
MINNESOTA CLEAN ENERGY: ECONOMIC IMPACTS & POLICY DRIVERS

How state and federal policies are converging to drive clean energy investment in Minnesota



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Energy Transition Lab

UNIVERSITY OF MINNESOTA
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Executive Summary

The recent extension of the Production Tax Credit (PTC) and Investment Tax Credit (ITC) was welcomed by renewable energy supporters throughout Minnesota and the nation. In this report, we draw attention to the multitude of ways that these policies have already had a positive impact on Minnesota's economy, and how their extension will continue to provide benefits for businesses and residents of the state.

Minnesota has undergone a remarkable transformation in its energy landscape over the past decade. Coal, once the dominant fuel source for Minnesota's electric utilities, has given way to new types of energy resources – wind and solar among them. While Minnesota's state energy policies have been a large driver in the shift from fossil fuels to renewables, the federal Production Tax Credit (PTC) and Investment Tax Credit (ITC) have played a major role in shaping the state's clean energy economy while keeping rates affordable for utility customers.

- Utility scale investments in wind and solar have increased since the extension of the PTC
- Distributed generation of solar energy has almost doubled in the past two years, with businesses citing the ITC as a major driver in their success
- The development of the existing wind and solar projects in the regional interconnection queue would result in approximately \$7.09 billion in direct investment, over 5,000 jobs related to construction alone, and 3987 megawatts of newly installed capacity
- Many of these new jobs and economic impacts will be in rural Minnesota counties that have not previously seen wind or solar development
- Minnesota Power and Otter Tail Power ratepayers have already saved money from renewable power purchases, with future savings from renewable power expected for Xcel Energy customers
- The ITC is also helping local businesses, schools, and universities benefit from their solar installations, frequently creating immediate cost savings
- Minnesota's clean energy economy has grown by over 7,000 jobs since 2000

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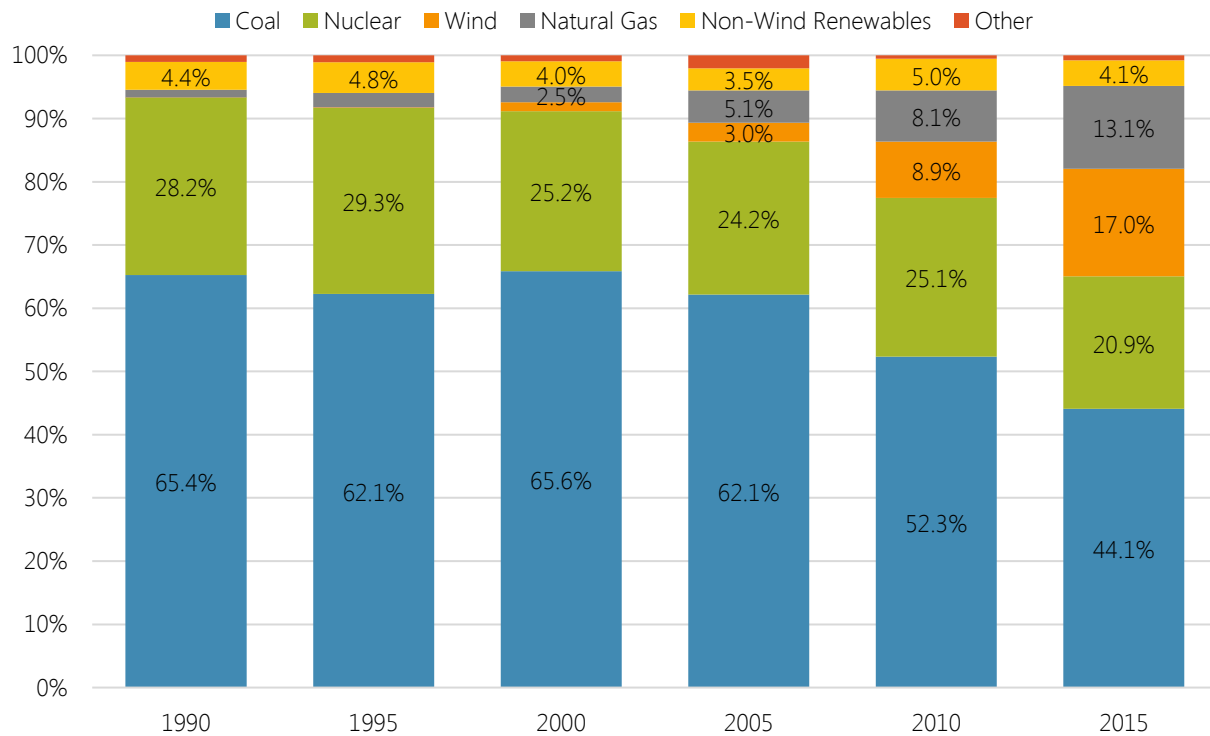
Introduction: Energy Landscape of Minnesota

Minnesota has undergone a remarkable transformation in its energy landscape over the past decade. Coal, once the dominant fuel source for Minnesota's electric utilities, has given way to new types of energy resources – wind and solar among them. While Minnesota's state energy policies have been a large driver in the shift from fossil fuels to renewables, the federal Production Tax Credit and Investment Tax Credit have played a major role in shaping the state's clean energy economy while keeping rates affordable for utility customers.

Minnesota's energy landscape has shifted rapidly throughout the past decade. Since 1990 the state has increased its share of renewable energy production from less than five percent to over 21 percent, with the majority coming from the deployment of wind energy. In the past five years solar energy has also experienced a period of remarkable growth, with close to 500 megawatts of projects forecasted to come online over the next two years.¹ The change from a system heavily dependent on fossil fuels produced out of state to one where local renewable energy is flourishing can be attributed to favorable policies at the local, state, and federal level.

In 2015, Minnesota generated 44.1 percent of its electricity from coal, down almost 20 percent from just 10 years earlier. This corresponded with a 14 percent increase in wind generation over the same period. The 2007 Renewable Energy Standard (RES) was a significant factor in the shift towards wind. Solar energy is entering a similar phase of development, especially in the wake of the state's 2013 solar energy standard (SES) which will require investor owned utilities to procure 1.5 percent of their annual energy from the sun.

Figure 1: Minnesota Electricity Generation Mix, % of total MWh



Source: EIA

The shift to renewable energy has kept billions of energy dollars in the state. Minnesota does not have any fossil fuel reserves. Instead, the state’s energy resources lie in wind, solar, biomass, and other renewable sources. The shift from imported energy to homegrown sources of electricity production improves Minnesota’s economy by creating jobs here instead of in other states or countries. Despite the explosion of renewable growth, Minnesota still sends over 18 billion dollars a year out of state by purchasing fossil fuels.² Greater expansion of renewable energy sources keeps these dollars circulating in the state.

There are a myriad of state, federal, and local policies that spur renewable energy development in Minnesota. From the national level tax credits to the state renewable portfolio standard, Minnesota’s policy landscape is driving enormous growth of the state’s clean energy economy. These overlapping state, federal, and local policies are difficult to isolate in terms of their specific economic impacts, but what is clear is that these policies have driven an enormous amount of economic growth in the state. It is clear that the Investment Tax Credit and Production Tax Credit have had a positive and lasting impact on Minnesota, and will continue to do so throughout the coming years. The chart below summarizes the major policies pertaining to renewable energy in Minnesota.

Table 1: Major Renewable Energy Policies in Minnesota for Wind and Solar

	Policy Details	Impacted Technologies	Implementing Sector
Renewable Electricity Production Tax Credit (PTC) ³	2.3¢ kWh tax credit through 2019, with drawdown	Wind	Federal
Business Energy Investment Tax Credit (ITC) ⁴	30% tax credit, 12/31/19 – solar phase out begins, 10% from 2022 onward 12/31/16 – wind phase out begins, 12/31/19 expiration	Solar, Wind	Federal
Renewable Energy Standard ⁵	30% by 2020 (Xcel Energy) 25% by 2025 (all other utilities)	Solar, Wind, Others	State
Solar Energy Standard ⁶	1.5% by 2020 (IOUs) 10% goal by 2030	Solar	State
Made in Minnesota ⁷	Production credit for solar equipment manufactured in MN	Solar	State
Net Metering ⁸	1MW Cap (IOUs) 40 kW Co-ops/Municipal Utilities	Solar, Wind	State
Value of Solar Tariff ⁹	Alternative to net metering for small solar	Solar	State, Utility
Utility Solar Incentive Programs	Various, both production and installation based	Solar, Wind	Utility
Community Solar Gardens	Allows anyone to participate in solar, Xcel has large program, others run their own gardens	Solar	Utility

ITC/PTC overview

Originally enacted in 1992, the Production Tax Credit (PTC) for wind and other renewable energy technologies has been a boon for development of alternative energy sources. The credit ensures a 2.3 cent per kilowatt hour incentive for wind, closed loop biomass, and geothermal energy resources.¹⁰ Since its inception the PTC has undergone several legislative changes and renewals, most recently at the end of 2015.¹¹ The credit was due to expire but a bipartisan effort extended both the PTC and the Investment Tax Credit (ITC) with gradual drawdowns for both in the Consolidated Appropriations Act of 2015.¹² Starting in 2017, facilities commencing construction will undergo a 20 percent reduction per year until 2020 when the PTC will be phased out completely.¹³ Projects that start construction by the end of 2016 will qualify for the full PTC and ITC, extending the already in place “safe harbor” guarantee. Guidance in 2016 from the Internal Revenue Service (IRS) extended this “safe harbor” guarantee from two years to four years.¹⁴ This means that a project that meets the 5% “safe harbor” test or the physical work test by December 31, 2016 it will be eligible for the full 100% PTC if it is placed in service by December 31, 2020.

Table 2: PTC Drawdown¹⁵

	2016	2017	2018	2019	2020
Wind Facilities Commencing Construction	100%	80%	60%	40%	0%

The Investment Tax Credit (ITC) originated in the Energy Policy Act of 2005 and similar to the PTC has been extended and expanded several times, most recently in 2015. The ITC exists for both business and residential customers, enabling each to take advantage of a thirty percent tax credit off the installed cost of various renewable energy systems. After the extension, the ITC will mainly apply to solar technologies, with a gradual drawdown of the incentive starting in 2020 and reducing to ten percent by 2022. If a renewable energy generator opts to take the ITC, they are ineligible for the PTC.

Table 3: ITC Drawdown¹⁶

Technology	2016	2017	2018	2019	2020	2021	2022	Future years
PV, Various Solar Thermal	30%	30%	30%	30%	26%	22%	10%	10%
Hybrid Solar Lighting, Fuel Cells, Small Wind	30%	-	-	-	-	-	-	-
Geothermal Heat Pumps, Micro turbines, CHP	10%	-	-	-	-	-	-	-
Geothermal Electric	10%	10%	10%	10%	10%	10%	10%	10%
Large Wind	30%	24%	18%	12%	-	-	-	-

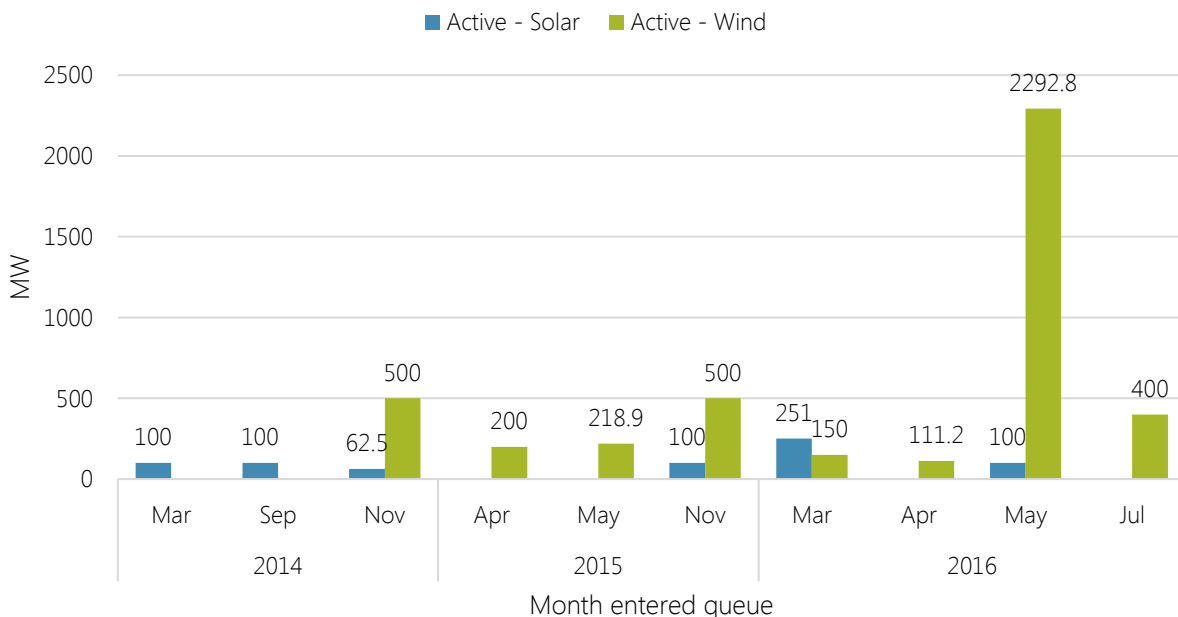
Utility Scale Investment in Wind and Solar

Minnesota’s electricity generation system is made up of a network of investor owned utilities, municipal power authorities, and rural electric cooperatives. Xcel Energy, an investor owned utility, is the largest electricity provider in the state and has driven a large portion of renewable energy development.

The extension of the ITC and PTC has accelerated planned investor owned utility investment in large scale wind and solar facilities over the next five years. In Minnesota, Xcel Energy moved up major investment in wind and solar to take full advantage of the tax credits. Likewise, Minnesota Power has been instructed to investigate the procurement of additional wind and solar resources. There was a corresponding jump in the Midcontinent Independent Operating System (MISO) Interconnection Queue in the first half of 2016. A large portion of the new projects under development are in Xcel Energy territory. Xcel also released a request for proposals (RFP) for up to 1500 megawatts (MW) of wind on September 22, 2016, furthering their commitment to renewable energy over the next decade.¹⁷ The extension of the PTC and ITC means that new projects will continue to receive the full value of the credit¹⁸ if they commence construction by the end of 2016.

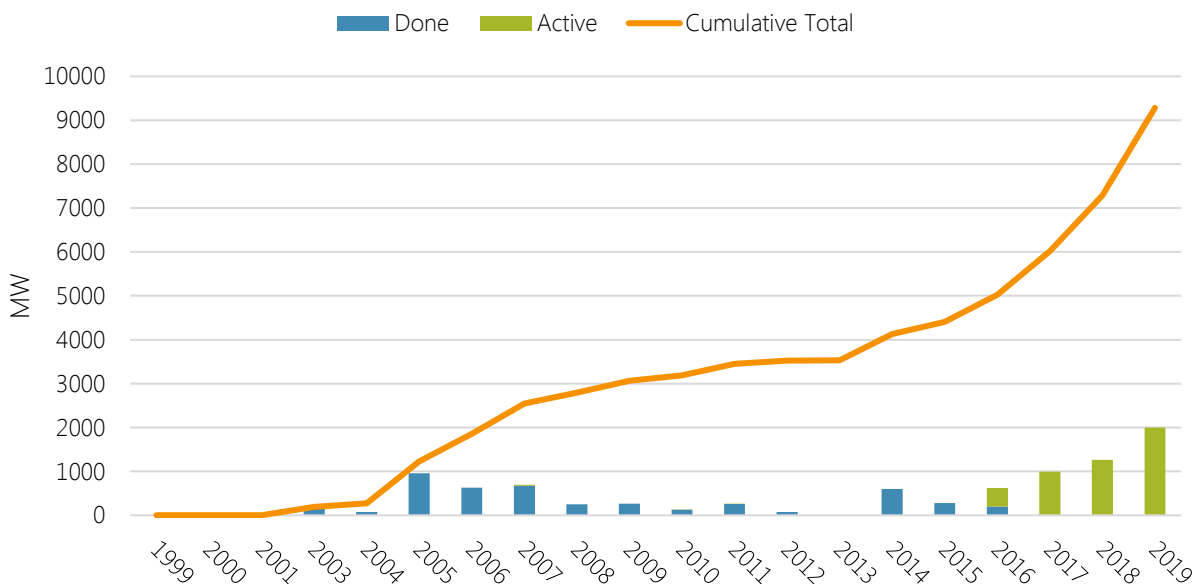
The graph below describes new investments in utility-scale wind and solar located in Minnesota. It is important to note that this only shows project sited in Minnesota – many utilities also contract wind under power purchase agreements from North Dakota and other neighboring states. Likewise, some projects in Minnesota deliver their energy to other states like Wisconsin, that do not have the same level of renewable resources.

Figure 2: MISO Interconnection Queue – Active Minnesota Projects¹⁹



Wind energy in particular will increase dramatically in Minnesota. Installed capacity will more than double in the next 5 years if all active projects are completed. This number may increase as utilities add new projects, especially in future resource planning periods that will occur after the expansion of the ITC and PTC. In particular, many of the cooperative utilities submitted resource plans before the extensions were approved, and may decide that it is prudent to procure wind or solar resources now to take full advantage of the tax credits.

Figure 3: Completed and Active Wind Developments, MN²⁰



Minnesota utilities' trend of moving up renewable energy projects is in line with national forecasts. The National Renewable Energy Laboratory (NREL) modeled scenarios with and without the ITC and PTC extension. Their modeling indicates that the extension will push up investment in wind through the early 2020s.²¹ By the end of the 2020s, NREL research indicates that even when the policies phase out, renewable investment levels would still be greater than in scenarios without the extensions.²² Earlier investment in renewables under the PTC and ITC is beneficial as it continues to result in ratepayer savings as utilities meet state RES requirements.

Xcel Energy

Xcel Energy has moved up the construction of several developments to take advantage of the tax credits. Before the renewal of the ITC, Xcel would have brought 187 MW of solar online by the end of 2016, with an additional 400 planned to come online starting in 2024.²³ The first half of 2016 saw developers register 350 MW of solar in Xcel Energy territory in the MISO interconnection queue, with anticipated in service dates of mid-2018.²⁴ If all developments move forward, this would almost triple the amount of utility scale solar on Xcel's system in 2017 and 2018. This does not include distributed solar projects, like rooftop solar, the Aurora project, and community solar gardens, which will also greatly increase

Xcel's solar portfolio. Xcel has also proposed significantly speeding up the development of large amounts of wind projects, both to comply with federal and state regulations and to take advantage of the extension of the federal tax credit extensions.²⁵

Xcel states in their comments that the extension of the tax credits lowered their preferred plan cost by more than anticipated, creating further savings for customers.²⁶ The utility is planning investments in renewables to replace their large coal fired power plant which will be retired in the mid-2020s.²⁷ They plan to site portions of the replacement generation at the site of the coal plant in order to maintain jobs in the community.²⁸

Minnesota Power

While Minnesota Power's recent integrated resource plan (IRP) did not contain any wind acquisitions in its preferred plan, the Minnesota Public Utilities Commission ordered the company to procure 100-300 MW of wind by 2017 in order to take advantage of cost effectiveness for its customers.²⁹ On July 26th, Minnesota Power issued an RFP for up to 300 MW of wind generation.³⁰

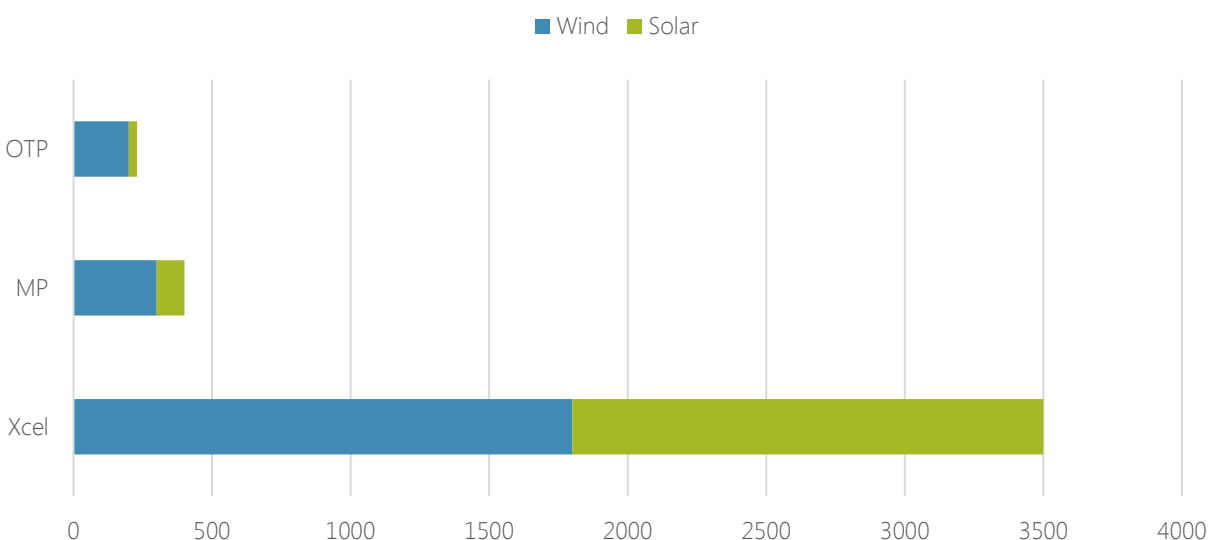
Minnesota Power also did not include large scale solar investment beyond acquisitions of 11, 12 and 10 MW to meet their SES requirement. However, modeling by the Department of Commerce found that adding additional solar would be cost effective in the time period before 2022. The MPUC therefore found that Minnesota Power must account for this in any competitive acquisition process.³¹ On August 4th, Minnesota Power issued an RFP for up to 300 MW of solar between 2018 and 2022, stating that its goal is to take advantage of the ITC³²

Otter Tail Power

Otter Tail Power submitted its IRP for the 2017 to 2031 planning period in June of 2016. Unlike Xcel Energy and Minnesota Power, their resource plan was initially filed after the extension of the federal tax credits.

Otter Tail has indicated that if the price of solar continues to fall it may include an additional solar project in future resource plans. The extension of the ITC maintains flexibility for utilities like Otter Tail to incorporate additional renewables over a longer period of time.

Figure 4: IOU Planned Resource Acquisitions, current IRPs³³



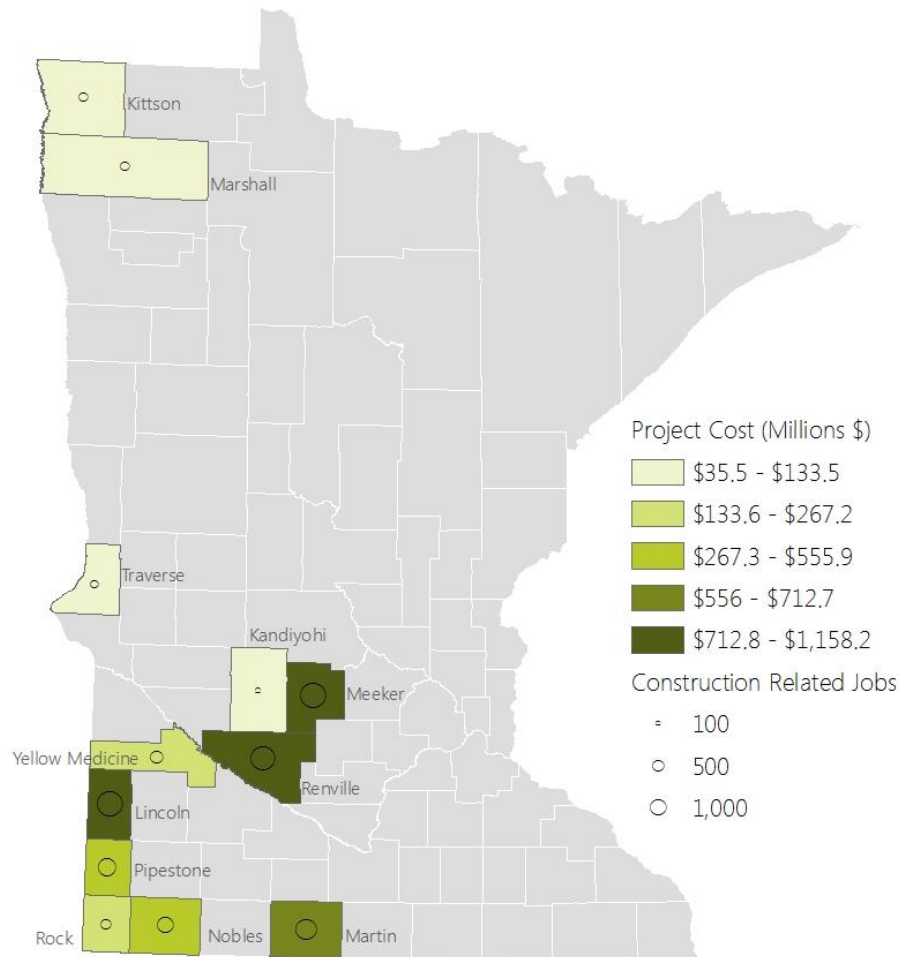
Cooperative and Municipal Utilities

Minnesota’s cooperative and municipal utilities are also subject to RES requirements. However, since most of them are small distribution utilities they receive their energy from larger generation and transmission (G&T) cooperatives, and as such do not invest heavily in their own generation. The twelve generation cooperatives operating in Minnesota have invested in wind energy to meet their RES requirements, assisted by lower costs due to the PTC. Many will continue to acquire wind to meet state standards, but have not indicated an accelerated timeline.

Economic and Employment Benefits

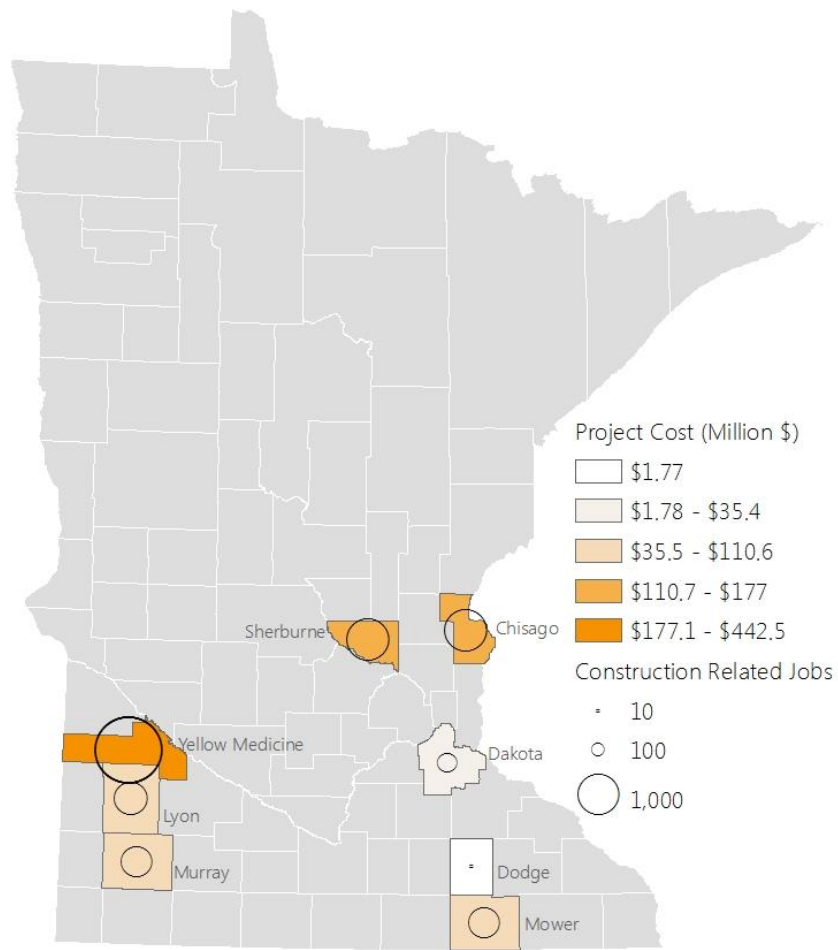
Utility scale investment in wind and solar has specific quantifiable benefits for Minnesota’s counties. Large scale energy developments bring jobs during construction, but also in ongoing employment, land leases, and tax revenue. Using the NREL’s Jobs and Economic Development Impact (JEDI) model and the projects in the MISO interconnection queue, it is possible to forecast the approximate impacts of wind and solar development in Minnesota. Figure 1 and Figure 2 depict total project costs and jobs created during development and production of the wind and solar farms proposed in the MISO interconnection queue. If every project were developed, they would result in approximately 3,987 installed MW of capacity, \$7.09 billion in direct investment, and over 5,000 jobs related to construction alone. The JEDI model also predicts up to 20,000 overall jobs from increased economic activity in the region, along with \$10.1 million in annual payments to landowners for wind leases.

Figure 5: Economic Impacts of Proposed Wind Developments³⁴



County	Planned MW	Installed Project Cost (million \$)	Property Taxes (thousand \$)	Land Lease Payments (thousand \$)	Construction Related Jobs	Total Jobs
Lincoln	650	\$1,158.2	\$1,820	\$1,952.7	315	2,443
Nobles	250	\$445.5	\$700	\$752.1	122	940
Pipestone	312	\$555.9	\$873.6	\$938.4	151	1,173
Martin	400	\$712.7	\$1,120	\$1,200.6	194	1,504
Rock	100	\$178.2	\$280	\$303.6	65	395
Traverse	50.5	\$89.9	\$141.4	\$151.8	54	224
Yellow Medicine	150	\$267.3	\$420	\$455.4	85	578
Meeker	620	\$1,104.8	\$1,736	\$1,863	300	2,330
Renville	600	\$1,069.1	\$1,680	\$1,800.9	291	2,255
Kandiyohi	20	\$35.6	\$56	\$62.1	40	109
Kittson	75	\$133.6	\$210	\$227.7	61	311
Marshall	75	\$133.6	\$210	\$227.7	61	311
Total	3,302.5	\$5,884.4	\$9,247	\$9,936	1,739	12,573

Figure 6: Economic Impacts of Proposed Solar Developments³⁵

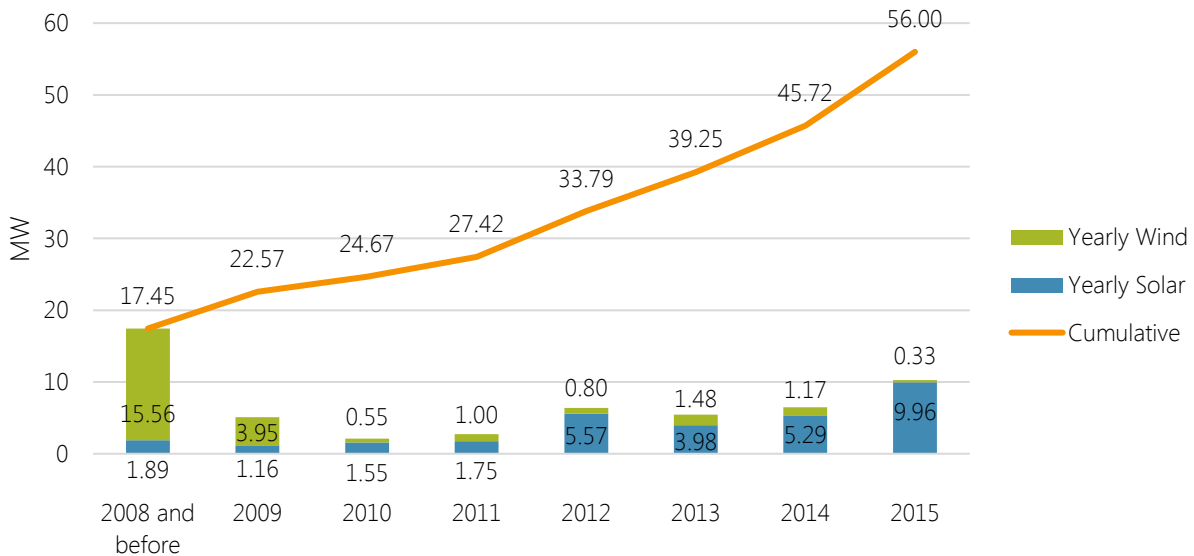


County	MW	Project Construction or Installation Cost (Million \$)	Jobs during construction		Jobs during operating years	
			Onsite	Total Impacts	Onsite	Total Impacts
Chisago	100	\$177.0	506.5	1094.3	18.5	27.6
Dakota	20	\$35.4	101.3	218.9	3.7	5.5
Dodge	1	\$1.8	5.1	10.9	0.2	0.3
Lyon	62.5	\$110.6	316.5	683.9	11.5	17.2
Mower	50	\$88.5	253.2	547.1	9.2	13.8
Murray	50	\$88.5	253.2	547.1	9.2	13.8
Sherburne	100	\$177.0	506.5	1094.3	18.5	27.6
Yellow Medicine	250	\$442.5	1266.2	2735.7	46.2	68.9
Total	633.5	\$1,121.3	3208.5	6932.3	117.0	174.7

Distributed Generation

A large beneficiary of the ITC extension are homeowners and small businesses who wish to install solar on their own properties and take control of their energy usage. Minnesota has seen strong growth of small distributed generation systems over the past 10 years, nearly doubling the amount of solar on the system in 2014 and 2015 alone.³⁶ In 2015 9.96 MW of distributed solar were added to the system, along with 327 kW of small scale wind.³⁷

Figure 7: Cumulative and Annual Added Capacity, DG Wind and Solar³⁸



This amount of growth is anticipated to continue throughout 2016, especially as Xcel’s Community Solar Garden projects come online towards the end of the year. Homeowners and businesses who install solar systems are able to receive the 30 percent federal income tax credit on their systems. Combined with state and utility run incentive programs, Minnesota residents are able to affordably and reliably install solar systems. The table below shows average savings for installers of small solar from the ITC alone.

Table 4: Average ITC savings for Minnesota residents on small solar systems³⁹

	5 kW System	10 kW System	20 kW System	40 kW System
Price before incentives	\$23,885.80	\$47,771.60	\$95,543.20	\$ 191,086.40
Price after incentives	\$16,720.06	\$33,440.12	\$66,880.24	\$ 133,760.48
ITC Savings	\$7,165.74	\$14,331.48	\$28,662.96	\$57,325.92

Community Solar Gardens

Minnesota's 2013 solar standard also included a provision for the state's largest utility, Xcel Energy, to develop a community solar garden program. Community solar gardens (CSGs) enable individuals or organizations who may not be able to install solar on their own property to buy the electrical output of a portion of a shared central solar array. They then receive a credit for the amount of energy produced by their unit on their normal utility bill, locking in their electrical rates for the next 20 to 25 years.

The program has far outpaced early expectations, with 400 MW of gardens expected online by the end of 2017.⁴⁰ An additional 400 MW are still in the interconnection queue, although it's possible that not all will be developed.⁴¹ The program has attracted both local and national solar developers to the state, increasing investment in Minnesota's clean energy economy. Minnesota Power is also developing its own utility operated CSG program, with two initial gardens of 1 MW and 40 kW.⁴²

Aside from utility-run programs, many of the electric cooperatives in the state have developed CSGs to offer solar to their members. There are at least 23 cooperative gardens in operation or development.⁴³ Both Lake County Power and Wright-Hennepin Cooperative have multiple gardens, and were among the first coops in the state to offer this option to their customers.

Businesses are some of the largest subscribers to CSGs across Minnesota. Companies like Anderson Windows contracted for a total of 19 MW of CSGs, anchoring projects throughout the state.⁴⁴ These large customers provide an important base for solar gardens, helping achieve economies of scale by subscribing to a large portion of a garden's output. Other companies like Ecolab are developing gardens on their own property, partnering with developers to offset energy use and provide benefits to other subscribers.⁴⁵

Schools Go Solar: How Intersecting Policies Help Tax Exempt Entities Invest in Renewables

As tax exempt entities, schools and universities are unable to directly take advantage of the tax credits for wind and solar. Some institutions have been able to take advantage of other financing options, such as the Renewable Development Fund, to install renewable energy; but for most, missing out on the thirty percent tax credit renders projects too expensive. Thanks to Minnesota's new CSG initiatives, more schools and universities are able to take advantage of the financial benefits of solar energy and use the federal tax incentives. Several school districts around the state have signed contracts to procure their energy from the sun. Spring Lake Park School District signed a contract to procure a portion of the district's energy from community solar gardens, with estimated savings of \$82,000 in the first year alone.⁴⁶ The Atwater-Cosmos-Grove City School District is taking a similar approach, with estimated savings of five percent for two of its buildings.⁴⁷

Some universities have gone a step further and are partnering with Minnesota developers to host solar gardens on their own land. St. Olaf College in Northfield will host five megawatts of community solar gardens developed by Minnesota based Geronimo Energy.⁴⁸ The college will then subscribe to the maximum 40 percent output of these gardens, saving the college money on its electrical bills. Macalester College is another heavy investor in community solar gardens, committing to enough energy to offset its entire campus load, giving the college the potential to save millions of dollars on energy costs over the next 25 years.⁴⁹ The extension of the investment tax credit for solar energy saves money for schools like St. Olaf and Macalester as they commit to renewable energy. Their partnership with solar developers allows them to take control of their energy production while benefiting from the savings of the federal tax credits.

Ratepayer Savings

The primary energy source for utilities to fulfill the RES is wind power, much of it located in the southwestern portion of state. These wind farms have been able to take advantage of the PTC, keeping rates low for customers while allowing utilities to fulfill state requirements. The Minnesota Public Utilities Commission has calculated savings for Minnesota Power and Otter Tail Power, with only slight increases for Xcel Energy. The increases for Xcel can also be attributed, in part, to its requirement to acquire wind earlier than Minnesota Power or Otter Tail Power, before costs had decreased. Their rate impact should even out over time.

Table 5: Annual Renewable Energy Standard Rate Impact by Utility (¢/kWh)⁵⁰

	2008	2010	2012	2013	2014
Minnesota Power	-0.67	-0.17	0.11	-0.03	-0.01
Otter Tail Power ⁵¹	-1.32	1.06	-0.30	-0.97	-1.35
Xcel Energy	0.12	0.45	0.58	0.45	

Minnesota's Clean Energy Economy

One of the largest, yet hard to quantify benefits of Minnesota's clean energy transition is the growth of the local clean energy economy. Due to the distributed nature of wind, solar, and other renewable energy there is longer sustained job growth, especially as residential solar installations have increased over the past 5 years.

The extension of the federal tax credits will continue to benefit Minnesota's strong clean energy economy. From 2000 to 2014 Minnesota added over 7,000 new jobs in energy efficiency, wind, solar, bioenergy, and smart grid technology.⁵² Wind, solar and bioenergy saw the largest growth, with wind related jobs increasing by 288 percent and solar and bioenergy by 130 percent.⁵³

A 2016 survey of statewide businesses by Clean Jobs Midwest puts these numbers even higher. It indicates that 5,343 individuals are employed in renewable energy out of a total of 54,000 in the clean energy economy.⁵⁴ This survey counts all employees who spend any time working on clean energy related projects, which other surveys only include those who spend at least 50 percent of their time on such activities. Either way however, Minnesota has seen long and sustained growth from widespread deployment of renewable energy and other clean energy technologies.

The Clean Jobs Midwest survey also found that 52 percent of clean energy businesses in the region attribute increased business prospects to the ITC.⁵⁵ A similar report by The Solar Foundation looks at solar installers in Minnesota, where 56 percent attribute the ITC as substantially contributing to their business's success.⁵⁶ This was the highest cited policy by far, with the state's renewable energy standard coming in a distant second at 22 percent. The ITC in particular is instrumental in driving business investment in clean energy throughout the Midwest.

Small scale solar installers are some of the largest beneficiaries from the extension of the federal tax credits. While residential and business installations under 40 kW benefit from state and utility run incentive programs, the 30 percent investment tax credit is a major tool increasing affordability for small solar systems. Almost 80 percent of clean energy business in Minnesota employ fewer than 25 workers, providing the backbone of the state's clean energy economy.⁵⁷

Incentives like the Made in Minnesota program for solar technology manufactured in the state attracts new business investment, while providing additional incentives for individuals and businesses installing their own systems. Along with the federal incentives, these types of programs are major drivers in the state's clean energy economy. Jobs created in the clean energy economy are not only booming, but they typically have higher salaries than other jobs being created in the state. Workers in clean energy average over \$71,000 a year in wages, compared to the statewide average of \$51,000.⁵⁸

This rosy picture of job growth is expected to continue over the coming years. The Solar Foundation report predicts that over 400 jobs will be added in Minnesota in 2016, a 20.5 percent growth rate.⁵⁹ Clean Jobs Midwest predicts a 4.4 percent growth rate in the entire clean energy sector throughout 2016.⁶⁰ Not only are there large numbers of jobs being created, they are spread throughout the state and through different demographic groups. Veterans make up a larger share of the clean energy economy than other portions of Minnesota as well, as do racial and ethnic minorities.⁶¹ Geographically, the metro region has the highest concentration of clean energy businesses,⁶² but the first and third congressional districts have the largest number of individuals employed in solar.⁶³

Conclusion

Minnesota has a vibrant renewable energy landscape that is poised for continued growth throughout the coming years. Strong local, state, and federal policies form a solid foundation that has grown the state's clean energy economy by thousands of jobs and millions of dollars since the early 1990s. While it is difficult to isolate the effects of any singular policy, the Production Tax Credit and Investment Tax Credit have certainly played a critical role in spurring renewable energy development throughout the state while maintaining affordability for electrical customers.

These policies have led to attractive renewable energy development opportunities for utilities, ratepayers, schools, and other customers. In fact, a majority of wind power capacity contracted through power purchase agreements in 2015 were with non-utility energy customers like technology companies, major corporations, universities, and major U.S. cities, all seeking low cost, emissions-free energy procurement.⁶⁴

As wind and solar achieve widespread use throughout the United States, other emerging energy technologies will continue to evolve. Innovations like battery storage, fuel cells, and ocean-powered energy are some of the next advances in creating a reliable domestic energy supply for the United States. In order to encourage these technologies, policy makers can learn from the implementation of the PTC and ITC to create a stable economic environment for these evolving processes. One of the key reasons utilities did not take more aggressive stances on renewable energy in their planning processes was the lack of stability in expiration dates for the ITC and PTC. The on-off history of these tax incentives has created a well-documented boom-bust cycle, leading to plant layoffs and shutdowns in previous years.⁶⁵ For the United States to continue to be a leading player in the rapidly-growing global clean energy economy, policymakers must successfully create a stable economic environment for emerging technologies, allowing them to fully develop into assets in the energy marketplace in the US. Minnesota's experience has shown that a consistent policy landscape will foster robust development of innovative industries, jobs, renewable energy deployment, and significant economic impact and tax revenues.⁶⁶

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Energy Transition Lab

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