style="list-style-type: none"> <li>▶ All utilities</li> <li>▶ System capacity limit of 1 MW; aggregate capacity limit of 50 MW</li> <li>▶ 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</li> <li>▶ Customer owns renewable energy credits (RECs), but not those associated with utility-purchased net excess generation</li> <li>▶ Virtual net metering allowed</li> </ul>
<b>Interconnection Standards</b>	<ul style="list-style-type: none"> <li>▶ All utilities</li> <li>▶ Net metering required</li> </ul>
<b>Other Financial Incentives</b>	<p><b>Commercial &amp; Industrial Solar Rebates:</b></p> <ul style="list-style-type: none"> <li>▶ 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</li> <li>▶ \$2.3m in rebates available for FY2014</li> </ul> <p><b>Residential Small Renewable Energy Rebates:</b></p> <ul style="list-style-type: none"> <li>▶ Residential PV or wind power systems 10 kW or less</li> <li>▶ \$0.75/watt; maximum incentive of the lesser of \$3,750 or 50% of system costs</li> </ul> <p><b>Residential Bulk-Fed Wood-Pellet Central Boilers and Furnaces:</b></p> <ul style="list-style-type: none"> <li>▶ 30% of the system and installation cost, up to \$6,000; \$575,819 in funding for FY2014</li> </ul> <p><b>Residential Solar Water Heating Program:</b></p> <ul style="list-style-type: none"> <li>▶ Residential solar water heating and space heating systems</li> <li>▶ \$1,500-\$1,900 depending on system size</li> <li>▶ Program budget of \$1.1m</li> </ul> <p><b>Commercial &amp; Industrial Renewable Energy Grants:</b></p> <ul style="list-style-type: none"> <li>▶ Renewable energy projects installed at commercial, industrial, public, non-profit, municipal, or school facilities, or at multiple family residences</li> <li>▶ Minimum incentive of \$100,000</li> <li>▶ Program budget of \$1.8m (not currently accepting applications)</li> </ul> <p><b>Enterprise Energy Fund Grants and Revolving Loans:</b></p> <ul style="list-style-type: none"> <li>▶ Loans for commercial energy projects \$10,000-\$500,000; terms vary</li> <li>▶ Grants for commercial renewable energy investments that yield large energy savings</li> <li>▶ Program budget \$6.6m (all funds currently obligated)</li> </ul> <p><b>Municipal Energy Reduction Fund Loans:</b></p> <ul style="list-style-type: none"> <li>▶ \$5,000-\$400,000 loans to encourage municipal governments to invest in clean energy</li> <li>▶ Loans range from 3-7 years; 2.5-4% interest rate</li> <li>▶ Program budget \$1.5m (all funds currently obligated)</li> </ul>
<b>More Info</b>	<ul style="list-style-type: none"> <li>▶ DSIRE Database: <a href="http://www.dsireusa.org/incentives/index.cfm?state=NH">www.dsireusa.org/incentives/index.cfm?state=NH</a></li> <li>▶ Public Utilities Commission (RPS): <a href="http://www.puc.state.nh.us/SustainableEnergy/Renewable_Portfolio_Standard_Program.htm">www.puc.state.nh.us/SustainableEnergy/Renewable_Portfolio_Standard_Program.htm</a></li> <li>▶ Community Development Finance Authority: <a href="http://www.nhcdfa.org">www.nhcdfa.org</a></li> <li>▶ Office of Energy and Planning: <a href="http://www.nh.gov/oep/energy/saving-energy/incentives.htm">www.nh.gov/oep/energy/saving-energy/incentives.htm</a></li> </ul>



# 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 23,900 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. However, the state has been diverting funding from its Clean Energy Program over the past few years to close budget gaps, weakening incentive programs for renewables and energy efficiency.<sup>13</sup>

### Installed Renewable Energy Capacity, 2012

Wind Power	9 MW	Marine Power	0.04 MW
Solar Photovoltaic	955.7 MW	Biomass & Waste	254 MW
Solar Thermal Electric	0 MW	Ethanol	0 mGy
Geothermal Power	0 MW	Biodiesel	90 mGy
Hydropower	13 MW	<b>Totals</b>	<b>1,232 MW; 90 mGy</b>

Sources: See User's Guide for details

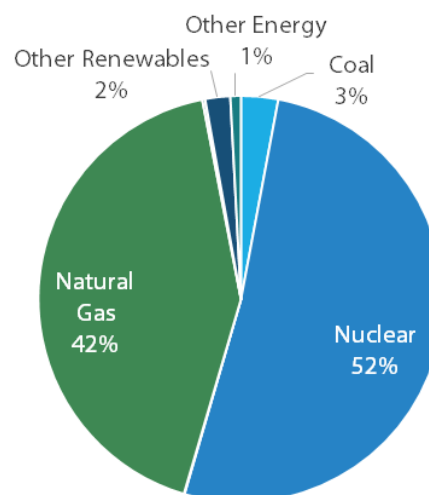
## Market Spotlight

- ▶ New Jersey achieved 1 GW of installed solar capacity in March 2013, ranking the state third in the nation for total solar installations and fourth for installed capacity per capita. Construction on a 14 MW solar farm in Phillipsburg began in August 2013, which will be one of the larger solar projects in the state. The energy produced from the project will power manufacturing and warehousing operations at a nearby factory. Larger systems are in the development pipeline.
- ▶ The state's largest publicly owned utility completed installations under its Solar 4 All program, involving 40 MW of small solar energy units attached to utility poles spread out across 300 municipalities.
- ▶ Despite an RPS carve-out for offshore wind generation, planned offshore wind farms continue to suffer setbacks, with uncertainty as to whether they will be able to qualify for federal tax credits.
- ▶ The U.S. Department of Energy has invested \$1 million to design a microgrid for the NJ Transit system, which would be one of the country's first large-scale civilian microgrids and able to operate independently if the grid fails. The project is part of a larger effort to repair damage caused by Hurricane Sandy.

## Economic Development

Employment		2011	
Green Goods & Services Jobs		81,018	
Investment (Grossed-up)		2011	2012
Asset Finance		\$897.6m	\$260.4m
Venture Capital & Private Equity		\$70.8m	\$45.4m

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



Electricity Generation, 2012 (EIA)

<sup>13</sup> <http://www.unitedenergyconsultants.com/possible-cuts-to-nj-clean-energy-fund>

# Renewable Energy in New Jersey

## State Policy

<b>Renewable Portfolio Standard</b>	<ul style="list-style-type: none"> <li>▶ 20.38% Class I and II resources by 2020-2021 and 4.1% solar electric by 2027-2028               <ul style="list-style-type: none"> <li>○ Offshore wind must account for 1,100 MW of main target</li> </ul> </li> <li>▶ Investor-owned utilities (IOUs), retail electric suppliers (98.3% of state's electric load)</li> <li>▶ 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</li> <li>▶ Class II resources include hydropower facilities 3-30 MW and waste-to-energy</li> <li>▶ Requirements may be met by Class I renewable energy credits (RECs), Class II RECs, solar RECs (SRECs), and offshore wind RECs (ORECs)</li> <li>▶ Utilities must make an alternative compliance payment (ACP) or solar ACP for the amount of RECs not submitted</li> </ul>
<b>Net Metering</b>	<ul style="list-style-type: none"> <li>▶ IOUs, electric suppliers</li> <li>▶ System capacity and aggregate limits not specified</li> <li>▶ 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</li> <li>▶ Customer owns RECs</li> </ul>
<b>Interconnection Standards</b>	<ul style="list-style-type: none"> <li>▶ IOUs (Class I renewable energy resources)</li> <li>▶ External disconnect switch not required; additional liability insurance not required for systems meeting certain technical standards</li> </ul>
<b>Grants and Loans</b>	<p><b>Sustainable Biopower Incentives:</b></p> <ul style="list-style-type: none"> <li>▶ Sustainable biopower systems that produce electricity from organic material</li> <li>▶ Competitive solicitation program for businesses; paid based on annual output of energy generated by facility</li> </ul> <p><b>Solar Water Heaters:</b></p> <ul style="list-style-type: none"> <li>▶ \$1,200 for new, qualifying solar water heating systems on single-family homes</li> </ul> <p><b>Geothermal Heat Pumps:</b></p> <ul style="list-style-type: none"> <li>▶ \$500 for new, qualifying geothermal heat pumps on residences</li> <li>▶ Extra incentive for victims of Hurricane Sandy</li> </ul> <p><b>Edison Innovation Clean Energy Manufacturing Fund (CEMF):</b></p> <ul style="list-style-type: none"> <li>▶ For project assessment and design, and project construction and operation, associated with the construction or expansion of a Class I renewable energy manufacturing line</li> <li>▶ Assessment and Design Grant: Up to \$300,000 or 10% of total project funds</li> <li>▶ Construction and Operation Loan: Up to \$3m as a 10-year, 2% interest loan</li> </ul> <p><b>Edison Innovation Green Growth Fund:</b></p> <ul style="list-style-type: none"> <li>▶ For technology companies with Class I products or certain emerging technologies</li> <li>▶ Must meet certain employment thresholds</li> <li>▶ 2% interest rate; five-year loan term; up to \$2m</li> <li>▶ 50% loan conversion to a performance grant may occur after five years</li> </ul>
<b>Tax Incentives</b>	<p><b>Wind Manufacturing Tax Credit:</b></p> <ul style="list-style-type: none"> <li>▶ 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</li> </ul> <p><b>Solar Energy Sales Tax Exemption:</b></p> <ul style="list-style-type: none"> <li>▶ Full exemption from state sales tax for all solar energy equipment</li> </ul> <p><b>Property Tax Exemption for Renewable Energy Systems:</b> For local property taxes</p>
<b>More Info</b>	<ul style="list-style-type: none"> <li>▶ DSIRE Database: <a href="http://www.dsireusa.org/incentives/index.cfm?state=NJ">www.dsireusa.org/incentives/index.cfm?state=NJ</a></li> <li>▶ Economic Development Authority: <a href="http://www.njeda.com/web/Aspx_pg/Templates/Pic_Text.aspx?Doc_Id=1080">www.njeda.com/web/Aspx_pg/Templates/Pic_Text.aspx?Doc_Id=1080</a></li> <li>▶ Clean Energy Program: <a href="http://www.njcleanenergy.com">www.njcleanenergy.com</a></li> <li>▶ Energy Master Plan: <a href="http://www.nj.gov/emp">www.nj.gov/emp</a></li> </ul>

# Renewable Energy in New York

## Summary

Renewable energy technologies are at the center of New York's concerted strategy to move to a 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 development of a state "Green Bank" is currently underway, which aims to leverage private sector capital to finance renewable energy projects and spur economic development.<sup>14</sup>

### Installed Renewable Energy Capacity, 2012

Wind Power	1,638 MW	Marine Power	0 MW
Solar Photovoltaic	179.4 MW	Biomass & Waste	518 MW
Solar Thermal Electric	0 MW	Ethanol	164 mGy
Geothermal Power	0 MW	Biodiesel	25 mGy
Hydropower	4,656 MW	<b>Totals</b>	6,991 MW; 189 mGy

Sources: See User's Guide for details

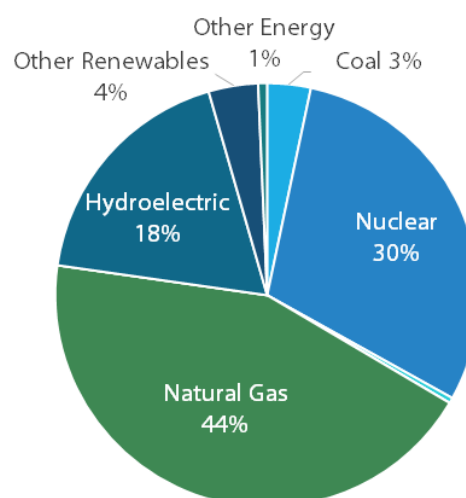
## Market Spotlight

- ▶ New York regularly ranks within the top ten states for solar photovoltaic capacity. In July 2013, the government announced that \$54 million had been awarded under the NY-Sun Initiative to 79 large-scale solar energy projects across the state. The new projects will add 64 MW to the state's solar capacity in 26 counties.
- ▶ A 94 MW wind farm in the town of Orangeville is expected to be completed by the end of the year, which will generate enough energy to power more than 38,000 homes and provide the town with an annual payment of about \$628,000.
- ▶ A 40 MW biomass power plant, converted from an existing coal-fired powered plant, became operational in June 2013 on land leased from the U.S. Army Corps of Engineers at Fort Drum. Additionally, the Defense Logistics Agency issued a request for proposals (RFP) in early 2013 to build a separate 15-28 MW biomass facility at Fort Drum. According to the RFP, the power generated from the project must meet or beat the spot market rate.
- ▶ The State University of New York (SUNY) recently funded the construction of 3 MW in hydraulic mix anaerobic biodigestors able to integrate food and farm residues for combined heat and power.

## Economic Development

Employment	2011	
Green Goods & Services Jobs	266,308	
Investment (Grossed-up)	2011	2012
Asset Finance	\$30.4m	\$383.1m
Venture Capital & Private Equity	\$48.2m	\$18.6m

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



Electricity Generation, 2012 (EIA)

<sup>14</sup> <http://www.governor.ny.gov/press/09102013-green-bank-initiative>

# Renewable Energy in New York

## State Policy

<b>Renewable Portfolio Standard</b>	<ul style="list-style-type: none"> <li>▶ 29% by 2015               <ul style="list-style-type: none"> <li>○ ~8.4% of annual increment must come from customer-sited systems</li> </ul> </li> <li>▶ Investor-owned utilities (IOUs) (covering 84.7% of state's electric load)</li> <li>▶ Certain resources may be procured through auction, requests for proposals, or standard offer contracts</li> <li>▶ Encourages new systems, but certain existing systems may also be eligible</li> <li>▶ NYSERDA collects an RPS surcharge from utility customer electricity bills, which supports projects and incentive programs</li> </ul>
<b>Net Metering</b>	<ul style="list-style-type: none"> <li>▶ IOUs</li> <li>▶ 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</li> <li>▶ 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</li> <li>▶ 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</li> <li>▶ Meter aggregation allowed for certain systems</li> </ul>
<b>Interconnection Standards</b>	<ul style="list-style-type: none"> <li>▶ IOUs</li> <li>▶ System capacity limit of 2 MW</li> </ul>
<b>Tax Incentives</b>	<p><b>Residential Wood Heating Fuel Sales Tax Exemption:</b> For the retail sale of wood used for residential heating purposes</p> <p><b>Solar Sales and Compensating Use Tax Exemption:</b> For the sale and installation of residential and non-residential solar energy systems</p> <p><b>Energy Conservation Improvements Property Tax Exemption:</b> Qualifying improvements, like the installation of certain renewable energy systems, are exempt from real property taxation for the value added to the property</p> <p><b>Residential Solar Tax Credit (Personal):</b></p> <ul style="list-style-type: none"> <li>▶ 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</li> <li>▶ 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</li> </ul> <p><b>Refundable Clean Heating Fuel Tax Credit (Personal or Corporate):</b> \$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</p> <p><b>Biofuel Production Tax Credit:</b> \$0.15/gallon of biodiesel or ethanol once state meets annual production threshold of 40,000 gallons of biofuel</p>
<b>Other Incentives</b>	<ul style="list-style-type: none"> <li>▶ NYSERDA provides incentives to support the customer-sited tier of the RPS</li> <li>▶ For the installation of new solar electric systems 25 kW or less for residential and 200 kW or less for commercial; goal to install 82 MW</li> <li>▶ For the installation of end-use wind energy systems for residential, commercial, institutional, or government use, up to \$400,000 per site/customer</li> <li>▶ Also supports solar thermal, fuel cell, anaerobic digester, and other technologies</li> </ul>
<b>More Info</b>	<ul style="list-style-type: none"> <li>▶ DSIRE Database: <a href="http://www.dsireusa.org/incentives/index.cfm?state=NY">www.dsireusa.org/incentives/index.cfm?state=NY</a></li> <li>▶ NYSERDA: <a href="http://www.nyserda.ny.gov">www.nyserda.ny.gov</a></li> <li>▶ Public Service Commission (RPS): <a href="http://www3.dps.ny.gov/W/PSCWeb.nsf/All/1008ED2F934294AE85257687006F38BD">http://www3.dps.ny.gov/W/PSCWeb.nsf/All/1008ED2F934294AE85257687006F38BD</a></li> </ul>



# 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, 2012

Wind Power	1,340 MW	Marine Power	0 MW
Solar Photovoltaic	164.3 MW	Biomass & Waste	637 MW
Solar Thermal Electric	0 MW	Ethanol	110 mGy
Geothermal Power	0 MW	Biodiesel	111 mGy
Hydropower	783 MW	<b>Totals</b>	<b>2,925 MW; 221 mGy</b>

Sources: See User's Guide for details

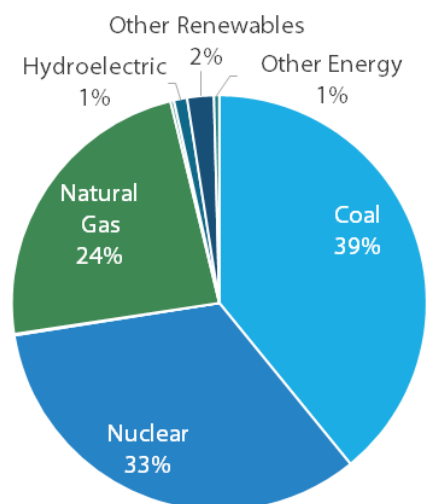
## Market Spotlight

- ▶ The 141 MW Mehoopany Wind Farm, the state's largest, was commissioned in December 2012. Located in Wyoming County, the turbines can power more than 40,000 average American homes.
- ▶ Biomass energy facilities in Pennsylvania produce power and heat from wood scraps, sawdust, and wood chips produced from mill and forestry operations. Facilities range from industrial-scale power plants to biomass boilers that heat schools, businesses, and other buildings.<sup>15</sup>
- ▶ A 110 mGy bioethanol facility started producing fuel again in July 2012 after shutting down two years prior due to filing for bankruptcy. The facility is the only commercial ethanol plant in the state.
- ▶ The Lake Erie Clean Power Connector, an underwater high-voltage direct current (HVDC) transmission project, closed development financing in September 2013. The project will supply power generated from hydroelectric, solar, wind, natural gas, and nuclear sources from Canada to Pennsylvania. Commissioning is targeted by the end of 2017.

## Economic Development

Employment		2011	
Green Goods & Services Jobs		167,397	
Investment (Grossed-up)		2011	2012
Asset Finance		\$570.2m	\$437.3m
Venture Capital & Private Equity		\$0.1m	\$80m

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



Electricity Generation, 2012 (EIA)

<sup>15</sup> [http://www.heinz.org/UserFiles/Library/PFPI-Report-Biomass%20EnergyInPA\\_%2012-12-12.pdf](http://www.heinz.org/UserFiles/Library/PFPI-Report-Biomass%20EnergyInPA_%2012-12-12.pdf)

# Renewable Energy in Pennsylvania

## State Policy

<b>Alternative Energy Portfolio Standard</b>	<ul style="list-style-type: none"> <li>▶ 18% by 2020-2021               <ul style="list-style-type: none"> <li>○ 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</li> <li>○ 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</li> <li>○ 0.5% from solar PV (counted under Tier I requirement)</li> </ul> </li> <li>▶ Investor-owned utilities (IOUs) and retail suppliers (covering 97.3% of electric load)</li> <li>▶ Utilities must acquire alternative energy credits (AECs), solar AECs, or make an alternative compliance payment into a fund that supports alternative energy projects</li> </ul>
<b>Net Metering</b>	<ul style="list-style-type: none"> <li>▶ IOUs</li> <li>▶ System capacity limit of 5 MW for microgrid and emergency systems, 3 MW for non-residential systems, and 50 kW for residential systems</li> <li>▶ 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"</li> <li>▶ Customer owns renewable energy credits; allows third-party ownership models</li> </ul>
<b>Interconnection Standards</b>	<ul style="list-style-type: none"> <li>▶ IOUs</li> <li>▶ Net metering required; external disconnect switch required</li> </ul>
<b>Tax Incentives</b>	<b>Property Tax Exemption for Commercial Wind Farms:</b> Wind turbines and related equipment may not be counted by tax assessors when setting property values
<b>Loans and Grants</b>	<b>Keystone Help Loan:</b> <ul style="list-style-type: none"> <li>▶ Low-rate loans for most types of qualifying energy improvements to houses, including geothermal and solar energy installations</li> <li>▶ Loan maximum: \$35,000, 20-year term</li> </ul> <b>Alternative and Clean Energy Program:</b> <ul style="list-style-type: none"> <li>▶ 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</li> <li>▶ 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</li> </ul> <b>High Performance Building Program</b> (includes renewable energy systems): <ul style="list-style-type: none"> <li>▶ Loans for high performance building projects for small businesses up to \$2m and for individual residence projects up to \$100,000</li> <li>▶ Grants for high performance building projects up to \$500,000 or 10% of total eligible building construction/renovation costs, whichever is less</li> </ul>
<b>Rebates</b>	<b>PA Sunshine Solar Program:</b> <ul style="list-style-type: none"> <li>▶ Rebates for commercial and residential solar PV, solar hot water, and battery back-up projects, up to \$52,500</li> <li>▶ As of October 25, 2013, program has about \$1.2m available for rebates</li> </ul>
<b>Renewable Fuels Mandate</b>	<ul style="list-style-type: none"> <li>▶ All gasoline sold in state must contain at least 10% cellulosic ethanol once in-state production reaches 350 million gallons of cellulosic ethanol</li> <li>▶ 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%</li> </ul>
<b>More Info</b>	<ul style="list-style-type: none"> <li>▶ DSIRE Database: <a href="http://www.dsireusa.org/incentives/index.cfm?state=PA">www.dsireusa.org/incentives/index.cfm?state=PA</a></li> <li>▶ Public Utility Commission (RPS): <a href="http://www.puc.pa.gov/consumer_info/electricity/alternative_energy.aspx">www.puc.pa.gov/consumer_info/electricity/alternative_energy.aspx</a></li> <li>▶ Department of Environmental Protection: <a href="http://www.portal.state.pa.us/portal/server.pt/community/grants_loans_tax_credits/10395">www.portal.state.pa.us/portal/server.pt/community/grants_loans_tax_credits/10395</a></li> <li>▶ Department of Community and Economic Development: <a href="http://www.newpa.com/find-and-apply-for-funding">www.newpa.com/find-and-apply-for-funding</a></li> </ul>

# 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, 2012

Wind Power	9 MW	Marine Power	0 MW
Solar Photovoltaic	1.9 MW	Biomass & Waste	26 MW
Solar Thermal Electric	0 MW	Ethanol	0 mGy
Geothermal Power	0 MW	Biodiesel	2 mGy
Hydropower	3 MW	<b>Totals</b>	40 MW; 2 mGy

Sources: See User's Guide for details

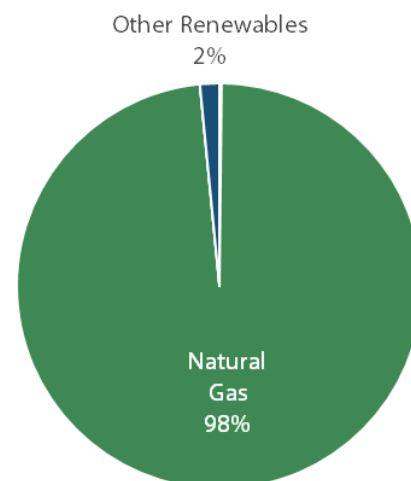
## Market Spotlight

- ▶ The Office of Energy Resources reported that, from December 2011 to June 2013, Rhode Island's distributed generation contracts program has supported the installation of 23 wind and solar projects with a combined capacity of nearly 18 MW, and resulted in \$17.8 million in expenditures at local businesses.<sup>16</sup>
- ▶ 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 September 2013, the U.S. Department of the Interior signed an agreement to lease 257 square miles of federal waters to the project developer.<sup>17</sup>
- ▶ The U.S. Navy is proposing to install 9 MW of wind power at the historic Naval Station Newport. The turbines would provide a quarter of the station's electricity and could reduce its energy bill by as much as \$3 million a year. The project aligns with the Navy's decision to purchase 1 GW of renewable energy.

## Economic Development

Employment	2011	
Green Goods & Services Jobs	12,327	
Investment (Grossed-up)	2011	2012
Asset Finance	\$1.9m	\$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, 2012 (EIA)

<sup>16</sup> <http://www.energy.ri.gov/documents/renewable/Distributed%20Generation%20Contracts%20Program%20-%20Job%20Impact%20Results.pdf>

<sup>17</sup> <http://www.providencejournal.com/breaking-news/content/20131022-r.i.-mass.-at-vanguard-of-offshore-wind-power-industry-u.s.-interior-secretary-says.ece>

# Renewable Energy in Rhode Island

## State Policy

<b>Renewable Portfolio Standard</b>	<ul style="list-style-type: none"> <li>▶ 16% by 2019</li> <li>▶ Investor-owned utilities (IOUs) and retail suppliers (covering 99.3% of the electric load)</li> <li>▶ 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</li> <li>▶ Under a separate standard, electric distribution companies must enter into long-term contracts for 90 MW in capacity by 2014 (including 3 MW from in-state solar facilities)</li> </ul>
<b>Net Metering</b>	<ul style="list-style-type: none"> <li>▶ IOUs</li> <li>▶ 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)</li> <li>▶ Net excess generation credited at avoided cost rate; rolls over indefinitely or can be purchased by utility</li> </ul>
<b>Interconnection Standards</b>	<ul style="list-style-type: none"> <li>▶ IOUs</li> <li>▶ Many requirements left unaddressed</li> </ul>
<b>Public Benefits Fund</b>	<p><b>Rhode Island Renewable Energy Fund:</b></p> <ul style="list-style-type: none"> <li>▶ Nation's first public benefits fund for renewable energy and demand-side management, currently supporting small-scale solar, feasibility studies, and commercial development</li> <li>▶ Supported by a surcharge on electric and gas customers' bills</li> </ul>
<b>Tax Incentives</b>	<p><b>Sales and Use Tax Exemption:</b></p> <ul style="list-style-type: none"> <li>▶ For eligible renewable energy systems and equipment, including solar electric and thermal, geothermal heat pumps, and wind power</li> </ul> <p><b>Residential Solar Property Tax Exemption:</b></p> <ul style="list-style-type: none"> <li>▶ For local municipal property tax purposes, systems are assessed at no more than a conventional energy system</li> </ul>
<b>Other Financial Incentives</b>	<p><b>Commercial-Scale Renewable Energy Grants:</b></p> <ul style="list-style-type: none"> <li>▶ 20% of project funding for systems 10-50 kW, up to \$75,000</li> <li>▶ Program budget of \$1m in 2013</li> </ul> <p><b>Early-Stage Commercialization Loans:</b></p> <ul style="list-style-type: none"> <li>▶ Forgivable loans or low-interest loans, up to \$300,000</li> <li>▶ To incentivize emerging technologies that will develop within the next 2-5 years and innovative business structures that will help commercialize emerging or existing technologies</li> </ul> <p><b>Distributed Generation Contracts Program:</b></p> <ul style="list-style-type: none"> <li>▶ National Grid must enter into 15-year renewable energy contracts with private landowners, businesses, and municipalities at a set, fixed price</li> <li>▶ Wind, solar PV, and anaerobic digestion technologies are eligible to participate</li> <li>▶ Contracts awarded based on price and economic factors</li> <li>▶ Target to deploy 40 MW by the end of 2014</li> </ul> <p><b>Small-Scale Solar Grants and Loans:</b></p> <ul style="list-style-type: none"> <li>▶ 25% cash grant, maximum of \$10,000, or 50% low-interest loan, maximum of \$20,000</li> <li>▶ <i>Commercial, residential solar PV:</i> 10 kW or smaller; <i>solar domestic hot water:</i> maximum of 160 sq. ft. of collectors</li> </ul>
<b>More Info</b>	<ul style="list-style-type: none"> <li>▶ DSIRE Database: <a href="http://www.dsireusa.org/incentives/index.cfm?state=RI">www.dsireusa.org/incentives/index.cfm?state=RI</a></li> <li>▶ Public Utilities Commission (RPS): <a href="http://www.ripuc.ri.gov/utilityinfo/res.html">www.ripuc.ri.gov/utilityinfo/res.html</a></li> <li>▶ Office of Energy Resources: <a href="http://www.energy.ri.gov/renewable">www.energy.ri.gov/renewable</a></li> <li>▶ Renewable Energy Fund: <a href="http://www.edc.ri.gov/finance/REF.php">www.edc.ri.gov/finance/REF.php</a></li> </ul>

# Renewable Energy in Vermont

## Summary

Vermont's strong and diverse renewable resources, including hydropower, biomass, solar, and wind energy, are responsible for an impressive 26% 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.

### Installed Renewable Energy Capacity, 2012

Wind Power	119 MW	Marine Power	0 MW
Solar Photovoltaic	28 MW	Biomass & Waste	88 MW
Solar Thermal Electric	0 MW	Ethanol	0 mGy
Geothermal Power	0 MW	Biodiesel	0 mGy
Hydropower	315 MW	<b>Totals</b>	550 MW; 0 mGy

Sources: See User's Guide for detail

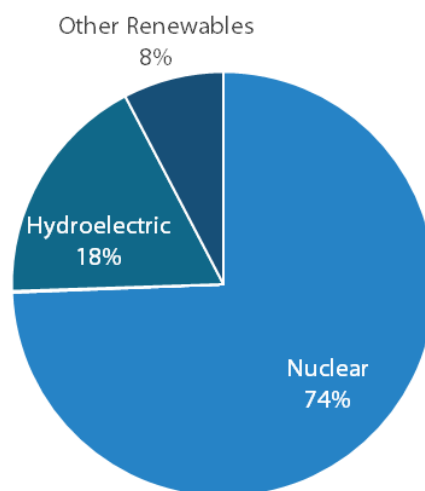
## Market Spotlight

- ▶ Vermont's largest wind farm, the 63 MW Kingdom Community Wind Farm in Lowell, came online in November 2012. The project is capable of supplying power to about 24,000 homes each year.
- ▶ The U.S. Department of Energy's SunShot Initiative funded an outdoor laboratory, the Vermont Photovoltaic Regional Test Center, to test the effectiveness of solar panels in cold weather and help to reduce their costs.
- ▶ The state is a leader in the research, development, and commercialization of wood energy. The Fair Haven Energy Center, to be comprised of a 30 MW biomass power plant fueled by wood residues, a pellet manufacturing facility with a capacity of 110,000 tons per year, and a 10-acre greenhouse complex, was proposed in February 2013. When complete, the power plant will provide base load capacity sufficient to power 34,000 homes, and the pellet facility will replace 13 million gallons of heating oil per year.
- ▶ Several of Vermont's schools use biomass energy for power and heat. Vermont Technical College broke ground for the Central Vermont Recovered Biomass Facility Anaerobic Digester in April 2013. The system will use natural biological processes to produce electricity plus heat from food waste and manure.

## Economic Development

Employment		2011	
Green Goods & Services Jobs		12,159	
Investment (Grossed-up)		2011	2012
Asset Finance		-	\$131.6m
Venture Capital & Private Equity		\$41m	\$8m

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



Electricity Generation, 2012 (EIA)



# Renewable Energy in Vermont

## State Policy

<b><i>Sustainably Priced Energy Enterprise Development (SPEED) Standard Offer Program</i></b>	<ul style="list-style-type: none"> <li>▶ Retail electric providers must purchase electricity from eligible renewable energy facilities via long-term contracts with fixed standard offer rates</li> <li>▶ 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</li> <li>▶ Beginning in 2013, request for proposals (RFPs) released annually until 2020</li> <li>▶ Renewable energy credits (RECs) generated through program may be sold in other states' markets</li> <li>▶ Full program details can be seen at the website (see "More Info")</li> </ul>
<b><i>SPEED Program Goals and Other Targets</i></b>	<ul style="list-style-type: none"> <li>▶ <b>SPEED Goal:</b> 20% of total statewide electric retail sales during year 2017 must be generated by SPEED resources (see above)</li> <li>▶ <b>Total Renewables Targets:</b> 55% of each retail electricity provider's annual electric sales during 2017 must consist of renewable energy, which will increase to 75% in 2032</li> <li>▶ <b>Comprehensive Energy Plan Goal:</b> 90% of state's energy needs (electric, heating, and transportation) should be met with renewable energy resources by 2050</li> </ul>
<b><i>Net Metering</i></b>	<ul style="list-style-type: none"> <li>▶ All utilities</li> <li>▶ 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 4% of the utility's peak demand (in 1996 or in the previous year, whichever is greater)</li> <li>▶ Net excess generation credited to next bill at retail rate; granted to utility at end of 12 months</li> <li>▶ Group net metering allowed</li> </ul>
<b><i>Interconnection Standards</i></b>	<ul style="list-style-type: none"> <li>▶ All utilities</li> <li>▶ External disconnect switch required</li> <li>▶ Special standards exist for systems 150 kW and under</li> </ul>
<b><i>Rebates</i></b>	<p><b>Small-Scale Renewable Energy Incentive Program:</b></p> <ul style="list-style-type: none"> <li>▶ Qualifying solar electric, solar hot water, and micro-hydro systems</li> <li>▶ Additional \$1.4m in program funding made available in October 2013</li> </ul>
<b><i>Tax Incentives</i></b>	<p><b>Renewable Energy Systems Tax Exemption:</b></p> <ul style="list-style-type: none"> <li>▶ Applies to renewable energy systems up to 250 kW, CHP systems up to 20 kW, and solar water heating systems</li> </ul> <p><b>Uniform Capacity Tax and Exemption for Solar:</b></p> <ul style="list-style-type: none"> <li>▶ Property tax exemption for solar PV equipment no more than 10 kW</li> <li>▶ \$4/kW charge for larger systems</li> </ul> <p><b>Investment Tax Credit (Corporate):</b></p> <ul style="list-style-type: none"> <li>▶ For commercial renewable energy system installations</li> <li>▶ Equal to 24% of the "Vermont-property portion" of federal business energy tax credit</li> <li>▶ Unused credit may be carried forward five years</li> </ul> <p><b>Alternative Fuel and Advanced Vehicle Research and Development Tax Credit:</b></p> <ul style="list-style-type: none"> <li>▶ High-tech businesses involved exclusively in the design, development, and manufacture of alternative fuel vehicles, hybrid electric vehicles, or energy technology involving fuel sources</li> <li>▶ 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</li> </ul>
<b><i>More Info</i></b>	<ul style="list-style-type: none"> <li>▶ DSIRE Database: <a href="http://www.dsireusa.org/incentives/index.cfm?state=VT">www.dsireusa.org/incentives/index.cfm?state=VT</a></li> <li>▶ VermontSPEED: <a href="http://www.vermontspeed.com">www.vermontspeed.com</a></li> <li>▶ Public Service Department: <a href="http://www.publicservice.vermont.gov/topics/renewable_energy">www.publicservice.vermont.gov/topics/renewable_energy</a></li> <li>▶ Renewable Energy Resource Center: <a href="http://www.erc-vt.org">www.erc-vt.org</a></li> </ul>

# 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 Interstate Renewable Energy Council (IREC), 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 Fourth Quarter 2012 Market Report*.
- ▶ Solar photovoltaic (PV) data is from IREC's *U.S. Solar Market Trends 2012* report. The report's data was obtained from state agencies; organizations administering state incentive programs; utility companies that manage incentive programs and/or interconnection agreements; and non-profit organizations (through surveys).
- ▶ Geothermal power data is from GEA's *2013 Annual US Geothermal Power Production and Development Update*, released in April 2012. 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 2012. The data is from EIA's *Monthly Energy Review: February 2013*, using the generation totals from January to December 2012.

## 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

**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.

**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.

**Polytaconic 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).*