POLICY BRIEF

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Minnesota Feed-In Tariff Could Lower Cost, Boost Renewables and Expand Local Ownership

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Executive Summary

Several European countries, and more recently the Canadian province of Ontario, have adopted a simple yet powerful strategy to expand renewable energy and benefit local economies. It is called a feed-in tariff: a mandated, long-term premium price for renewable energy paid by the local electric utility to energy producers. Evidence shows that a feed-in tariff achieves greater results at a lower cost than do other strategies like tax incentives or renewable electricity standards.

Feed-in Tariff Benefits

- **Supports small-scale, grows large-scale-** Germany's feed-in tariff has led to an astonishing 20,000 MW of installed wind capacity, with 45% of turbines locally-owned. Even more remarkable, Germany had 2,500 MW of on-site solar electric at the end of 2006, about 250 times more than Minnesota despite Germany's weaker solar resources.
- **Lowers costs-** 20-year tariffs stabilize project revenues, lowering the cost of capital for all investors. By supporting all commercial renewable technologies, tariffs create economies of scale. And tariff rates are set to allow for reasonable profits, no more. Finally, by spreading the costs over all ratepayers, the cost to the individual household is very low. Germany's massive expansion of renewables, for example, costs the average German household $2 per month.
- **Improves fairness-** By enabling broad participation, feed-in tariffs are more equitable than other renewable energy policies. Current renewable electricity standards tend to favor those institutions large enough to play in a wholesale market, typically utilities and large independent power producers. Federal tax credits benefit only those with sufficient tax liability to use the credits effectively. In contrast, tariff rates adjust for size and quality of resource, allowing producers of any size and any geographic region to participate.

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Introduction

Feed-in tariffs are premium prices utilities pay for renewable electricity. Successfully used in Europe, feed-in tariffs (also called feed laws) can support a large market for renewable energy and limit the impact on ratepayers by spreading costs to all electricity consumers. Feed laws have enabled tremendous growth in renewable energy and stunningly high local ownership rates for renewable energy: 45% local ownership of German wind projects and 83% of Danish ones.[1] These gains have come at a lower cost to produce electricity than under renewable standards in other European nations and have supported a greater diversity of energy sources, such as solar photovoltaic.

A Minnesota feed law could complement Minnesota's Renewable Electricity Standard and Community-Based Energy Development statutes by turbocharging investment, making non-wind renewables economical, and enabling more dispersed, local ownership of projects. With premium prices available to anyone, electricity consumers would have a much better opportunity to become electricity producers.

Results of German Feed Laws vs. Minnesota Renewable Electricity Policies

In Germany, the first decade of the feed-in tariff led to 70% annual increases in wind capacity, from 60 MW to over 6,000 MW.[2] The rate has slowed to 22% in the last 6 years (Fig. 2) as capacity has eclipsed 20,000 MW.[3] Three-quarters of German wind turbines were locally-owned in 2001 and 45% were in 2004. The solar industry saw similar growth when its tariff was increased in 2000 and 2004, growing by 70% per year from 1999-2005.[4] Over 1 GW of solar capacity was added in 2006.[5]

In Minnesota, the federal production tax credit, the state's 1994 renewable electricity incentive, and the state's community-based energy development (C-BED) tariffs fostered an expansion of the wind industry, from 290 MW in 1999 to 900 MW in 2006, an 18% annual growth rate. As of November 2007, only a quarter of Minnesota's wind capacity is majority locally-owned.

Because the state has no substantive policies promoting solar, the photovoltaic industry in Minnesota is negligible, despite the fact that Minnesota has a better solar radiation profile than Germany.

Figure 1
Germany's Feed-in Tariff Provides More Renewables Than Minnesota's Policies

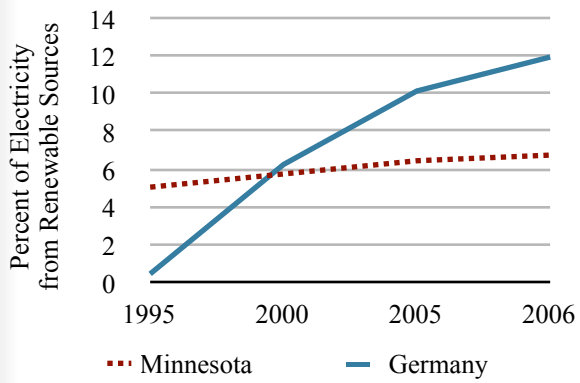
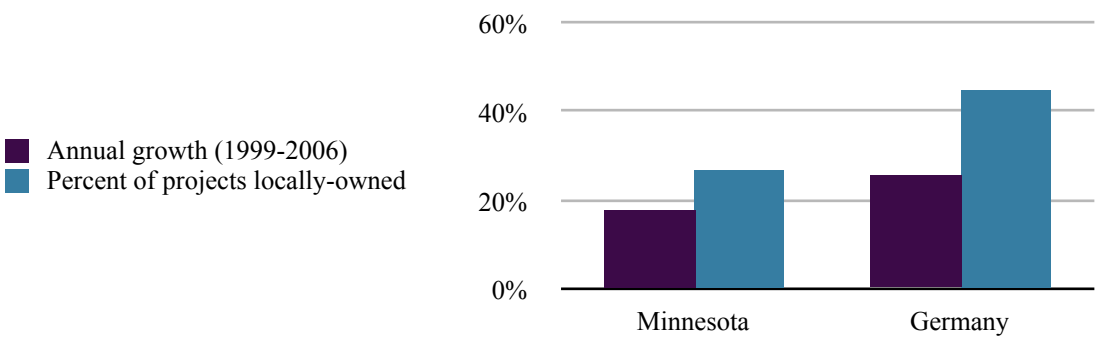


Figure 2
Germany's Feed-in Tariff Provides More Wind Energy and More Local Ownership



A Feed-in Primer

The following section explains how feed laws are designed and implemented.

I. Setting Rates to Encourage Development and Avoid Windfall Profits

Tariff rates for renewable electricity derive from several factors.

- **Base rate** – tariffs are designed to provide a reasonable rate of return to investors (much like a public utility commission does for regulated utility projects). Rates are based on production cost estimates (Germany) or a premium over retail electric rates (Spain).
- **Project size/productivity adjustment** – tariffs in Germany and in a proposed Michigan bill reduce payment rates to larger scale projects and to projects with a particularly strong energy resource (e.g. high wind speeds) to reduce windfall profits and promote small projects.
- **Technology/experience adjustment** – tariff rates can be set to decrease annually for new projects to reflect improving technology. This is not universal. Germany's biomass tariff declines by 1.5% each year; its solar tariff drops by 5% per annum.[6]
- **Inflation adjustment -** tariffs may also have an inflation adjustment, as well as short-term adjustments for spikes in component costs (e.g. the dramatic rise in the price of wind turbine parts and solar cell wafer silicon in 2007). France adjusts new tariffs and existing tariffs with inflation.
- **Innovation premium** – occasionally an especially high tariff is paid to projects with unusually high efficiency, novel location, or other innovation.

Tariff Rates in Ontario and Michigan (proposed) [$/kWh]

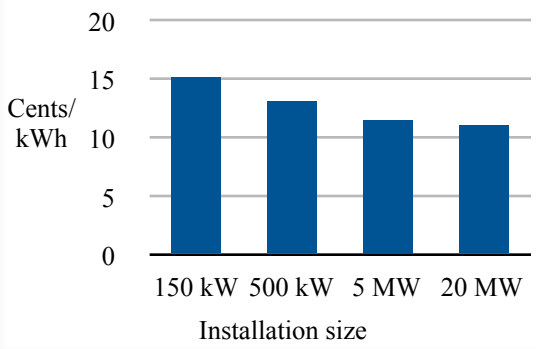
Technology	Ontario	Michigan bill
Solar PV	$0.42	$0.65[a]
Wind	$0.11	$0.105[b]
Hydro	$0.11	$0.10
Landfill gas	n/a	$0.10
Biomass/biogas	$0.11	$0.145
Geothermal	n/a	$0.19

[a] Tariff is higher for rooftop and façade cladding installations than for open-field installations
[b] In years 6-20, the tariff is based on a sliding scale, paying less to projects with higher yields.

II. Encouraging Multiple Technologies with Varying Tariff Rates

A feed law tries to encourage development of a variety of renewable energy sources by setting rates that offer a reasonable return on investment, much like a regulated utility's cost-recovery allowance. The following table illustrates feed law rates in Ontario and in the proposed Michigan system (modeled directly on Germany's feed law with rates converted from euros as of March 2007).[7] The Michigan tariffs scale down as projects increase in size.

Size Scaling of Germany's Biomass Tariff

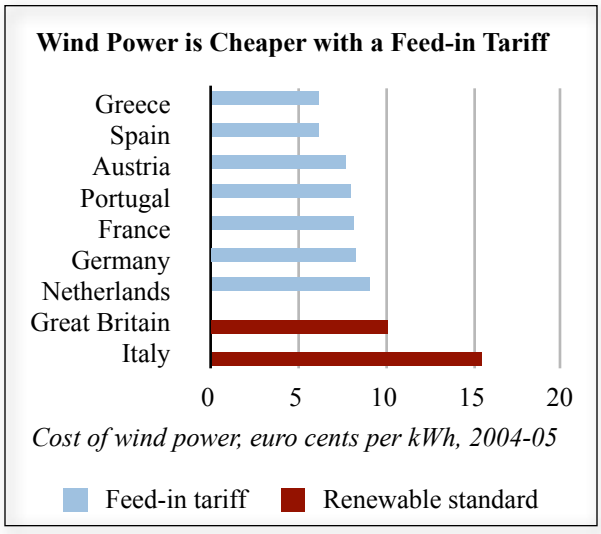


III. Encouraging More Dispersed Technologies and More Locally-Owned Installations

Feed-in tariffs provide two significant advantages for communities and individuals interested in producing their own energy. Tariff levels often inversely scale with the size of the renewable installation, so that returns on investment are similar for large and small producers. This makes it economical for individual households or communities to become energy producers, plugging in to the grid with small-scale projects.

In Europe, feed-in tariffs are used instead of tax incentives. Avoiding tax-based incentives reduces costs because it eliminates elaborate project financing strategies - developed to access tax credits - commonly employed in the United States**.** It also enables local ownership, because a tariff doesn't require a partnership with a large, corporate entity with sufficient tax liability to use the incentives.

Finally, German feed-in tariffs with their premium prices are paid only for domestically produced energy, like Minnesota's C-BED law.[8]



IV. Tariff duration and obligation

- Tariff duration – power producers lock in a given tariff rate for a set period of time. German tariffs cover 20 years,[9] like U.S. power purchase agreements. Other countries have shorter tariff terms: France – 15 years; Austria – 13 years, Portugal – 12 years. Development has been stronger in countries with longer terms.
- Purchase obligation – most policies obligate utilities to purchase renewable electricity produced under the feed law.

V. Getting More Bang for the Buck (or Euro)

Studies have shown that feed-in laws are more economical for encouraging the growth of renewable energy than are mandates. Feed-in tariffs marginally increase the cost of electricity to consumers as renewable electricity capacity expands. In most cases, the costs are shared by all ratepayers as a per kWh surcharge. In Germany, the massive expansion of renewable capacity has cost average ratepayers less than $2.00 per month.[10] Why would that be?

The primary reason is investment stability. Unlike expiring state and federal incentives or tax credits, a tariff is a long-term, fixed price for electricity that is available to everyone regardless of tax liability. This is particularly important to small producers, who can't depend on multiple, diverse projects to support them if an income stream dries up. Such stability is not only less expensive, it's more effective at reaching renewable electricity generation goals.[11] Mandate systems are volatile because the producers may rely on the sale of their renewable certificates to supplement the power purchase price. Because selling these credits on the annual market is more unpredictable than a long-term, fixed-price contract, feed-in tariffs create more investor confidence and lower the cost of capital.[12]

Feed-in tariffs also lower long-term economic costs when they target both established and emerging technologies. By pushing investment in diverse technologies simultaneously, the feed-in tariff advances their experience curves, improving each technology and lowering costs. A renewable standard, on the other hand, will exhaust existing low-cost technologies first and then move to more

expensive technologies as the former are fully prescribed.[13]

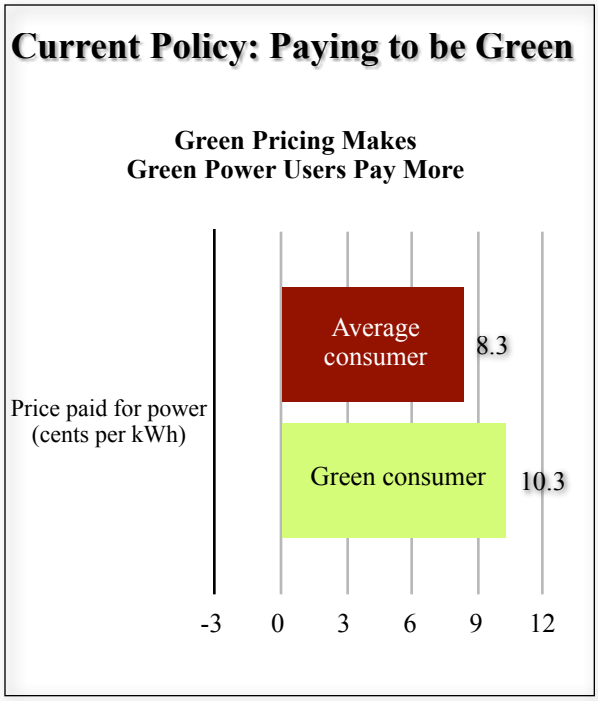
Feed-in tariffs also help to balance public and private costs. The tariff price is set to guarantee the investor a profit, provided the facility produces energy at the expected level. However, the tariff rates decline over time as new more efficient technologies are introduced, which reduces windfall profits and therefore minimizes the ratepayer impact.[14]

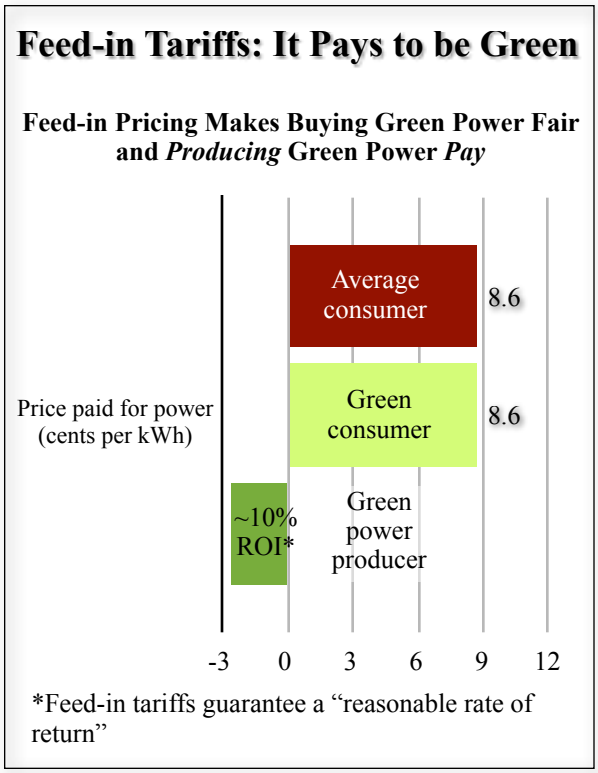
A feed law and an RES could work in complementary fashion. Minnesota has an RES. The feed-in tariff could be used to not only achieve that mandate – supporting any renewable electricity producer – but also to achieve it in a way that maximizes the benefit to Minnesota by promoting locally-owned and widely dispersed production facilities.[15]

VI. Fair Pricing Levels the Playing Field

Feed-in tariffs level the playing field. No longer must an individual or cooperative seek a corporate partner with a tax appetite[16] for the federal production tax credit and accelerated depreciation – a feed-in tariff provides a full revenue stream for any producer. No longer do small producers operate at a disadvantage to large producers – tariff rates adjust for project size. No longer is development limited only to select corners of the state – tariff rates adjust for project productivity, restoring some geographic equity.

Feed-in tariffs also reduce cost inequities. Aside from its renewable energy mandates, Minnesota has relied on "green pricing" to expand renewable electricity production (such as Xcel's Energy's Windsource program). Green pricing has the opposite dynamic and impact from feed-in tariffs. In green pricing, the individual who wants to use renewable energy is actually penalized by having to bear the full additional cost of that energy. In Minnesota, this comes to 1-2 cents per kWh. Feed-in tariffs, on the other hand, reward the green consumer because the cost is spread over all electric customers, raising the cost per customer a small amount (closer to 0.3 cents per kWh) and making it possible for customers to be the owner of a valuable renewable energy production unit.





An Example: Michigan's Feed-In Bill

In September 2007, Representative Kathleen Law introduced a bill in the Michigan Assembly that would bring Germany's feed-in laws to the United States. Using identical size caps and tariff rates to Germany's law (using the March 2007 euro to dollar exchange rate), the Michigan bill contains several key features:

- The utility must interconnect and purchase from an renewable electricity provider.
- The interconnection costs are covered by the ratepayer surcharge.
- The duration of the power purchase agreement is 20-years.
- Any federal or state incentives received will offset the feed-in tariff.
- The public utility commission must bi-annually review tariff rates and adjust them for inflation and technological advancements, to prevent excessive profits or unnecessary costs.

Recommendations

We recommend adopting the Michigan bill terms and rates (as shown below) for the following technologies: landfill and sewer gas, geothermal, wind, and solar.

We also recommend changing the C-BED statute to complement the new feed-in tariff. Since a feed law would supersede the existing C-BED tariff, the C-BED statute should be amended to include a local ownership premium over the feed-in price. For example, a locally-owned solar project of less than 30 kW under C-BED could receive $0.715 per kWh, a 10% premium on the feed-in tariff of $0.65 per kWh. This would continue to encourage local ownership of projects, no matter the scale.

Michigan tariff rates

Hydro	**$/kWh**
<500 kW	$0.10
500 kW to 10 MW	$0.09
10-20 MW	$0.07

Landfill or sewer gas	**$/kWh**
< 500 kW	$0.10
>500 kW	$0.09

Biomass/biogas	**$/kWh**
<150 kW	$0.15
150-500 kW	$0.13
500 kW-5 MW	$0.12
5-20 MW	$0.11

Geothermal	**$/kWh**
< 5 MW	$0.19
5-10 MW	$0.18
10-20 MW	$0.12
>20 MW	$0.09

Wind, Year 1-5	**$/kWh**
Rotor diameter > 17m	$0.11
Rotor diameter < 17m	$0.25

Wind, Year 6-20	**$/kWh**
Rotor diameter > 17m	
Yield (kWhs/m^2)	
< 700	$0.11
700-1100	$0.08-$0.105
>1100	$0.08
Rotor diameter < 17m	$0.25

Solar	**$/kWh**
Open-field	$0.50
Rooftop <30 kW	$0.65
Rooftop 30-100 kW	$0.62
Rooftop >100 kW	$0.61
Façade cladding <30 kW	$0.71
Façade cladding 30-100 kW	$0.68
Façade cladding >100 kW	$0.67

Endnotes

[1] Elliot, Dave. "Community-led Renewables." (Paper for EERU Conference on 'Locating Renewables in Community Contexts', 2004). Accessed 11/28/07 at http://tinyurl.com/3xp9p7; Poetter, Bernhard. "Falling in Love with Wind." *Onea*rth. (NRDC, Summer 2007). Accessed 11/28/07 at http://tinyurl.com/3d8eeh.

[2] "IEA Wind 2002 Annual Report." (International Energy Agency, 2002), 114. Accessed 1/7/08 at http://tinyurl.com/2esk2y.

[3] Gipe, Paul. "Feed Law Powers Germany to New Renewable Energy Record." RenewableEnergyAccess.com, 2/5/07. Accessed 12/19/07 at http://tinyurl.com/yrbomo.

[4] "What Can the U.S. Learn from European Feed-In Tariffs?" IREC Telephone Seminar, 5/8/07 (Rickerson Energy Strategies, LLC). Accessed 11/27/07 at http://tinyurl.com/yv6wdz.

[5] Wikipedia contributors, "Photovoltaics." (*Wikipedia, The Free Encyclopedia*). Accessed 11/26/07 at http://tinyurl.com/38a3yc.

[6] "What Can the U.S. Learn from European Feed-In Tariffs?"

[7] The Ontario Sustainable Energy Association just released a report noting that Ontario's rates were almost uniformly too low and that their lack of size differentiation hampered development Gipe, Paul. "Renewables Without Limits." (Ontario Sustainable Energy Association, 11/15/07), 5. Accessed 12/19/07 at http://tinyurl.com/ytmuwr.

[8] C-BED projects must be majority owned by and revenues paid to Minnesota residents, governments, and Indian tribes.

[9] Although German rates lock-in for 20 years, for wind there is a one-time decrease in tariff rates for more productive turbines after the first 5 years.

[10] "Renewable energy act is efficient and cost-effective." (October, 2006). Accessed 11/28/07 at http://tinyurl.com/2p7drr

[11] Butler, Lucy and Karsten Neuhoff. "Comparison of Feed In Tariff, Quota and Auction Mechanisms to Support Wind Power Development." Cambridge Working Papers in Economics CWPE 0503, (CMI Working Paper 70, 12/21/04), 7. Accessed 12/19/07 at http://tinyurl.com/365qv6.

[12] Rickerson, Wilson H., et al. "If the Shoe FITs: Using Feed-in Tariffs to Meet U.S. Renewable Electricity Targets." *Electricity Journal,* (v20 n4, May 2007, p. 73), 75;
"Renewable energy act is efficient and cost-effective"; Rickerson, Wilson and Robert C. Grace. "The Debate over Fixed Price Incentives for Renewable Electricity in Europe and the United States: Fallout and Future Directions." (The Heinrich Böll Foundation, February 2007), 9-10. Accessed 11/28/07 at http://tinyurl.com/2ar86g
"The Support of Electricity from Renewable Energy Sources." (Commission of the European Communities, 12/7/05), 7-8. Accessed 12/7/07 at http://tinyurl.com/22anrl.

[13] Rickerson, et al.

[14] Rickerson and Grace.

[15] The CapX2020 Utilities. "Community Based Energy Development Transmission Study: West Central (Minnesota) Transmission Planning Zone." 1/18/07.

[16] Tax appetite, in the context of the federal production tax credit, means having sufficient passive tax income liability to fully use the tax credit.

Acknowledgments

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Other publications from the New Rules Project of the Institute for Local Self-Reliance

The Policy Gap: Minnesota Energy Policy vs. Minnesota Climate Policy, by John Farrell, John Bailey and David Morris, November 2007

Burlington Telecom Case Study, by Christopher Mitchell, August 2007

Wind and Ethanol: Economies and Diseconomies of Scale, by John Farrell, July 2007

Energizing Rural America: Local Ownership of Renewable Energy Production is Key, by David Morris, April 2007

Lessons from the Pioneers: Tackling Global Warming at the Local Level, by John Bailey, January 2007

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