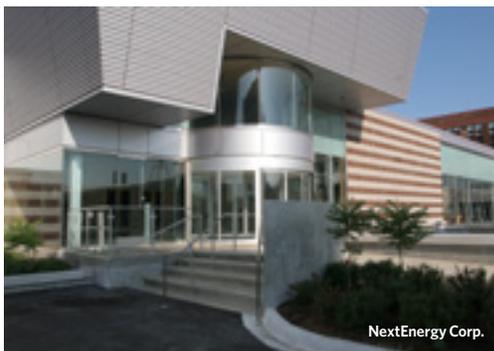




SkySpecs



Ben VanderVeen



NextEnergy Corp.



Clean Economy Rising

Wind powers Michigan's energy industry

Overview

Since the 1970s, Michigan has supported renewable energy and efficiency programs, an approach reinvigorated by the state's 2008 clean energy law. Today, these sources include biomass power plants, hydropower, solar energy systems, and wind turbines.¹ Michigan's skilled workforce, manufacturing and engineering expertise, and export markets in the port cities along the Great Lakes have contributed to the state's success in developing a clean energy industry. This brief examines the reasons for Michigan's success and its resulting economic growth.

Clean energy policies

Michigan's 2008 Clean, Renewable, and Efficient Energy Act established a renewable portfolio standard, which requires electricity providers to generate 10 percent of their sales from renewable resources by 2015.² The standard also allows electric utilities to use energy efficiency and other advanced energy technologies to fulfill part of the requirement.

Michigan offers tax incentives for projects in renewable energy renaissance zones, which the 2008 law established to help develop a renewable energy manufacturing industry.³ The state also offers loan and rebate programs for energy efficiency investments. Additionally, Michigan encourages managers of public buildings, such as museums and government offices, to use energy savings performance contracts, which are agreements between a government agency and a utility or power company to finance energy efficiency.⁴

Key State Policies					
<input checked="" type="checkbox"/>	Renewable portfolio standard	<input checked="" type="checkbox"/>	Tax incentives	<input type="checkbox"/>	Green power purchasing
<input checked="" type="checkbox"/>	Net metering and interconnection standards	<input checked="" type="checkbox"/>	Bonds/loans/rebates/other financing	<input checked="" type="checkbox"/>	Nonutility sales of renewable electricity allowed

Source: North Carolina State University, Database of State Incentives for Renewables and Efficiency

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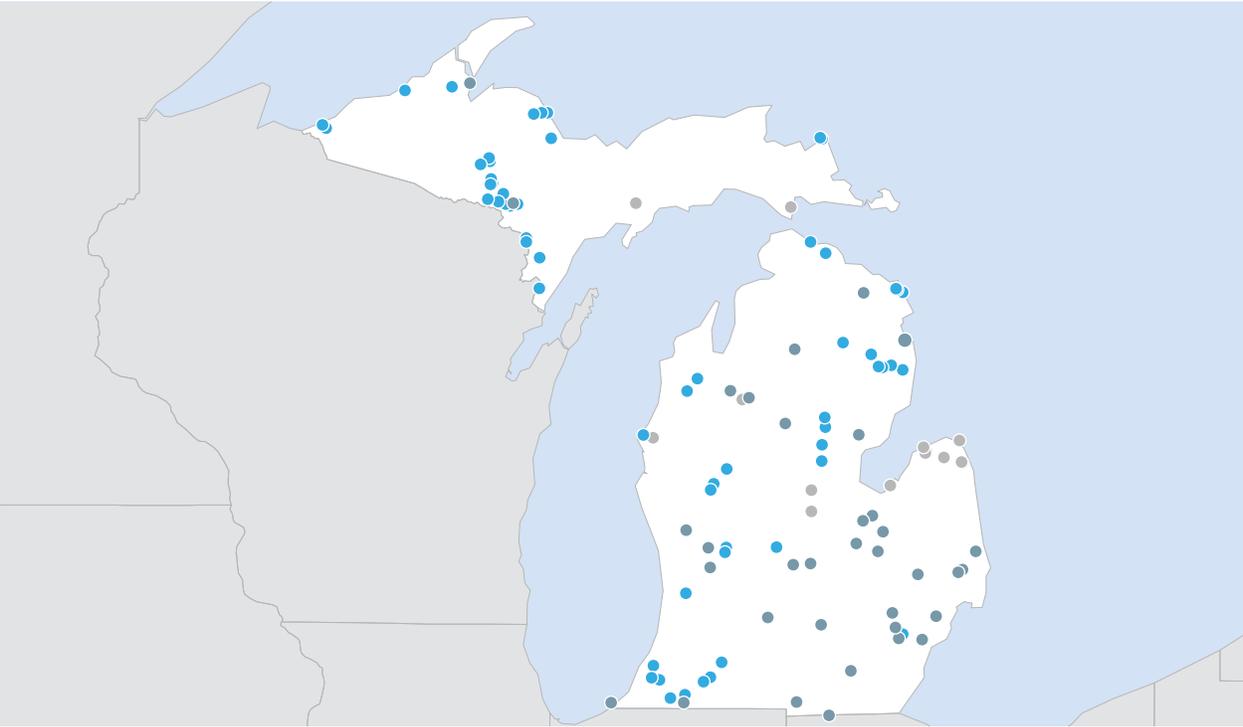
Sources of power and economic growth

Michigan's clean energy helps power the state's economic recovery. Total capital investment in renewable energy from 2009 to 2013 topped \$2 billion and is expected to grow to \$3.5 billion by 2015.⁵ From 2009 to 2013, more than 1 gigawatt of new wind capacity was installed, almost 95 percent of the total clean energy added in those five years. Most new clean generation came from wind, but solar, methane digester, and other technologies also grew.

Manufacturing generates economic activity in addition to the revenue from project installations. The annual economic impact of clean energy manufacturing is currently \$4.9 billion in Michigan. Energy efficiency manufacturing is expected to contribute an additional \$2.3 billion annually by 2015.⁶

Michigan employed more than 69,116 workers in clean energy and other environment-related fields in 2011.⁷ From 2003 to 2010, the fastest-growing sectors were fuel cells, energy-efficient lighting, solar photovoltaic, and electric car battery technologies.⁸ According to a 2011 report, Michigan's wind turbine supply chain alone consisted of more than 31 component manufacturers, and the state's wind industry could yield an average annual total economic output greater than \$460 million by 2015. As a result, \$14.5 million in local and state tax revenue may be realized.⁹

Renewable Electricity Power Plants, > 1 Megawatt Capacity



● Hydro ● Wind ● Biomass

Source: Energy Information Administration

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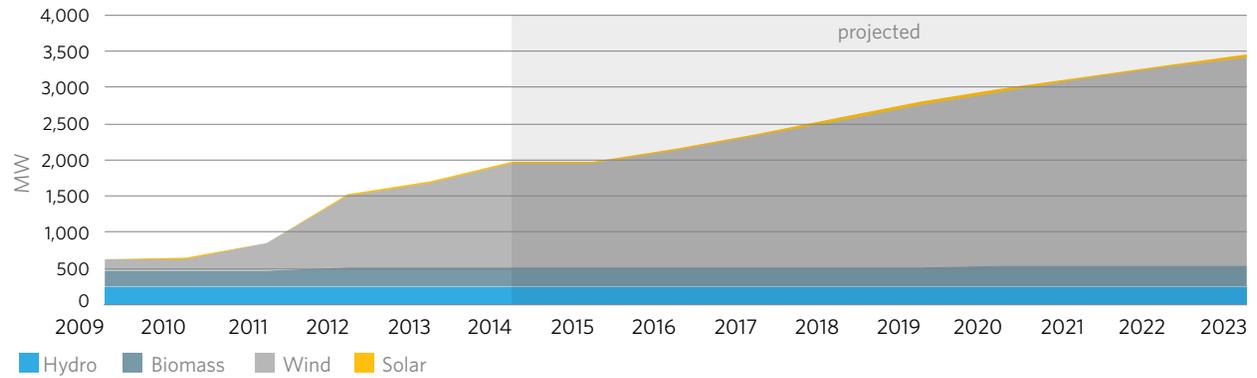


In 2013, wind projects accounted for more than 90 percent of Michigan's clean energy installations.

Snapshot: Michigan's clean energy economy

Clean Energy Capacity, by Sector and Year

Actual (2009-13) and projected (2014-23) growth in cumulative capacity



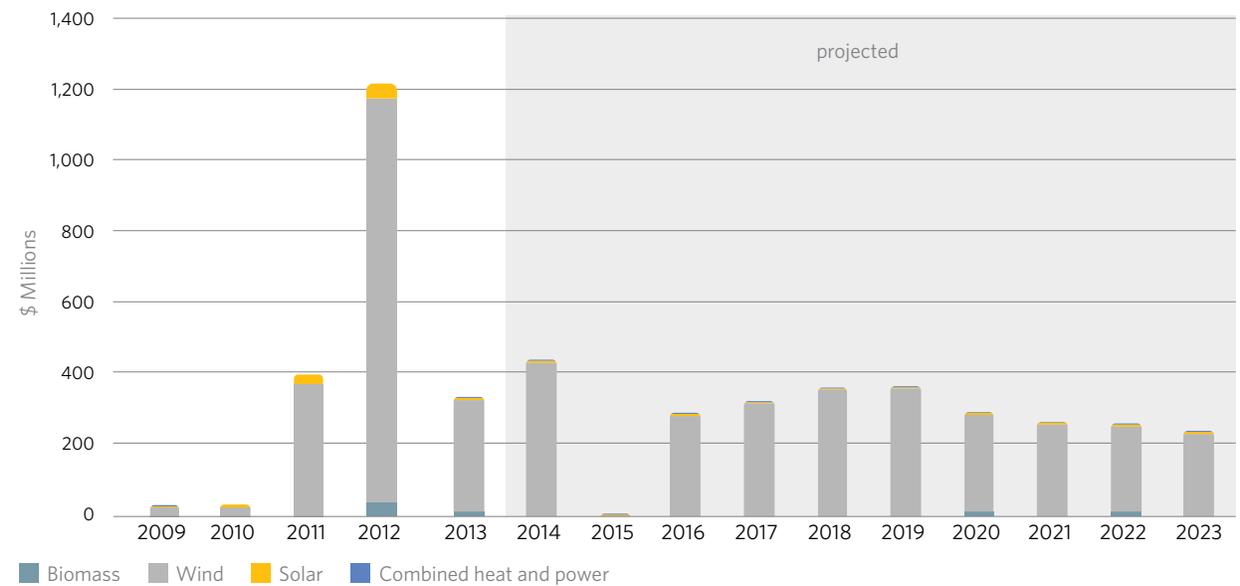
Note: Navigant Research provided data and projections of annual capacity additions from 2009 to 2023. These figures were added to baseline 2008 cumulative capacity data from the Energy Information Administration (except for wind and solar, for which cumulative data were available from Navigant Research). Navigant Research's methodology is described at the end of this brief, and that of the Energy Information Administration is available in Table 3, available at <http://www.eia.gov/renewable/state/michigan>.

Sources: Navigant Research, Energy Information Administration

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Clean Energy Investment, by Sector and Year

Actual (2009-13) and projected (2014-23) annual investment



Source: Navigant Research

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New Clean Energy Capacity Installed in 2013 (MW)

Wind accounted for majority of new projects

	Wind	175
	Biomass	10
	Solar	1
	Combined heat and power	1
	Hydro	0
	Geothermal	0
	Marine hydrokinetic	0
Total		187

Source: Navigant Research

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“Grand Rapids is being honored as an American leader in the practice of sustainability. The city has diversified its economy, and it has more LEED-certified buildings per capita than any other U.S. community. Twenty percent of its power is renewable, and 99 percent of the sewer overflow into the Grand River has been eliminated.”

—U.S. Chamber of Commerce (2010)

National Rankings

Rank	
10th	in new renewable capacity installations, 2013 (187 MW)
13th	in energy- and environment-related jobs, 2011 (69,116)
14th	in private investment, 2013 (\$335 million)

Sources: Navigant Research, Bureau of Labor Statistics

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Wind industry highlights

Michigan's wind capacity is among the fastest growing in the nation. In 2010, the state's Public Service Commission identified wind energy resource zones—areas most viable for commercial energy generation—as mandated by the state's 2008 Clean, Renewable, and Efficient Energy Act. This designation streamlines development of wind energy projects and has been a significant factor in the industry's growth.¹⁰ With 1.2 GW of installed wind capacity, Michigan ranks 16th nationwide in wind energy capacity.¹¹ The commission estimates the state will top 1.4 GW by the end of 2014.¹²

Michigan Wind Energy National rankings and statistics, 2013

Rank	
3rd	new capacity (175 MW)
3rd	private investment (\$315 million)
16th	total capacity (1.2 GW)
300,000	homes powered by wind

Sources: American Wind Energy Association, Navigant Research

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The state's experience in advanced manufacturing has been essential in developing its wind industry. Michigan ranks seventh in the number of wind-related jobs nationwide with over 2,000 jobs and has 38 facilities producing products.¹³ The sector began with a target of producing wind turbine blades and components, and gradually expanded to include a wider range of new products and services. The companies include:

- Ventower Industries and Energetx Composites, which specialize in wind turbine component manufacturing.
- Loc Performance Products Inc. and Dokka Fasteners Inc., which manufacture machine components for wind turbines.
- Wind Secure Inc., which developed a patented anti-rust coating for wind turbine foundation anchor bolts.
- SkySpecs, which offers drone technology for aerial inspections of wind farms.

Company Spotlights

Michigan's Wind Industry

Wind power manufacturing is creating a strong backbone for the state's clean energy economy. Companies ranging from Energetx, the largest wind industry employer in the state, to SkySpecs, a small start-up out of the University of Michigan, drive innovation.

Ventower sees expansive growth in wind turbine manufacturing industry

Opportunity for growth in the wind industry attracted the interest of Gregory Adanin, a former steel industry developer. With the help of \$6 million in federal funding, Adanin launched Ventower Inc. in Monroe in 2010.* The company has grown to more than 138 employees and has partnered with Monroe Community College to train and educate the next generation of wind industry workers.†

University of Michigan graduate students create high-tech, clean energy company SkySpecs

Ann Arbor-based SkySpecs founded in 2012 by a group of University of Michigan graduate students developed the technology for an unmanned aerial vehicle that can safely inspect hard-to-reach structures such as bridges and wind turbines.‡ The vehicle took the top prize of \$50,000 in the Michigan Clean Energy Venture in 2012.



SkySpecs' drone technology won a \$50,000 prize in Michigan's Clean Energy Venture Challenge.

Continued on next page

Energetx Composites expands its manufacturing roots to emerging wind industry

Looking to diversify its products, S2 Yachts (formerly Tiara Yachts) of Holland began to evaluate new business opportunities in energy. In July 2008, the company founded Energetx Composites as a sister enterprise, using more than 50 years of composite manufacturing experience to focus on manufacturing reliable wind blades. In 2012, Energetx announced a partnership with Aeroblade, an international aeronautical technology company, to produce 150-foot blades. The company began shipping its first utility-scale blades in early 2012 and now employs 116 workers.[§]

[†] Ventower Industries, "Another ARRA Success Story: New Funds Mean More Jobs in Monroe," <http://www.ventower.com/ventower-news-arra-success-story.htm>.

[‡] Greater Ann Arbor Region, "Ventower," <http://greaterannarborregion.org/portfolio/ventower>.

[§] University of Michigan, Department of Electrical Engineering and Computer Science, "Students Form SkySpecs LLC to Produce Autonomous Aerial Vehicles" (March 11, 2013), <http://www.eecs.umich.edu/eecs/about/articles/2013/SkySpecs.html>.

[§] Environmental Entrepreneurs, "Michigan Yacht Builder Charts New Course With Wind," <http://cleanenergyworksforus.org/michigan-yacht-builder-charts-new-course-to-profits-with-wind-energy>.



A 160-foot wind turbine blade on its way to the Gratiot Country Wind Project.

Project Spotlight

Gratiot County Wind Project

The Gratiot County Wind Project, Michigan's largest wind farm at 212.8 MW,¹ began operation in 2012 on 30,000 acres of privately owned land. Developers involved area stakeholders from the beginning to foster a community-inclusive project, which will provide payments of \$35 million over 20 years to landowners and Bethany Township.² During construction, the Gratiot wind farm also contributed nearly \$31 million to the local economy in direct costs (construction and materials) and indirect costs (food, lodging, and other).³

50,000 The number of homes powered by the Gratiot County Wind Project

Source: DTE Energy Co.

The power produced by the Gratiot County Wind Project is sold to utility companies in Michigan as well as those located within the larger Midcontinent Independent System Operator regional transmission area. The project helps DTE Energy meet the state's renewable portfolio standard requirement that 10 percent of energy come from renewable sources by 2015. Backers estimate that the project will offset about 450,000 tons of carbon dioxide emissions per year.⁴



The Gratiot County Wind Project, the largest wind installation in Michigan, operates more than 100 turbines.

¹ DTE Energy Co., "Gratiot Wind Park," <https://www2.dteenergy.com/wps/wcm/connect/72c00b3b-e4df-4f5c-9474-c0b0aa76ee3d/Fact+Sheet+-+GratiotCountyWindPark.pdf?MOD=AJPERES>.

² Department of Energy, Office of Energy Efficiency and Renewable Energy, "WINDEXchange: Gratiot County Wind Project Case Study" (Oct. 8, 2012), http://apps2.eere.energy.gov/wind/windexchange/filter_detail.asp?itemid=3684.

³ DTE Energy Co., "Gratiot Wind Park."

⁴ Ibid.

⁵ Trade Wind Energy Inc., "Gratiot Farms Wind Project," <http://tradewindsenergy.com/Project.aspx?id=1816>.

Biofuel highlights

Technologies that recover and generate thermal energy and electric power from biomass can use a variety of nonfood fuels, including wood waste, forest residues, and wood energy crops such as switchgrass and willow. Biomass energy production and advanced biofuels research are prevalent throughout Michigan because of a strong forest products industry. The state committed to developing these resources while retaining overall forest health. Michigan's 2008 renewable portfolio standard requires biomass fuels to be sustainably harvested.¹⁴

Industries, universities, and their partners are working together to understand and improve biofuel efficiency while minimizing the environmental impact. From 2009 to 2013, the organizations invested \$57 million in Michigan's biomass industry. Studies include economical ways to grow woody materials for fuel and research into harvest, transportation, and energy production to ensure that nonfood fuels from forests are produced sustainably and efficiently. For example, the U.S. Department of Energy Great Lakes Bioenergy Research Center collaborates with Michigan State University on the processes of turning biomass into fuel. Other projects include early stage research into advanced biofuels technology development and commercialization.

Project Spotlight

Alpena Biorefinery

The Alpena Biorefinery, one of the first commercial plants of its kind in the country, uses waste from the manufacturing process as feedstock—changing hardboard waste into fuel.^{*} Located at Decorative Panels International's wall panel plant in northeastern Michigan, the biorefinery received grants from the U.S. Department of Energy and the Michigan Economic Development Corp. and was designated a Renewable Energy Renaissance Zone with a 15-year property tax abatement.[†]



The Alpena Biorefinery.

^{*} American Process Inc., "Alpena Biorefinery," <http://www.alpenabiorefinery.com/about.html>.

[†] Department of Energy, Office of Energy Efficiency and Renewable Energy, "Alpena Biorefinery" (January 2013), http://www1.eere.energy.gov/bioenergy/pdfs/ibr_arra_api.pdf.

Institution Spotlights

Michigan's University Research Corridor

The goal of Michigan's University Research Corridor—an alliance among Michigan State University, the University of Michigan, and Wayne State University—is to develop and diversify the state's economy. Studies sponsored by these partners contribute to the state's growing advanced vehicle and clean energy industries and support invention, technology transfer, and continued workforce education.

Michigan State University's alternative energy research centers

Through its alternative energy research centers, Michigan State University provides varied expertise in agriculture and engineering, along with opportunities for industrial and federal collaboration in transportation, energy, and efficiency.[†] The Automotive Research Experiment Station provides multidisciplinary research in the automobile industry.[‡] The Great Lakes Bioenergy Research Center, where Michigan State is a major partner with the University of Wisconsin, focuses on approaches to converting nonfood plants and biomass into transportation fuels[§] and is one of three national centers funded by the U.S. Department of Energy.

University of Michigan's Energy Institute

The Energy Institute draws on the University of Michigan's foundation in technology innovation and experience in the automotive and manufacturing industries to develop solutions for today's energy challenges. Through industry and government collaboration and funding, the institute's annual \$50 million budget supports such topics as carbon reduction at energy sources, energy storage, transportation fuels, and the economic and societal impacts of energy policy.[§]

Wayne State University's National Biofuels Energy Laboratory

The National Biofuel Energy Laboratory, established with U.S. Department of Energy funding, also leads in research and development. Located in Wayne State University's College of Engineering, the lab supports collaborative biodiesel research and product development. Partnerships include Michigan's NextEnergy Corp., Bosch, and Delphi.^{**}

[†] Michigan State University, "Research: Alternative Energy," <http://research.msu.edu/topics/alternative-energy>.

[‡] Michigan State University, "Automotive Research Experiment Station," <http://www.egr.msu.edu/ares>.

[§] Michigan State University, "Great Lakes Bioenergy Research Center," <http://glbrc.msu.edu/>.

[§] University of Michigan, "Energy Institute," <http://energy.umich.edu/about-us>.

^{**} Wayne State University, "National Biofuels Energy Laboratory," <http://www.eng.wayne.edu/page.php?id=4765>.

Emerging opportunities

The U.S. Department of Energy introduced a \$3.2 million opportunity supporting innovation in early 2014: the National Incubator Initiative for Clean Energy. The initiative's goals are to advance the performance of business incubators and increase support and investment for early stage companies developing cutting-edge technologies.¹⁵

As part of the initiative, the Department of Energy selected Detroit's NextEnergy Center to establish a Midwest Innovation Bridge to facilitate public and private sector innovation. Along with its partner, the Clean Energy Trust in Chicago, the project will receive more than \$745,000 to establish the bridge, providing clean energy entrepreneurs access to testing and demonstration facilities in three sectors: transportation, electric grid, and buildings.¹⁶ This effort will coordinate clean energy business incubators nationwide and provide resources to support entrepreneurship and innovation, including entrepreneurial training, technology partnerships, and access to demonstration platforms. Eighty to 100 clean technology start-ups will participate in the program over three years.¹⁷

Project Spotlight

NextEnergy Center Fosters Clean Energy Research and Innovation



The NextEnergy Center, a hub of energy research and innovation in Detroit, focuses on energy efficiency and battery storage.

Continued on next page

The Detroit-based nonprofit NextEnergy Center focuses on energy efficiency and battery storage. Since its inception in 2002, the center has helped attract more than \$1.3 billion in new investment in Michigan. The center supports the state's advanced energy industry by leasing the research and conference campus to organizations seeking laboratory access and business incubator space, and to global companies, utilities, universities, and government agencies participating in collaborative projects. NextEnergy Center projects help develop smart grid technologies, which use digital communications to allow electricity providers to detect and react to changes in usage, energy storage, and electric vehicle technology. This is consistent with the needs of southeastern Michigan's advanced energy cluster.*

* Department of Energy, "Energy Department Invests \$3.2 Million to Support Clean Energy Small Businesses and Entrepreneurs" (June 20, 2014), <http://energy.gov/articles/energy-department-invests-32-million-support-clean-energy-small-businesses-and>.

Conclusion

Michigan's unique portfolio of renewable resources and skilled technical workers positions the state well to keep growing its clean energy economy. Ongoing investment in the state's strengths of manufacturing, innovation, and collaborative research will allow Michigan to capitalize fully on the discovery, deployment, and production of clean energy technologies.

Acknowledgments

This policy brief is one of a collection examining state clean energy economies. The states selected have demonstrated leadership in clean energy policies, installations, and economies or are at a crossroads in their energy futures. The brief was prepared by The Pew Charitable Trusts' clean energy initiative, with Kerry Schlichting as lead author. This research was funded in part by The 11th Hour Project.

Unless otherwise specified, data on capacity additions and investment were provided by Navigant Research, an energy market research firm, and include solar photovoltaics, industrial sector combined heat and power, geothermal power (excluding heat pumps), biomass power (excluding landfill-gas, anaerobic digesters, and biogas recovery), hydropower projects, permanently installed (not pilot) marine and hydrokinetic projects, and wind projects greater than 1 megawatt.

The Clean Energy Business Network

Pew's Clean Energy Business Network seeks to inform and engage clean energy business leaders in policy issues affecting the industry. For more information or to sign up for this free resource, visit pewtrusts.org/businessnetwork.

Endnotes

- 1 Hill Group Inc., *Economic Impact of Two Renewable Portfolio Standard Scenarios in Michigan, 2015 to 2025*, (Lansing, MI: Michigan Conservative Energy Forum, January 2014), 4, <http://www.hillgroupinc.com/documents/MichiganRenewablePortfolioStandardStudy.pdf>; and Michigan Energy Options, "Michigan Renewable Energy Success Stories," last updated Dec. 14, 2009, <http://michiganenergyoptions.org/education/226-3-michigan-renewable-energy-success-stories>.
- 2 Ibid. 4.
- 3 Energy Information Administration, "Michigan State Profile and Energy Estimates," last updated Dec. 18, 2013, <http://www.eia.gov/state/analysis.cfm?sid=MI>.
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- 10 John D. Quackenbush, Greg R. White, and Sally A. Talberg, *Report on the Implementation of the P.A. 295 Renewable Energy Standard and the Cost-Effectiveness of the Energy Standards* (Lansing, MI: Michigan Public Service Commission, Department of Licensing and Regulatory Affairs, Feb. 14, 2014), http://www.michigan.gov/documents/mpsc/pa295report_447680_7.pdf.
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