



MINNESOTA

CLEAN ENERGY ECONOMY PROFILE

How Industry Sectors are Advancing Economic Growth

OCTOBER 2014

EXECUTIVE SUMMARY

Readily available and reliable energy is critical for the economic vitality, public health, and well-being of all Minnesotans. Because it has no natural deposits of coal, natural gas or petroleum, Minnesotans have spent at least \$13 billion every year since 2010 on fossil fuels imported into the state.¹ Minnesota can ease the effects from importing fossil fuels by using its abundant natural renewable resources, such as wind, solar, and many types of biomass. Minnesota has become a national leader in growing the clean energy economy, and is positioned to compete in a \$1.13 trillion global clean energy market.²

Minnesota's longstanding and new energy policies are sending a signal to businesses that are comparing investment opportunities. This report shows that the state's steady support is stimulating growth across clean energy sectors, creating a diversity of good-paying jobs, a concentration of expertise, substantial clean energy infrastructure, and a variety of businesses spanning the value chain.

Clean energy is reducing Minnesota's dependence on non-renewable sources of energy. For example, only 4 percent of the electricity generated in Minnesota in 2000 came from renewable energy, but by 2011 renewable electricity jumped to 16 percent of total generation.³ Minnesota farmers are providing feedstock for renewable ethanol to replace more than 10 percent of petroleum gasoline the state imports for vehicles. The state is now an energy exporter as well, with 880 million gallons of ethanol exported to other states in 2011.⁴ Farmers also reduce imports of diesel by providing a minimum of 5 percent renewable diesel for fuel sold in the state during winter months and 10 percent for summer months.

As a result, Minnesota has a growing clean energy economy that sustains local jobs and attracts investment. These clean energy businesses employ workers and generate revenue directly from products or services that use less energy to provide the same service, or produce heat, power, or fuel from renewable sources of energy. This assessment includes clean energy sectors (along with their value chains) known to have a direct but undetermined impact on the economy: energy efficiency, wind, solar, bioenergy, and smart grid. A strong local value chain, including manufacturing, supplying components or raw material, sales and distribution, installation and maintenance, and research or development, can give the state a competitive advantage in the industry.

Minnesota's clean energy economy is growing quickly in terms of jobs, wages, and market development. This report includes the following findings:

- **Minnesota's early start and continued support of clean energy policies creates a competitive advantage:** State policies dating back to 1980 sent strong market signals to investors. These policies provided incentives that encouraged development and adoption of energy efficient and renewable energy technologies. For example, Minnesota passed a law in 2013 to provide an incentive payment for solar systems manufactured in the state, and in 2010 a state goal for utilities to achieve 1.5 percent annual energy savings took effect. These policies have further stimulated markets by influencing federal standards and supporting development of community-centered enterprises.
- **The clean energy market is developing rapidly, reducing the state's dependence on imported energy:** Biofuels production capacity, energy efficiency savings, and solar and wind installations all had triple-digit percentage jumps between 2000 and 2012. As of 2012, annual energy efficiency savings and renewable electricity capacity in Minnesota was enough to power over 1.4 million homes in the state for a year. State biofuel production capacity was enough to replace traditional fuel for 1.7 million vehicles for one year.

- **Employment in clean energy sectors reached 15,300 in 2014 and is growing faster than total state employment:** Clean energy employment in Minnesota surged 78 percent between January 2000 and the first quarter of 2014, growing steadily through the recession. The state's total employment grew only 11 percent over the last 15 years. Over 15,300 workers are employed in a diversity of clean energy sectors in Minnesota. Of these workers, about 60 percent are in the energy efficiency sector, and the rest are spread across bioenergy, wind power, solar energy, and smart grid.
- **Workers in clean energy earn high average wages compared with the state average:** Minnesota workers in the clean energy economy earned over \$1 billion in wages in 2013. Average annual wages in the clean energy economy reached over \$71,000 in 2013, which was 42 percent higher than the statewide average for all jobs of about \$50,000. Within clean energy sectors, average wages range from \$61,500 in wind to \$80,300 in smart grid. These jobs range from installation and maintenance to manufacturing and research.
- **Minnesota is advancing innovation in clean energy sectors, with strong patent and investment activity:** Minnesota companies are developing and deploying new clean energy technologies at an increasing rate. Minnesota ranked eighth in the US in total clean energy patents in 2013 — a leap from a decade ago when the state ranked 20th — and companies received about \$450 million in early stage investment over the last 10 years. Companies also received nearly \$11 billion in project financing from the private sector to install renewable energy projects between 2004 and 2013.

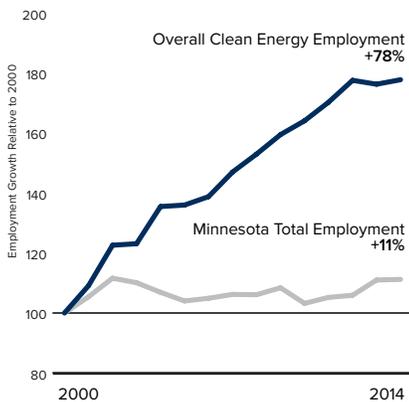
The clean energy economy is creating an increasing number of high-paying jobs, decreasing dependence on imported fuels, and improving air and water quality in the state. Other states have increasingly recognized the value of the clean energy industry and are rapidly accelerating their support for it. However, thanks to robust developments in the last 25 years, along with public and private sector technical and financial expertise, Minnesota is well positioned to benefit from a window of opportunity presented by the growing, international clean energy economy and advance local clean energy economic development.

CLEAN ENERGY ECONOMY PROFILE AT A GLANCE

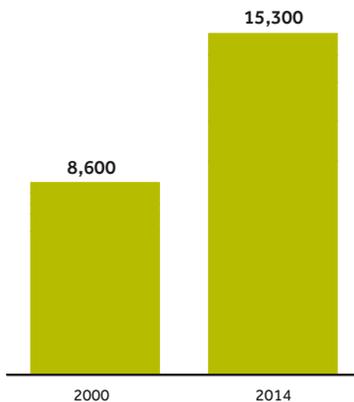
Clean Energy Employment and Wages

The clean energy economy is growing rapidly, creating jobs with good-paying wages. Minnesota employed over 15,300 workers in energy efficiency, bioenergy, wind, solar, and smart grid sectors as of first quarter 2014. Clean energy employment grew faster than employment in the state overall over the last 15 years. Moreover, wages in clean energy are well above the state average.

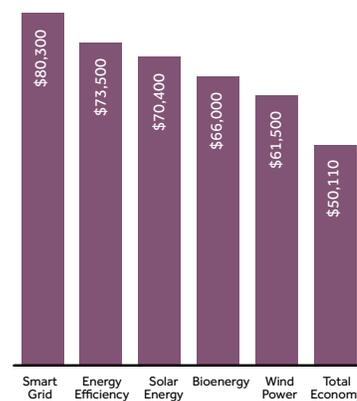
EMPLOYMENT GROWTH
2000-2014



CLEAN ENERGY EMPLOYMENT
2000 and 2014



AVERAGE ANNUAL WAGE
2013



Clean energy employment grew faster than total state employment since January 2000

Jobs in Minnesota's overall clean energy economy jumped 78 percent between 2000 and 2014, reaching more than 15,300 in the first quarter of 2014. Over the same time period, total employment in the state increased 11 percent.

Employment in the clean energy economy nearly doubled in the last 15 years

Employment in Minnesota's clean energy economy has grown across all sectors and diversified over time; while energy efficiency remains the largest sector, bioenergy, smart grid and solar employment all more than doubled between 2000 and 2014. Wind employment nearly tripled over the same period.

Average annual wages in the clean energy economy are 42 percent higher than the statewide average for all jobs

Total payroll was over \$1 billion in 2013. Average wages ranged from roughly \$61,500 annually in the wind sector, to roughly \$80,300 annually for smart grid jobs.

Clean Energy Market Development

Policies enacted by the Legislature have helped stimulate growth across sectors and increased in-state production of clean energy from the early 1980s through today.

COMPARISON OF CLEAN ENERGY MARKET DEVELOPMENT
Minnesota, 2000-2012

	2000-2012 % change
Energy Efficiency cumulative savings	524%
Bioenergy electricity production	40%
Installed wind energy capacity	935%
Installed solar energy capacity	9670%
Biofuel (Ethanol) production capacity	408%

As of 2012, annual energy efficiency savings and renewable electricity capacity in Minnesota was enough to power over 1.4 million homes in the state for a year

Energy efficiency savings, bioenergy electricity generation, wind and solar installations, and ethanol production had triple digit percentage jumps between 2000 and 2012 across nearly all sectors.

Clean Energy Innovation

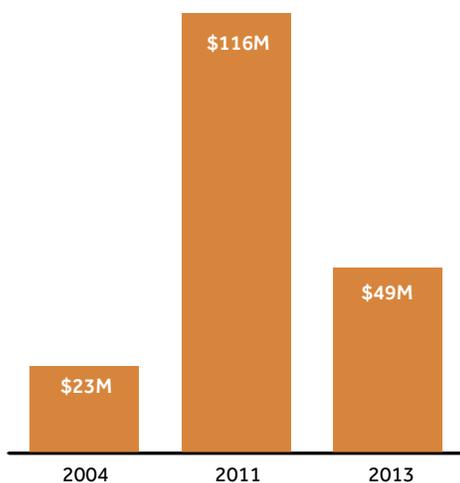
Minnesota companies are driving clean energy innovation, and developing and deploying clean energy technologies at an increasing rate.

CLEAN ENERGY PATENTS REGISTERED Minnesota Rank among U.S. States, 2013		
	Rank in U.S.	Total Patents
Smart Grid	6	44
Energy Efficiency	12	38
Solar Energy	13	9
Wind Power	13	4
Bioenergy	22	3
Total Clean Energy Rank	8	98

In 2013, Minnesota ranked 8th in the U.S. for patents registered

Minnesota is becoming an innovation leader in developing clean energy technologies; it ranked eighth in the US for number of patents registered in 2013, up from 20th in 2003. The state is also a leader in smart grid technologies, ranking sixth in the nation in patents registered in 2013

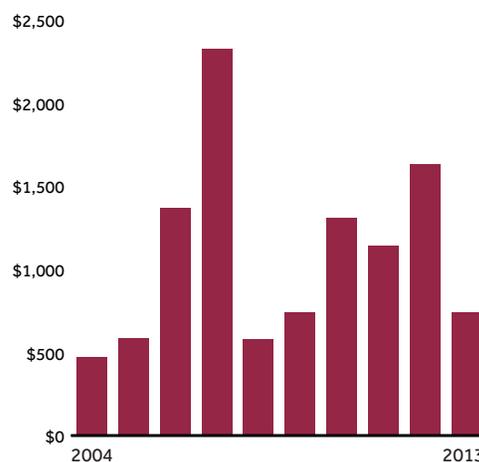
EARLY STAGE INVESTMENT Inflation adjusted



Clean energy companies received over \$450 million in early stage investment between 2004 and 2013

Between 2004 and 2013, Minnesota's clean energy companies received over \$450 million of early stage investment. Bioenergy companies received the most investment over the period, followed by energy efficiency technology companies. Investment has declined from peak levels in 2011, mirroring a nationwide change in early stage clean technology investment.

RENEWABLE ENERGY PROJECT FINANCING In Millions of Dollars, Inflation adjusted



Nearly \$11 billion in renewable energy project financing from the private sector between 2004 and 2013

Financing for renewable energy projects in Minnesota totaled nearly \$11 billion between 2004 and 2013, led by recent investments in wind projects, and investments in biofuel production facilities in earlier years. As in other states, uncertainty surrounding federal energy policies has deterred some investors in recent years.