

**Renewable Energy Question #23: How have eligible “renewable”/ “clean”/ “sustainable” energy resources been defined in other jurisdictions? How has the possibility of new forms of energy been accommodated, if at all?**

Renewable, clean, and sustainable energy resources have been defined in various ways under the 29 states that have established renewable electricity standards. See the table below for a detailed listing of eligible energy technologies under each state RES.

**Solar:** Nearly all states, including Michigan, consider both Solar Photovoltaic and Solar Thermal Electric to be eligible to meet their RPS. Other states include solar technologies that do not produce electricity, such as solar water heat, solar space heat, and solar thermal process heat.

**Wind:** All states include wind energy in their renewable electricity standards.

**Geothermal:** Most states, including Michigan, count geothermal electric as a renewable energy resource in their RPS. Some states also give credit for other forms of geothermal energy that do not produce electricity, including the geothermal heat pumps in buildings and the direct use of hot water produced in geothermal reservoirs.

**Hydroelectric:** All states include hydroelectric resources in some way. Because large-scale hydro is a mature technology that typically does not need the policy support as other renewable energy technologies, states have chosen to deal with hydroelectric in different ways. Some states include provisions for small hydroelectric facilities, and some include hydroelectric in a separate tier so that it does not compete with other renewable technologies. Several states require hydroelectric facilities to be certified by the Low Impact Hydropower Institute (LIHI certification) or meet other generic environmental criteria. For example, California’s RPS only includes new hydroelectric that facilities have a capacity of 30 MW or less and does not “cause an adverse impact on instream beneficial uses or cause a change in the volume or timing of streamflow.”

**Ocean:** Coastal states and states located on the Great Lakes also include various forms of Ocean Energy renewable technologies, including wave, tidal, and ocean thermal.

**Biomass:** Michigan, along with most other states, includes four categories of biomass: generic biomass, landfill gas, municipal solid waste, and anaerobic digestion. However, not all biomass resources have the same environmental benefits. As a result, several states have adopted sustainability criteria when determining biomass energy eligibility for a renewable electricity standard. For example, New York has extensive sustainability and emissions criteria for biomass.

**New Technologies:** Most states do not include explicit provisions for new technologies in their renewable electricity standards. For the states that do include such provisions, the public service commission in the state typically has discretion to allow new technologies, and best practice requires that these decisions are made in an open stakeholder process. New Mexico has an open category for “zero emission technology with substantial long-term production potential”. Arizona includes “additional technologies upon approval”. Michigan includes advanced cleaner energy facilities using a technology that is not in commercial operation as of the date of the act's effective date. It specifically identifies gasification, industrial cogeneration, and coal-fired facilities that capture and sequester (CCS) 85 percent of carbon dioxide emissions as eligible technologies.

**Alternative Resources:** In general, renewable electricity standards should not include support for non-renewable resources. However, some states, including Michigan, Ohio, and Pennsylvania, have included

provisions for non-renewable resources, generally using a separate tier or cap on the amount of generation that is eligible from these resources.

Resources:

1) Database of State Incentives for Renewables and Efficiency. Available at: <http://www.dsireusa.org/>

2) New York State Renewable Portfolio Standard Biomass Guidebook. Available at:  
[http://www.dps.ny.gov/NYS\\_Biomass\\_Guidebook\\_April\\_2006.pdf](http://www.dps.ny.gov/NYS_Biomass_Guidebook_April_2006.pdf)

3) Heeter, Jenni and Lori Bird. 2012. *Including Alternative Resources in State Renewable Portfolio Standards: Current Design and Implementation Experience*. National Renewable Energy Laboratory: Golden, CO. Available at: <http://www.nrel.gov/docs/fy13osti/55979.pdf>

	Solar Photovoltaic	Solar Thermal Electric	Solar Water Heat	Solar Space Heat	Solar Thermal Process Heat	Solar Light Pipes	Solar Pool Heating	Daylighting (non-residential only)	Solar Space Cooling	Solar HVAC
Arizona	X	X	X	X	X		X	X	X	X
California	X	X								
Colorado	X	X								
Connecticut	X	X								
Iowa	X	X								
Kansas	X	X		X	X					
Maine	X	X								
Maryland	X	X	X							
Massachusetts	X	X								
Michigan	X	X								
Minnesota	X	X								
Missouri	X	X								
Montana	X	X								
Nevada	X	X	X	X	X		X			
New Hampshire	X	X	X	X	X					
New Jersey	X	X								
New Mexico	X	X								
New York	X		X							
North Carolina	X	X	X	X	X					
Ohio	X	X								
Oregon	X	X								
Pennsylvania	X	X	X	X	X					
Rhode Island	X	X								
Texas	X	X	X							
Washington	X	X								
Wisconsin	X	X	X		X	X				

	Wind	Geothermal				Hydroelectric		Ocean	
	Wind	Geothermal Electric	Geothermal Heat Pumps	Geothermal Direct Use	Hydroelectric	Small Hydroelectric	Wave Energy	Tidal Energy	Ocean Thermal
Arizona	X	X	X	X	X				
California	X	X				X	X	X	X
Colorado	X	X			X				
Connecticut	X				X		X	X	X
Iowa	X				X				
Kansas	X				X	X			
Maine	X	X			X				X
Maryland	X	X	X	X	X		X	X	X
Massachusetts	X	X			X	X	X	X	X
Michigan	X	X			X		X	X	
Minnesota	X				X				
Missouri	X				X	X			
Montana	X	X			X				
Nevada	X	X		X	X				
New Hampshire	X		X		X	X	X	X	X
New Jersey	X	X			X		X	X	
New Mexico	X	X			X				
New York	X				X		X	X	X
North Carolina	X	X				X	X	X	
Ohio	X	X			X				
Oregon	X	X			X		X	X	X
Pennsylvania	X	X	X		X				
Rhode Island	X	X			X		X	X	X
Texas	X	X	X		X		X	X	X
Washington	X	X			X				
Wisconsin	X	X	X		X	X	X	X	

	Biomass	Landfill Gas	Municipal Solid	Anaerobic Digestion	Biodiesel	Ethanol	Methanol	Biomass Thermal	Pyrolysis	Densified Fuel	Biogas
Arizona	X	X		X							
California	X	X	X	X	X						
Colorado	X	X		X							
Connecticut	X	X	X	X							
Iowa	X	X	X	X							
Kansas	X	X									
Maine	X	X	X								
Maryland	X	X	X	X							
Massachusetts	X	X	X	X							
Michigan	X	X	X	X							
Minnesota	X	X	X	X							
Missouri	X	X	X	X		X					
Montana	X	X		X							
Nevada	X	X	X	X	X						
New Hampshire	X	X		X	X						
New Jersey	X	X	X	X							
New Mexico	X	X		X							
New York	X	X		X	X	X	X				
North Carolina	X	X		X							
Ohio	X	X	X	X							
Oregon	X	X	X	X							
Pennsylvania	X	X	X	X							
Rhode Island	X	X		X	X						
Texas	X	X									
Washington	X	X		X	X						
Wisconsin	X	X	X	X	X			X	X	X	X

	Fuel Cells			Storage		Combined Heat and Power	
	Fuel Cells	Hydrogen	Fuel Cells using Renewable Fuels	Compressed Air Energy Storage (From Eligible Renewables)	Energy Storage	CHP/Cogeneration	CHP only counts when the source fuel is an eligible renewable energy resource
Arizona			X				X
California			X		X		
Colorado			X				
Connecticut	X		X			X	
Iowa							
Kansas			X				
Maine	X		X			X	
Maryland			X				
Massachusetts			X				
Michigan						X	
Minnesota		X					
Missouri			X				
Montana			X	X			
Nevada							
New Hampshire	X	X	X			X	
New Jersey			X				
New Mexico			X				
New York	X		X			X	
North Carolina		X				X	
Ohio	X		X		X	X	
Oregon		X					
Pennsylvania	X		X			X	
Rhode Island			X				
Texas							
Washington							
Wisconsin			X			X	

