



**Energy Supply (ES)
Technical Work Group**

Summary List of Pending Priority Policy Options for Analysis

	Policy Option	GHG Reductions (MMtCO ₂ e)			Net Present Value 2009–2025 (Million \$)	Cost-Effectiveness (\$/tCO ₂ e)	Level of Support
		2015	2025	Total 2009–2025			
ES-1	Renewable Portfolio Standard	0.0	10.2	63.5	\$1,732	\$27.28	Pending
	Wind	0.0	7.6	48.6	\$1,229	\$25.27	Pending
	Biomass	0.0	2.0	12.5	\$173	\$14	Pending
	Solar PV	0.0	0.3	1.5	\$303	\$203	Pending
	Plasma Gasification	0.0	0.2	0.9	\$27	\$31	Pending
ES-12	Distributed renewable energy incentives, barrier removal, and development issues including grid access - TOTAL	0.7	1.5	14.0	\$1,145	\$82.1	Pending
	Solar Hot Water	0.0	0.2	1.2	\$29	\$24.0	
	Geothermal	0.1	0.2	1.6	\$70	\$44.3	
	Distributed Wind	0.1	0.2	3.8	\$463	\$122	
	Solar PV	0.1	0.2	2.1	\$588	\$275	
	Biogas	0.4	0.7	6.8	\$66	\$9.7	

Note: The numbering used to denote the pending priority draft policy options is for reference purposes only; it does not reflect prioritization among these important draft policy options.

ES-1. Renewable Portfolio Standard

Policy Description

A renewable portfolio standard (RPS) is a requirement that utilities supply a certain amount of annual retail sales from eligible renewable energy sources by a certain date and each year thereafter. Beyond reducing utility-sector emissions of carbon dioxide, benefits to Michigan would include lower emissions of smog and soot precursors, improved energy balance of trade, diversified fuel supply risk, and economic development potential. Michigan currently meets over 4% of its electricity needs from renewable sources.

Twenty-four states plus the District of Columbia have adopted some form of RPS. In the Midwest, these include IL (25% by 2025), MN (27.4% by 2025), OH (12.5% by 2025) and WI (10% by 2015).

Policy Design

Goals and Timing:

Goals are stated as a percent of annual sales and represent total renewable contribution and not 'new' or 'incremental'.

Short-term target (consistent with [recently passed Michigan Energy Legislation \(P.A. 295 of 2008\)](#))

- 10% by 2015¹

Long-term goals (consistent with MGA platform)

- 20% by 2020
- 25% by 2025
- 30% by 2030

Parties Involved:

An RPS provision within State law will affect all aspects of Michigan's energy sector and the State's population. Therefore, all aspects of Michigan society will need to participate, either in the formation of policy, in the generation and delivery of energy, or by paying for renewable energy resources either voluntarily through signing up for existing renewable energy programs offered by utilities and others or through costs embedded in general rates, through Power Supply

Deleted: 21st Century Energy Plan, pending state legislation and MGA platform

¹ P.A. 295 specifies with up to 10% of the RPS able to be met with energy optimization (10% of the 10% RPS) or advanced cleaner energy credits (7% of the 10% RPS). Eligible renewable resources include: solar water heat, solar thermal process heat, photovoltaics, landfill gas produced from MSW, wind, biomass, certain hydroelectric, tidal, geothermal electric, municipal solid waste, gasification, industrial waste heat, and clean coal. Michigan RPS is subject to "cost caps" and extensions to meet RPS are permitted Consumer Energy must meet 200 MW of renewable energy capacity by 2013 and 500 MW of renewable capacity by 2015, and: Detroit Edison must meet 300 MW of renewable energy capacity by 2013 and 600 MW of renewable capacity by 2015. Credit Trading is available; Alternative Compliance Payments are not available.

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Cost Recovery mechanisms or other social funding mechanisms. Renewable energy will need to be evaluated within statewide long-term energy planning and also within company-specific IRP planning as detailed in another Energy Supply policy statement. Participation is required for all electricity distribution providers in Michigan.

Other:

- Given the economic benefits to Michigan of locating renewable energy projects and related manufacturing operations in the state, provisions that encourage these activities should be carefully considered.
- In general, the Michigan Renewable Energy Program, established under MPSC Act 3 of 1939 Section 460.10r; renewable energy includes solar, hydroelectric, wind, biofuel, solid waste incineration (WtE), biomass, and other renewable fuel sources.
- It should be noted that extensive discussions have taken place, through legislative stakeholder groups, over the past 2 years on defining renewable energy as it relates to an RPS.
- Mechanisms that expose renewable energy projects to competitive bidding should be explored.
- Any renewable energy supplied under ES-12 (Distributed Renewable Energy) should count toward the overall statewide RPS goal.
- Legislative support for the streamlining of siting, zoning and permitting for renewable energy projects will be of significant importance to achieve the long-term RPS goals of greater than 10%.
- Long-term RPS goals beyond 10% will need to allow sufficient flexibility for delays in development and construction timing due to the need for development of the electric transmission system and the risks and challenges of developing offshore renewable energy systems.

Implementation Mechanisms

Available policy mechanisms to implement an RPS requirement include a legislative act or regulatory action by the MPSC, within their jurisdiction. In any case, program development and administration would be directed by MPSC. Enforcement of the RPS requirement needs to balance the application of some form of a non-compliance penalty with allowance for a cost cap to control overall program costs. Typically a renewable energy credit-trading program will also be instituted to facilitate the development of a viable intrastate renewable energy market.

Related Policies/Programs in Place

In September 2008 the Michigan Legislature enacted SB.213, [and Governor Granholm signed this bill into law \(P.A. 295 of 2008\) creating](#) the “Clean, Renewable, and Efficient Energy Act,” calling for the MPSC to order electric utilities to submit [an energy optimization](#) plan with the Commission demonstrating how the utility will comply with the new renewable portfolio standard. The Renewable Portfolio Standard mandates that 10% of the state’s electricity be derived from renewable sources by 2015, with some exceptions.

Deleted: renewable

Per the U.S. Department of Energy, 24 states plus the District of Columbia have RPS requirements in place. Together these states account for more than half of the electricity sales in the United States. Four other states, Illinois, Missouri, Virginia, and Vermont, have nonbinding goals for adoption of renewable energy instead of an RPS.²

Utilities and some Municipal suppliers in Michigan currently offer renewable energy options to customers through voluntary programs. These programs allow customers to opt to supply a portion of their load from renewable energy sources for a pricing premium.

Type(s) of GHG Reductions

Carbon dioxide (CO₂)

Estimated GHG Reductions and Costs or Cost Savings

ES-1-1: Renewable Portfolio Standard	2015	2025	Units
GHG emission savings	0.0	10.2	Million tons of CO ₂
Cumulative net costs (present value) (2009-2025)		\$1,732	Million \$
Cumulative emissions reductions (2009-2025)		63.5	Million tons of CO ₂
Cost-effectiveness		\$27.28	\$/ton of CO ₂

Data Sources:

- EIA Annual Energy Outlook
- http://www.windpoweringamerica.gov/pdfs/economic_development/2008/mi_wind_benefits_factsheet.pdf
- Conversation with Recovered Energy Inc (for plasma gasification)

Quantification Methods: New renewables were assumed to displace primarily coal-fired power, as reflected in the inventory and forecast. The values presented above *do not* reflect the recent RPS legislation but do account for reductions associated with other options.

Key Assumptions:

- The following portfolio of new renewables was used, based on input from the TWG:

Type of electricity generation	2015	2025	Units
Wind	80%	75%	of RPS

² Source: http://apps1.eere.energy.gov/states/maps/renewable_portfolio_states.cfm

Biomass	19%	25%	of RPS
Solar PV	1%	3%	of RPS
Plasma gasification	0%	2%	of RPS

- **X**% of new renewable generation must come from distributed sources (smaller than 10MW)
- The following assumptions were used for each type of generation

	2015	2025
Wind		
Capital cost (\$/kW)	1,650	2,000
Transmission cost (\$/kW)	120	120
Capacity factor	25%	25%
Solar Thermal		
Capital cost (\$/kW)	3,004	2,524
Transmission cost (\$/kW)	80	80
Capacity factor	25%	25%
Biomass		
Capital cost (\$/kW)	2,800	2,500
Transmission cost (\$/kW)	80	80
Capacity factor	90%	90%
Solar PV		
Capital cost (\$/kW)	4,915	4,331
Transmission cost (\$/kW)	80	80
Capacity factor	15%	15%
Geothermal		
Capital cost (\$/kW)	1,126	3,231
Transmission cost (\$/kW)	80	80
Capacity factor	85%	85%
Plasma Gasification		
Capital cost (\$/kW)	9,601	9,000
Transmission cost (\$/kW)	80	80
Capacity factor	85%	85%

- Avoided emissions rate: 0.73 tCO₂/MWh (2015); 0.56 tCO₂/MWh (2025). This accounts for the effect of other options (ES-1, ES-3, ES-6, ES-10, ES-11, ES-12 and ES-13)

Key Uncertainties

- Feasibility of plasma gasification
- Future capital costs for all types of renewable generation

Additional Benefits and Costs

The use of renewable sources in lieu of fossil fuels often reduces emissions of criteria pollutants and air toxics in addition to GHGs. These reductions offer indirect public health and related economic benefits, none of which are quantified or included here.

Feasibility Issues

The RPS enacted in 2008 and effective in 2015 is equivalent to the policy recommended here for 2015. The policy recommended here calls for progressively more stringent renewable contributions in 2020, 2025 and 2030. The likelihood that future Legislatures will extend and expand the RPS will depend in part on the experience with the 2015 requirement.

Status of Group Approval

Pending – [until MCAC moves to final agreement]

Level of Group Support

TBD – [blank until MCAC moves to final agreement]

Barriers to Consensus

TBD – [blank until final vote by the MCAC]

ES-12. Distributed renewable energy

Policy Description

This option focuses on removing barriers to and providing incentives to encourage the development of distributed renewable energy throughout the state. Distributed renewable energy is generally defined as smaller scale (generally less than 10 MW); located at or near the point of end use; interconnected to the distribution (as opposed to transmission) system; and more likely to have homeowner or community ownership.³ Increasing the use of distributed renewable energy provides electricity reliability, security and environmental benefits. Policies that have been developed and implemented successfully elsewhere to promote distributed renewable energy can be adapted for Michigan.

Policy Design

The main focus of the policy is developing and leading the market to produce distributed renewable energy by assuring investors of the opportunity to earn a reasonable return. Michigan must seek an appropriate combination of policies fitting our state's unique circumstances, which together will provide sufficient leverage/incentives to establish and grow a vibrant market. This could include any combination of utility rate treatment, financial incentives, tax policy, and consumer education.

The preferred policy design would include a well-designed and fully implemented Renewable Energy Payment (REP) program. While this policy option and associated goal specifically refer to distributed renewable energy, there is interest in making REPs available to large-scale projects also. A REP program may be designed to promote and encourage development of renewable energy projects of all sizes ranging from small residential up to the largest utility scale projects.

Goals:

With an objective to completely open the distributed renewable energy market, set a goal for new distributed renewable energy to reach 1% of Michigan's peak load by 2015 and increase to 3% of peak load per year through 2025. Based on data for Michigan's 2006 peak load from the 21st Century Energy Plan of 23,756 MW, this goal would require approximately 240 MW⁴ of new distributed renewable energy by 2015 increasing to reach 715 MW of new distributed renewable energy by 2025.

Small-scale renewable energy not connected to the grid and non-electric generating renewable resources such as geothermal heating and cooling and solar thermal domestic water heating systems should be encouraged. Incentive programs should be developed according to the schedule below such that, by 2025, an additional 1% of Michigan households are making use of these systems.

³ "Self-Service Power" defined in MCL 460.10a(6a). See [http://www.legislature.mi.gov/\(S\(dm4pmzapcyxj0fi2oor0t5fa\)\)/mileg.aspx?page=getobject&objectname=2000-PA-0141&query=on](http://www.legislature.mi.gov/(S(dm4pmzapcyxj0fi2oor0t5fa))/mileg.aspx?page=getobject&objectname=2000-PA-0141&query=on).

⁴ Distributed renewable energy totals represent nameplate capacity.

Year	Cumulative Percent of Michigan Housing Units w/Each Type of System at end of Year Range	Solar Thermal Domestic Water Heating		Geothermal Heating and Cooling	
		Annual Installations	Cumulative Installations at end of Year Range	Annual Installations	Cumulative Installations at end of Year Range
2010 - 2014	0.125%	1,125	5,625	1,125	5,625
2015 - 2019	0.375%	2,250	16,875	2,250	16,875
2020 - 2024	0.875%	4,500	39,375	4,500	39,375
2025	1%	5,625	45,000	5,625	45,000

There are 4.5 million housing units in Michigan. See <http://quickfacts.census.gov/qfd/states/26000.html>

A public education program would determine and widely disclose to the public the full cost accounting for renewable energy and fossil fuel production, including costs to public health and the environment. The public education program should be adequately funded.

Timing: As soon as possible.

Parties Involved: Legislation must be passed to provide for property tax exemptions. After passage of legislation to provide for these programs, utilities would administer the renewable energy payments and net metering programs under supervision of a state agency. The local distribution utility interconnection process is currently under review and an improved process is under development at the direction of the Michigan Public Service Commission. Efforts to quantify the benefits of distributed renewable resources would be undertaken by a state agency. State agencies have already providing funding on a county-by-county basis to work with local governments to develop model distributed wind energy facility siting and zoning ordinances. This work could be continued and expanded to other counties and could be expanded to other types of renewable energy resources.

Other: The net metering policy helps remove barriers by requiring utility companies to provide access to the power grid including streamlining and simplifying their interconnection procedures. Supplemental policies could: (1) provide assistance and incentives to local units of government to streamline and modernize zoning and siting rules and processes, and (2) determine and widely disclose to the public full cost accounting for renewable energy and fossil fuel production, including costs to public health and the environment.

Implementation Mechanisms

Legislation is most likely needed to establish the REP program.

REPs would provide for producers of renewable electrical energy to be paid an established rate for each kilowatt-hour of energy they “feed into” the grid. The key principles of REPs include:

- The REP payment price is set just high enough to cover costs and assure a reasonable return on investment. Prices vary according to the source of the energy (i.e., sun, wind, water, biomass, etc.) and the size of the energy-producing installation.⁵
- Barriers to interconnection must be removed. Implementation of ES-15a Transmission Access and Upgrades and ES-15b Distribution System Access and Upgrades are key elements to successful implementation of REPs. A fully implemented REP program would have no limit on the amount of renewable energy that can be sold to utility companies.
- Distributed renewable energy producers must be able to obtain 15-20 year tariffs. All tariffs are transparent and open for inspection.
- The utility companies can recoup their increased costs of paying higher prices for renewable energy by spreading these costs among all their customers.
- An independent government review board periodically sets the prices and terms for new tariffs. It is expected that the REP payment price will decrease for new installations as technology advances decrease the costs of distributed renewable generation.

The financial subsidy need not come from utility ratepayers. Any source of public funding could be used to augment utility rates.

Based on the design of the REP program, net metering may be an additional incentive and a complement to the REP program for certain types of distributed renewable energy. The net metering program may be established either through legislation or state agency actions. The simplest form of net metering allows owners of grid-connected distributed energy (generating units on the customer side of the meter, often limited to some maximum kW level) to be billed based on net usage and receive a credit for excess electricity from their electricity supplier. This type of net metering provides several incentives for distributed renewable energy by reducing transaction costs (e.g., no need to negotiate contracts for the sale of electricity back to the utility or purchase expensive upgraded meters) reducing customer utility bills by providing for monthly netting of customer electricity usage.

For grid-connected and non-grid connected distributed renewable energy, consideration should be given to how other incentives such as tax credits, property tax exemptions, installation cost rebates, and low interest loans would best complement the REP program. These additional incentives may have a high impact on the development of renewable energy that is not grid connected and non-electricity generating renewable resources such as solar thermal domestic water heating and geothermal heating and cooling systems. Such non-electricity generating systems reduce the use of electricity needed for household heating and cooling which would benefit from these economic incentives. Such incentives may be established through a combination of legislation or state agency actions.

Utilities, state agencies, environmental groups and other interested parties should develop and implement the renewable energy public education program.

⁵ See for example: Gipe, Paul. (2007). *Advanced Renewable Tariff Pricing Worksheets*. Website: <http://www.wind-works.org/PricingWorksheets/ARTsTariffsPricingWorksheets.html>. Mendonca, Miguel. (2007). *Feed-In Tariffs, Accelerating the Deployment of Renewable Energy*, World Future Council, Earthscan.

Related Policies/Programs in Place

On October 6, 2008, PA 295 was enacted. Part 5 of the Act requires the Michigan Public Service Commission to establish a statewide net metering program applicable to electric utilities and alternative electric suppliers. The program provides “true net metering” for eligible generators with a capacity of 20 kW and under and “modified net metering” for eligible generators with a capacity of up to 150 kW and methane digesters with a capacity of up to 550 kW. Electric utilities and alternative electric suppliers are required to offer net metering until the size of their program reaches 1% of their in-state peak load for the preceding year.

Since 1991, Germany, Spain, Denmark, and over 40 other nations, states, and provinces, have successfully implemented REPs as incentives for homeowners, farmers, businesses, etc., to become producers or increase their production of renewable energy. In many of these countries these policies are called “Feed-In Tariffs” (FITs). Eighteen out of 25 European Union countries have established a variety of different feed-in tariff designs.⁶

With REPs, producers of distributed renewable energy are offered long-term, standard tariffs with prices intended to provide developers with ample revenues to assure a reasonable return on their investment. As such, REPs have the potential to increase overall production and use of renewable energy, and decrease consumption and burning of fossil fuels. At least some researchers believe REPs represent the fastest, least expensive means for supporting wide growth of distributed renewable energy.

A bill titled, “*Michigan Renewable Energy Sources Act*,” was introduced in the Michigan House during 2008.⁷

New Jersey, Colorado, Pennsylvania, Maryland, and California are states with net metering programs that received an “A” grade in *Freeing the Grid*, 2007 Edition.⁸

Michigan currently has a limited net metering program available to customers of regulated utilities. The program is not standardized and varies widely by utility. As of the most recent reporting period, there were a total of 23 customers participating in the program.

The Michigan Public Service Commission issued an Order on August 6, 2008, in Case No. U-15316, adopting the Energy Policy Act of 2005 net metering standard.⁹ Utilities are ordered to file an application for approval of a new net metering tariff by December 31, 2009. Utilities that file a rate case before that date or that have a rate case pending on the date of issuance of this order do not need to file a separate application for the new tariff.

⁶ Klein, Arne; Held, Ann; Ragwitz, Mario; Resch, Gustav; Faber, Thomas. (2007). Evaluation for different feed-in tariff design options: Best practice paper for the International Feed-in Cooperation. German Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU). Website: http://www.feed-in-cooperation.org/images/files/best_practice_paper_final.pdf

⁷ See HB 5218, [http://www.legislature.mi.gov/\(S\(fg1phg45vqwgajjnikisaao\)\)/mileg.aspx?page=getObject&objectName=2007-HB-5218](http://www.legislature.mi.gov/(S(fg1phg45vqwgajjnikisaao))/mileg.aspx?page=getObject&objectName=2007-HB-5218).

⁸ See *Freeing the Grid*, 2007 Edition, Network for New Energy Choices www.newenergychoices.org.

⁹ See Order, <http://efile.mpsc.cis.state.mi.us/efile/docs/15316/0022.pdf>.

Other forms of financial incentives for renewable energy include special utility rates, tax credits (for example, the Federal Production Tax Credit¹⁰), installation cost rebates, and low interest loans. Both New Jersey and California have had very successful rebate programs.¹¹

As of January 2008, there are 6 utilities in Michigan who are member utilities of Wisconsin Public Power Inc. These utilities offer rebates or low interest loans for qualifying solar thermal domestic water heating, solar photovoltaic, and small-scale wind installations.¹²

The Michigan Energy Office implemented a \$3/watt incentive program for small solar and wind systems in 2001. The program budget was \$300,000 from the State Energy Program grant from the U.S. Dept. of Energy. It was anticipated that the program would start slowly after January 1 and end late in calendar year 2001. By the end of March, 18 incentives had been approved. By the end of April, 86 incentives and the entire budget of \$300,000 had been approved. The 86 incentives represented 47 kW of solar energy and 62 kW of wind energy. The Michigan Energy Office learned that 1) there was a significant amount of interest on the part of consumers, and 2) the budget was not big enough to have a program in place for a reasonable amount of time. A four-month program generated a lot of interest, but also a lot of disappointment.

In 2005, a Michigan Energy Office solar thermal domestic water-heating program offered incentives totaling \$415,000. Of the 117 systems receiving incentives, 20 rebates were provided for repair of existing systems. Rebates varied within a range of \$2000 to \$4000 based on the type of system selected. At the time the program ended, approximately \$290,000 had been spent.

Type(s) of GHG Reductions

Carbon dioxide (CO₂)

Estimated GHG Reductions and Costs or Cost Savings

ES-12: Distributed renewable energy	2015	2025	Units
GHG emission savings	0.69	1.52	Million tons of CO ₂
Cumulative net costs (present value) (2009-2025)		\$1,145	Million \$

¹⁰ See

http://www.dsireusa.org/library/includes/incentivesearch.cfm?Incentive_Code=US13F&state=US¤tpageid=7&search=TableState&EE=1&RE=1 for more information on the production tax credit.

¹¹ See <http://www.njcleanenergy.com/renewable-energy/programs/core-rebate-program/incentives/core-rebate-program> for information on New Jersey's rebate program. See

<http://www.gosolarcalifornia.ca.gov/csi/index.html> for information on California's solar rebate program.

¹² See

http://www.wppisys.org/programs_services/default.asp?CategoryID=38&SubcategoryID=82.

Cumulative emissions reductions (2009-2025)		14	Million tons of CO ₂
Cost-effectiveness		\$82	\$/ton of CO ₂

Data Sources:

- EIA Annual Energy Outlook
- Data provided by Michigan Public Service Commission

Quantification Methods: Distributed generation would displace primarily coal-fired electricity. Solar hot water and geothermal energy would displace 50% natural gas heating and 50% electricity heating.

Key Assumptions:

- The following portfolio of new distributed generation was used, based on input from the TWG:

Type of electricity generation	2015	2025	Units
Wind	40%	40%	of new distributed generation
Solar PV	25%	25%	of new distributed generation
Biogas	35%	35%	of new distributed generation

- Solar hot water installations: 7,875 homes by 2015; 45,000 by 2025
- Geothermal installations: 7,875 homes by 2015; 45,000 by 2025
- The following assumptions were used capital costs for each type of generation

Capital Costs	2015	2025	Units
Solar hot water	\$4,459	\$5,203	\$/installation
Geothermal	\$16,000	\$16,000	\$/installation
Wind (distributed)	\$6,000	\$5,000	\$/kW
Solar PV (distributed)	\$10,000	\$10,000	\$/kW
Biogas	\$2,500	\$2,500	\$/kW

- Avoided emissions rate: 0.73 tCO₂/MWh (2015); 0.56 tCO₂/MWh (2025). This accounts for the effect of other options (ES-1, ES-3, ES-6, ES-10, ES-11, ES-12 and ES-13)
- Biogas heat rate: 10,000 Btu/kWh

Key Uncertainties

- Future capital costs

Additional Benefits and Costs

Distributed renewable energy anticipates a relatively large number of small scale installations. The successful implementation of the policy will require the establishment of a large number of enterprises to meet the new demand. This will create many new jobs requiring new skills. In addition, the demand will likely spur R&D of new technologies, which will further promote investment and job creation.

Feasibility Issues

None

Status of Group Approval

Pending – [until MCAC moves to final agreement]

Level of Group Support

TBD – [blank until MCAC moves to final agreement]

Barriers to Consensus

TBD – [blank until final vote by the MCAC]