



Feed-in tariffs in America

Driving the Economy with Renewable Energy Policy that Works

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Other Publications from the New Rules Project

The Benefits of North Dakota's Pharmacy Ownership Law, by Justin Dahlheimer and Stacy Mitchell, January 2009

Meeting Minnesota's Renewable Energy Standard Using The Existing Transmission System, by John Bailey, George Crocker (NAWO), John Farrell, Michael Michaud (Matrix Energy Solutions), and David Morris, November 2008

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Executive Summary

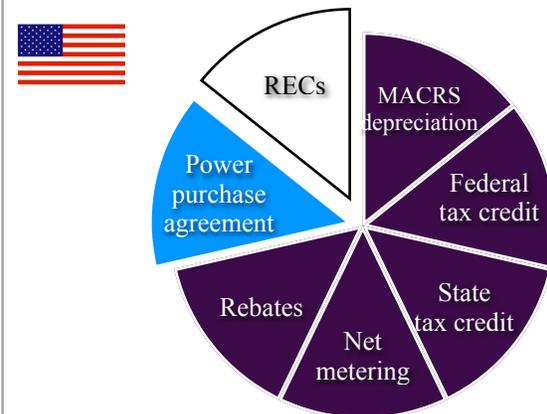
American renewable energy policy consists of a byzantine mix of tax incentives, rebates, state mandates, and utility programs. The complexity of the system results in more difficult and costly renewable electricity generation, and hampers the ability of states and communities to maximize the benefits of their renewable energy resources.

Evidence from Europe suggests that a simpler, more comprehensive policy achieves greater renewable energy development, but at a lower cost and with greater economic and social benefits like local ownership. It is called a feed-in tariff, a price for renewable energy high enough to attract investors without being so high it generates windfall profits. The tariff can be varied to spur new emerging technologies or to achieve social ends.

Denmark and Germany both used a feed-in tariff to drive renewable electricity generators to more than 15 percent market share. This policy also resulted in large-scale local ownership, with near half of German wind turbines and over 80 percent of Danish ones owned by the residents of the region.

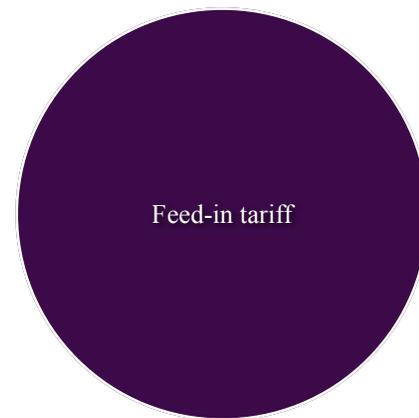
In 2009, one Canadian province (Ontario) and one US municipal utility (Gainesville, FL) have enacted a feed-in tariff. As many as 11 U.S. state legislatures are seriously considering adopting the system as a complement to their renewable electricity mandates. State and federal policy makers should strongly consider turning to a feed-in tariff as the key mechanism for encouraging renewable energy development. It's fairness, simplicity, and stability can help the United States maximize the benefits of the renewable energy revolution.

Figure 1 – One Source of Revenue Makes Financing European Renewable Energy Projects Simpler



Revenue Streams for Renewable Projects

- Market based
- Semi-market
- Fixed



Feed-in Tariff Success, by the numbers:

- Germany: 15% renewable electricity, 280,000 jobs in the renewable industry, a net benefit of 6 billion Euro per year.
- Denmark: 28% renewable electricity, 21,000 jobs in the wind industry

The Power of Feed-in Tariffs

In the United States, renewable energy policy consists of an uncoordinated and often haphazard combination of state and federal incentives and mandates. A company or person wanting to install a wind turbine or solar electric system must negotiate a bewildering array of incentives (**Figure 1**). Each of the incentives has an overhead cost. Rebates, for example, might require a cumbersome paperwork process. Tax incentives require one to put together a group of profitable corporations with sufficient tax liability to make use of the incentives, and in the process the tax equity investors divert some of that incentive away from the actual project. Having gained sufficient financing, the developer must then engage in lengthy and costly negotiations with the local utility to develop a contract with a price and with often onerous and costly interconnection requirements.

This process impedes the growth of renewable energy, may well raise its cost, and certainly discriminates against small and locally owned projects. It may also undermine states' renewable energy efforts.

In the last few years, 38 states adopted renewable electricity mandates. These mandate a specific quantity of renewable electricity based on the overall electricity consumption and leave the price up to the "market," a market, as noted, that largely consists of financial incentives. A number of states may be falling behind their interim benchmarks.

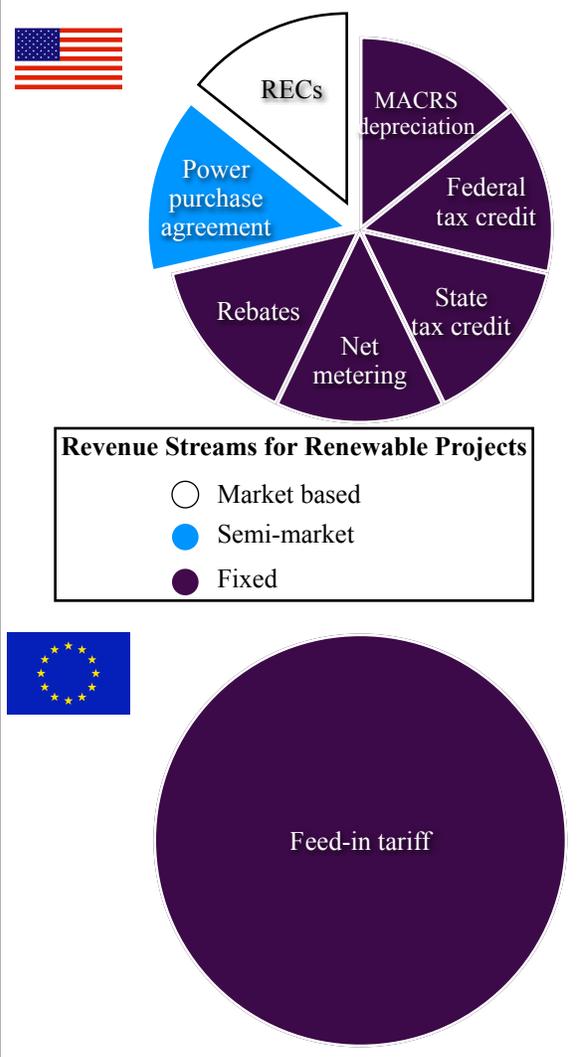
Europe has taken a different approach. It has mandated a specific price for renewable electricity and leaves the quantity achieved up to the "market."

In the 1980s and early 1990s, European nations imitated U.S. renewable energy policies (i.e. incentives) and found them ineffective. First Denmark and then Germany, France and Spain adopted a new, simpler policy. They set a price (tariff) sufficient to attract investors.

This policy has several attractive impacts. By establishing a price, it does away with the need for multiple incentives and the financing of projects largely based on their value in reducing tax liabilities. By reviewing the price every few years, European states can lower the price if they find that it results in windfall profits and attracts too many renewable energy proposals and raise it if they find it insufficiently attractive. Prices can be varied by technology and scale of production, thereby providing an incentive to emerging technologies and to renewable energy projects that have attractive social or economic impacts (e.g. on site generation, local ownership).

European nations further require utilities to interconnect renewable energy projects on demand. The utilities bear the cost of connecting to higher voltage transmission lines and the utilities must offer a short, uniform contract that includes interconnection requirements.

Figure 1 – One Source of Revenue Makes Financing European Renewable Energy Projects Simpler



Empirical studies of the European system have found that it spurs more renewable energy at a lower price than do incentive programs or stand-alone renewable mandates.

A **Feed-In Tariff (FIT)** provides three key provisions to renewable electricity generators: a **guaranteed grid connection**, a **long term contract**, and a **fixed price** sufficient for a reasonable return on investment.

In Europe this new policy is called a Feed In Tariff. A tariff is the traditional term that describes a utility price structure. Feed-in means that this is a price paid to producers that feed their electricity into the grid system. European nations require that those who accept a feed in tariff must “export” all of their electricity into the grid, unlike many U.S. states that offer **net metering** arrangements whereby the output of a rooftop solar array, for example, would first be used inside the building and spin the meter backwards, with any excess sent into the grid. **Figure 2** illustrates the difference between net metering and a European feed-in tariff for a household with a solar panel, with data in kilowatt-hours (kWh).

Figure 2 (a) – Under net metering, the homeowner uses power to offset domestic use and gets paid at the wholesale rate for excess power

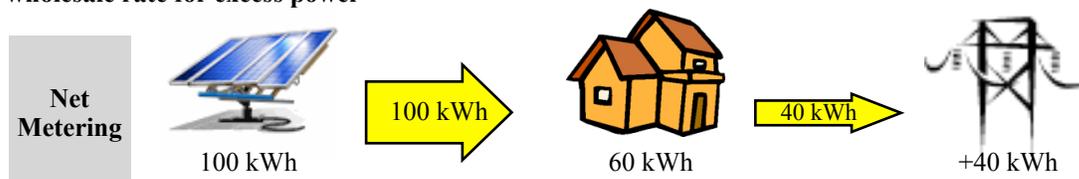
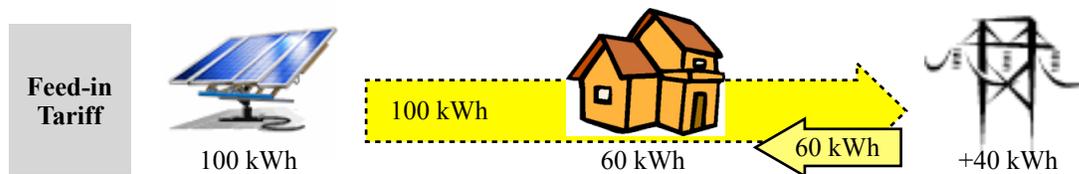


Figure 2 (b) – Under a feed-in tariff, the homeowner sells all their power to the grid for a premium price, but buys all their power from the grid at retail rates



The two policies are really just accounting measures, because the electrons from the solar panel will serve the home first in either case. However, they have a very different impact on the building owner’s decision about the size of the renewable energy facility that will be installed. Under net metering, the owner will probably size the unit to the building’s internal use, because excess power is purchased at low (wholesale) rates. Under a feed-in tariff, the producer is paid a premium for every kilowatt-hour generated and there is often no limit on the size of the facility that will earn that payment. The project is an investment – the system will be sized to maximize the rate of return. This could have a significant impact on the economics of rooftop arrays. In the United States a typical photovoltaic (PV) system might cover a third of a roof. Later as PV panel costs decline, the system could be expanded, but because installation is a significant percentage of the overall cost, the second install may offset the lower priced panels. A feed-in tariff that encourages the maximum sized facility to be installed in the first place may lower long term costs.

Outside Europe, feed-in tariffs go by many names: advanced renewable tariffs, renewable energy payments, or feed laws. We prefer to use the name feed-in tariffs (since it’s the name used in Europe), although renewable energy payments (REPs) are somewhat more intuitive to the typical American.

This paper presents the case for an American feed-in tariff, based on the European history, the elegance of the policy and the preponderance of evidence that feed-in tariffs generate greater social and economic benefits than alternative policies for the same level of renewable energy deployment.

The European Experience

Two countries in particular provide an illustration of the success of the feed-in tariff: Denmark and Germany.

Denmark: The Rise and Fall of Feed-In Tariffs

Denmark's history of renewable energy policy is one of early commitment, rapid success under a feed-in tariff, and then stagnation from a changed policy. In the 1980s, the Danes were among the first to encourage renewable energy development, a step ahead of many other national efforts to respond to the Arab oil crisis. Their head-start meant that the California wind farms – representing the early renewable energy efforts of the United States in the post oil crisis era – were largely powered by Danish turbines. However, while the U.S. abandoned many of its initiatives as the price of oil fell during the 1980s, the Danes remained committed to their energy independence goals, including the development of renewable energy. A strong anti-nuclear movement also increased the Danish commitment to wind power.¹

The following timeline illustrates the history of Danish renewable energy policy.

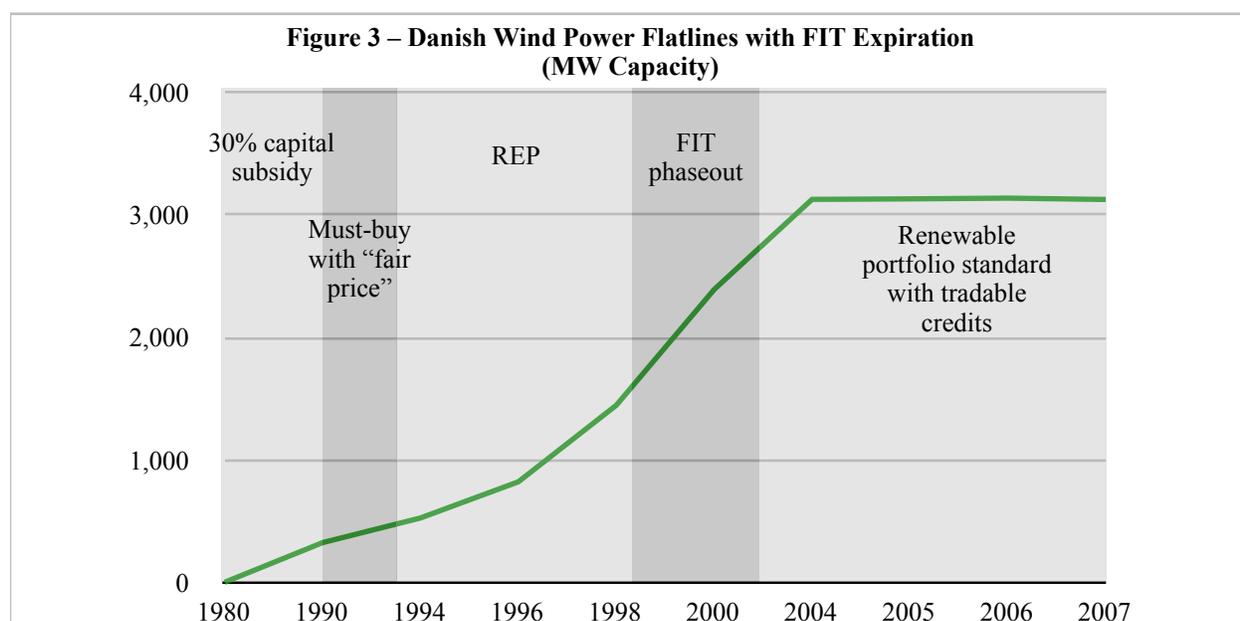
1980s	<p>1979-1992: Fostering a wind industry</p> <p>In 1979, the Danish legislature (Folketing) introduced the first incentives for wind power, a subsidy for 30 percent of total project costs that decreased over time.² Wind power generation first exceeded 100 megawatts (MW) under this proposal, an impressive feat since most were turbines less than 100 kilowatts (kW) in size.</p> <p>In 1988, the Danes took a step closer to a feed-in tariff, reducing the capital subsidy but requiring utilities to interconnect and purchase power from wind projects. Utilities were also required to provide a “fair price.”³ Wind power capacity increased to near 300 MW.</p>
1990s	<p>By 1992, the “fair price” for wind power was set at 85 percent of the retail electricity rate.⁴ The Danes provided guaranteed interconnection and power purchase. The price was still set relative to retail rates and not relative to the cost of production for wind generators.</p> <p>1993-2002: The FIT and the Surge in Production</p> <p>In 1993, the Danes formally established a Feed-In Tariff, decoupling the power purchase price from electricity rates. The price paid for power from wind turbines was set at 85 percent of utility production and distribution costs.⁵ Wind projects also received a refund of the Danish carbon tax and a partial refund on the energy tax. These refunds effectively doubled the payment to wind projects for the first five years of the project.</p> <p>In 1998, the price language was changed slightly, though the support level remained largely the same. The new law required utilities to purchase the wind turbine's output at “85 percent of the consumer price of electricity plus ecotax relief.” These costs were largely borne by the utilities, who received a payment to offset their costs,⁶ but turbine operators were responsible for the initial grid connection. “The costs of grid connection are paid by the wind mill owners exactly until the nearest 10 or 20 kV line.”⁷</p> <p>In 1999 the election of a center-right government ended the feed-in tariff in Denmark. Instead, the renewable energy program was changed to an American-style renewable portfolio standard with tradable credits.⁸ The new program was phased in, so some producers who came online through 2002 were still able to get the prior tariff rate locked in for 10 years.⁹</p>
2000s	<p>2003-Present: U.S.-style quotas and stagnant development</p> <p>By 2003, all wind generators connecting to the grid had to do so under the new renewable</p>

2000s

portfolio standard, earning the market price plus a premium. This premium was capped, setting a maximum price that wind producers could receive. The new scheme also no longer guaranteed interconnection. Additions to wind power capacity declined precipitously.¹⁰

From 1993 to 2004, Danish wind power grew from 500 MW to over 3,000 MW. Since the feed-in tariff was abandoned in 2004, development has stagnated at that level (**Figure 3**).

The new government also offered incentives and a higher payment cap for repowering, making replacement of old turbines more lucrative than adding new wind projects.¹¹ Developers would remove several small turbines and replace them with one, larger one. The repowering incentives were so lucrative that one wind cooperative sold its turbine for decommissioning in 2005 for the same price it paid in 1988.¹² In 2005, the government responded to stagnating wind development by removing the cap on wind payments, but the net increase in wind power capacity was less than 25 MW between 2004 and 2007.¹³



Danish Results: Energy and Industry

Despite the recent stagnation in wind energy growth, the feed-in tariff's legacy is striking:

- A domestic wind industry with over 20 billion DKK in turnover (\$37 billion), employing 21,000 people.¹⁴
- Denmark gets more electricity from renewables than nearly every other country. In 2007, 28 percent of electricity came from renewable sources,¹⁵ with 20 percent from wind power.¹⁶
- Over 150,000 families have invested in wind turbines individually or through cooperatives, owning over 80 percent of the country's turbines (with about 60 families per MW).¹⁷

Denmark: Locally owned wind power

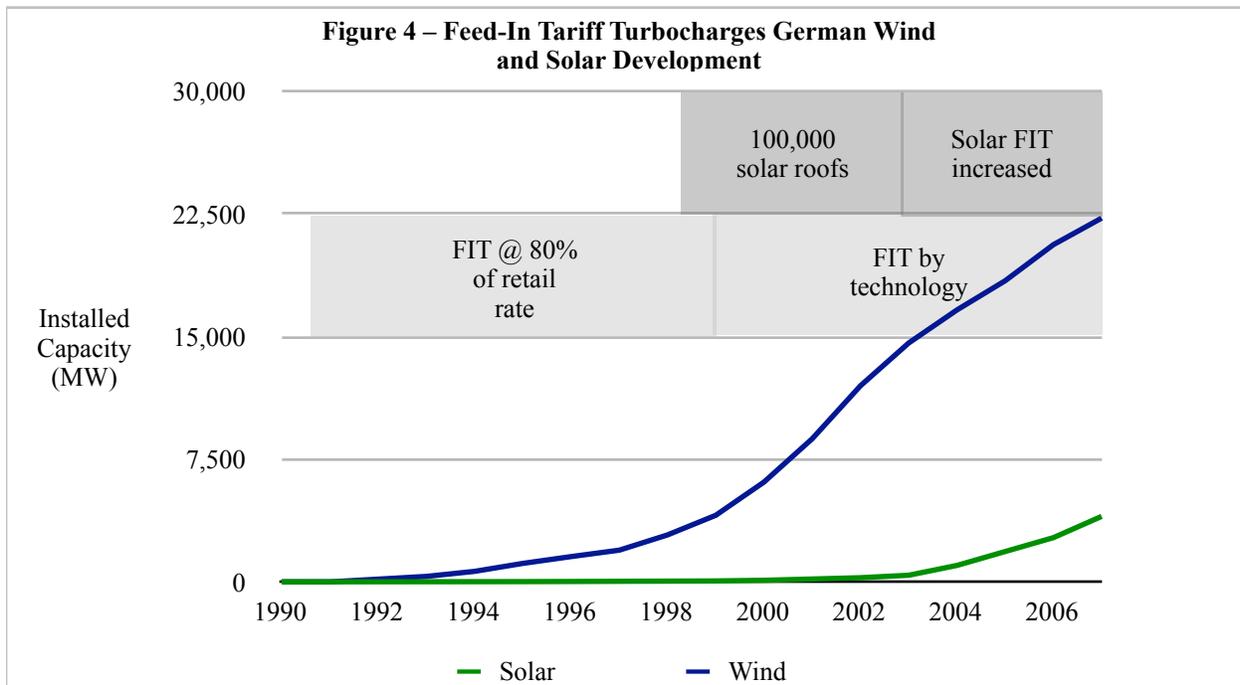
In keeping with a tradition of cooperative ownership in their electricity generation system, the Danes strongly encouraged cooperative ownership of wind projects. The key policy was a tax exemption on revenue from cooperative wind enterprises, a provision that essentially doubled the income from a wind project because of a marginal tax rate close to 50 percent.¹⁸ This exemption dates back to at least 1985 and is a significant reason that cooperatives own over 80 percent of Danish turbines and distribute the revenues to over 150,000 families.

Germany: The Rise and Rise of Feed-In Tariffs

In Germany the motivation for a renewable energy plan was somewhat different than Denmark. Concerns about climate change and environmental degradation motivated the initial commitment to renewable power in the late 1980s, as did an interest in developing a native industry. Later, Green Party participation in the government added an anti-nuclear component to renewable energy policy.

The following timeline illustrates Germany's road to feed-in tariffs.

1990s	<p>1987-1990: A small start</p> <p>Individual German states offered wind power incentives as early as 1987, when Niedersachsen provided a 50 percent capital subsidy that was phased out by 1995.¹⁹ The federal renewable energy program was started in 1989 with a market stimulation program. It provided a fixed price payment for wind power (with a total budget sufficient for up to 250 MW) and investment incentives for private operators (e.g. farmers) to invest in renewable energy. The program did not yet guarantee interconnection for small producers.²⁰</p> <p>1991-1999: Feed-In Tariff accelerates wind, some solar</p> <p>In 1991, the Germans adopted feed-in tariffs when they enacted their Electricity Feed-In law. Utilities were required to purchase renewable energy generation and to pay 80 percent of the historical average retail price to producers of qualified renewables.²¹ The program was capped at 5 percent of a utility's generation.²²</p> <p>In 1999, Germany introduced a parallel incentive for solar PV, known as the 100,000 Roofs Program. It provided zero interest loans and a grant worth 12.5 percent of the system cost. The program ended in 2003 with 346 MW installed across the country.²³</p>
2000s	<p>2000-Present: Revised FIT broadens German renewable development</p> <p>In 2000, major revisions were made in the form of the Renewable Energy Act (EEG). This landmark law decoupled feed-in tariff prices from retail rates and instead based prices on the cost of production. There was a guaranteed payment for 20 years and the cap on renewables was removed. The EEG was scheduled for review every two years starting in 2007.²⁴</p> <p>The law also introduced more sophisticated elements to feed-in tariffs, including tariff degression to account for improving technology, stepped tariffs based on the size of a energy producer and the quality of the renewable resource, and set rates separately for wind, solar, and other technologies.²⁵ The EEG also created the cost-sharing program where the incremental costs of renewable generation are spread among all high-voltage grid operators and end customers.²⁶</p> <div style="border: 1px solid black; padding: 5px; margin: 10px 0;"> <p>Tariff degression – an annual decrease in the new contract price for a feed-in tariff</p> <p><i>Example: 5% solar tariff degression</i></p> <ul style="list-style-type: none"> • A 2008-installed solar panel gets 60 cents per kWh for 20 years • A 2009-installed solar panel gets 57 cents per kWh for 20 years </div> <p>In August 2004, the EEG was revised (with support from conservatives), adding firm targets for renewable energy generation and revising tariff prices. Solar PV received a price increase, as did several other technologies, and onshore wind generators saw their tariff decrease.²⁷ The law also enforced the guaranteed connection and priority access for renewable energy systems.</p> <p>The result of the German commitment to renewable energy has been a staggering increase in renewable energy production as well as jobs and industry. Figure 4 illustrates the fruits of Germany's commitment to the feed-in tariff – substantial increases in wind and solar power capacity.²⁸</p>



Results: Energy and Industry

- From 1995 to 2005, Germans increased the share of renewables in their electricity mix from 1 percent to 12 percent.²⁹ By 2007, Germany received 14 percent of its electricity from renewable sources.³⁰
- German renewable energy industries had sales of nearly 11 billion Euro to worldwide customers in 2007 (\$15 billion), 44 percent from solar, 21 percent from wind.³¹ Germany has 249,000 jobs in renewable energy industries.³²

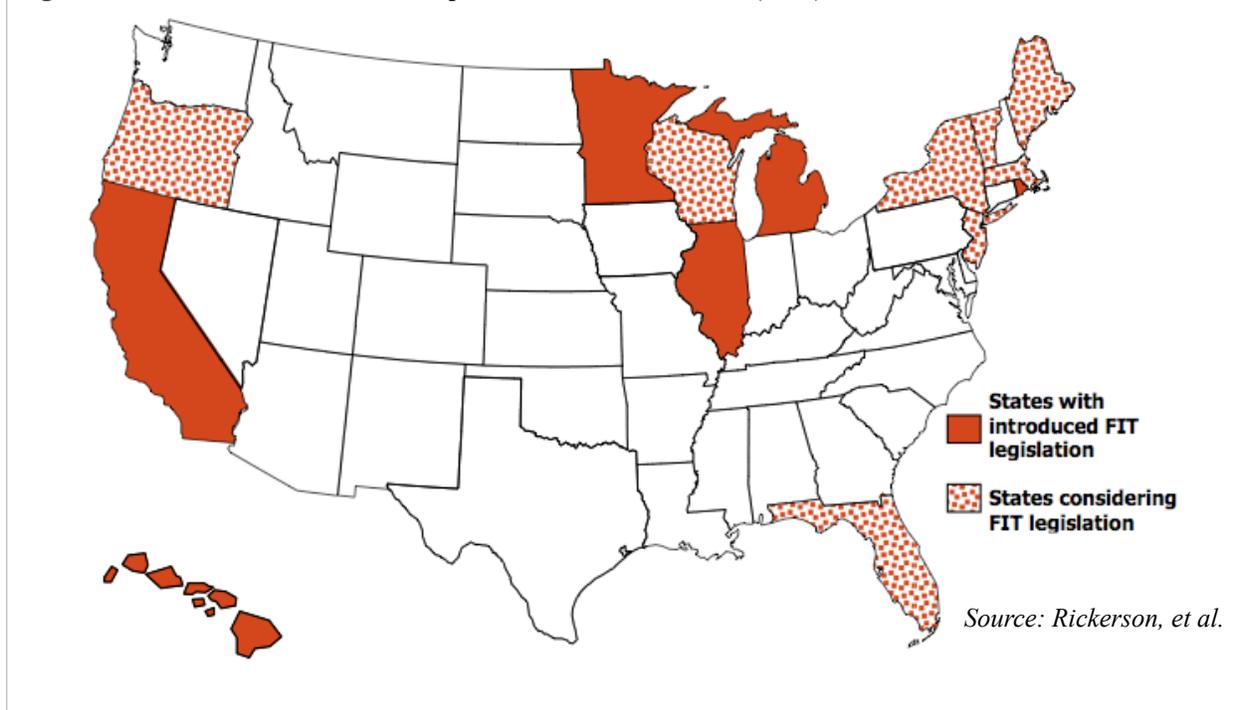
Germany: Locally owned renewable energy

In Germany, high population density and a deep environmental sensitivity encouraged dispersed generation from wind projects and helped enable local ownership. The other factor was the interest of farmers, who helped develop the financing for early wind projects by providing their land as collateral.³³ One-third of Germany's wind power is owned by over 200,000 local landowners and residents.³⁴

Feed-In Tariffs in the United States

The stunning success of European policy has encouraged American policy makers to consider feed-in tariffs at the federal, state, and local level. Bills have been introduced in at least eight states to establish feed-in tariffs. Two municipal utilities have proceeded without legislation.³⁵ Rep. Jay Inslee (D-WA) introduced a bill to encourage nationwide feed-in tariffs in the U.S. House during the summer of 2008.³⁶ **Figure 5** illustrates the breadth of the feed-in tariff fervor.³⁷ Since the map was drawn, at least two other states (Iowa and Indiana) have been added to the list.

Figure 5 – Status of Feed-in Tariff Proposals in the United States (2008)



Thirty years ago, the United States briefly flirted with feed-in tariffs after the federal Public Utility Regulatory Policies Act (PURPA)³⁸ policy ended the utility monopoly on electricity generation, requiring them to buy electricity from independent producers at a price based on their avoided costs. In the early 1980s California required utilities to offer a standard 10 year contract with a high fixed price for wind energy that was in essence a feed-in tariff. The standard offer contracts were abandoned in the early 1990s as California opted to pursue retail electricity deregulation.

We need to get something on the table that allows community projects to get financed, move ahead, and not get bogged down in all the B.S. that's involved in large power generation.

–Dan Juhl, community wind developer, Minnesota

The contrast between the U.S. and Europe is stark. In the U.S. a producer must juggle periodically expiring incentives, 50 independent renewable energy markets, hard-to-use tax credits, and complex and protracted negotiations with utilities over contracts nearly a hundred pages long.

Wind developer Dan Juhl described the U.S. situation at a recent conference on feed-in tariffs in Minnesota, pointing out the many challenges for community-based wind projects.³⁹ Getting a project on the grid begins with a utility's request for proposal, and a community-based developer bases their project preparation – price

quotes for turbines and installation, and other parts of the wind project – on the utility’s timeline. The utility usually advertises a particular date for the selection of the winning bid. But once the developer wins the bid process, they begin the power purchase agreement negotiation. Dan noted,

“It takes a year...[there are] land mines in the power contract...You have to negotiate them out or you will not get financing.”

By the time the power purchase contract is negotiated, the community-based developer may be required to renegotiate purchase agreements with suppliers since so much time has elapsed. The entire project is jeopardized. Dan sees a need for legislation to simplify the process:

“We need to get something on the table that allows community projects to get financed, move ahead, and not get bogged down in all the BS that's involved in large power generation.”

Power purchase contracts in the U.S. can be very complex and lengthy. In Germany, a producer gets a 20-year, all-in-one contract that ensures a reasonable profit. The contract is five pages long.⁴⁰

European renewable energy leaders were driven by more than environmentalism – they wanted to capture the economic benefits and green jobs from their renewable energy development. FITs created a vast, competitive market for renewable energy production by creating a truly level playing field for development. With prices set for reasonable cost recovery and profit, a producer need not rely on attracting the relatively few individuals or corporations with large amounts of tax liability (like in the U.S.). The opportunities for ownership were dramatically broadened.

The result of this market democratization was significant. In Germany, 45 percent of wind projects are locally owned. In Denmark, 83 percent of wind projects are owned by individuals or local cooperatives.⁴¹ And for each of these locally owned projects, more of the investment dollar stays in the community and country, creating a cycle of more investment and jobs.

Why Feed-In Tariffs Work

A feed-in tariff incorporates three basic principles for increasing renewable energy generation: fairness, simplicity, and stability (**Figure 6**). Policies based on these principles tend to achieve three goals: a) much broader and dispersed ownership of renewable energy; b) economic development and c) energy security. Evidence from countries with FITs shows that it often achieves these benefits at a lower cost than alternative renewable energy incentives.⁴²

Simplicity

A feed-in tariff makes generating renewable energy simple. If you build a renewable electricity generator, you'll get paid one specific price for every kilowatt-hour you produce. Prices are set to guarantee a reasonable rate of return, encouraging further development and more potential owners.

Consider the Paper Trail

A typical American power purchase agreement between a producer and the utility is 85 pages. In Germany, the contract is 2-4 pages.

Figure 7 (next page) illustrates how someone interested in renewable energy is compensated under a feed-in tariff, and how this contrasts with the status quo in the United States.

In contrast to existing incentives like the federal production tax credit, with a FIT there's no negotiating with utilities, partnering with tax-credit-hungry investors, or uncertainties about Congress.

Stability

A feed-in tariff makes the market stable. Utilities must connect renewable generators and buy their electricity at the incentive rates for 20 years.

Contrast the FIT with the existing system, where federal incentives can expire, creating boom-and-bust cycles in the market. This stability is a significant reason that Denmark and Germany generate more than 15 percent of their electricity from renewable energy, while the U.S. achieved only 3 percent in 2007.⁴³

Fairness

A feed-in tariff makes the market fairer because it removes the barriers to participation from a number of players. A FIT allows people with little tax liability or non-taxable entities – cities, counties, states, non-profits – to pursue renewable energy projects.

Most current U.S. incentives are in the form of tax credits, which are only valuable to individuals or businesses with a lot of tax liability. This unfair system reduces the pool of potential renewable energy investors and dollars, to everyone's detriment.

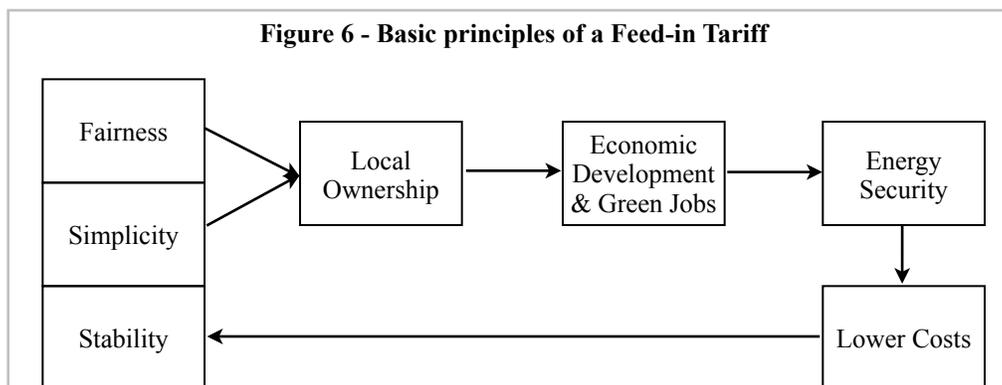
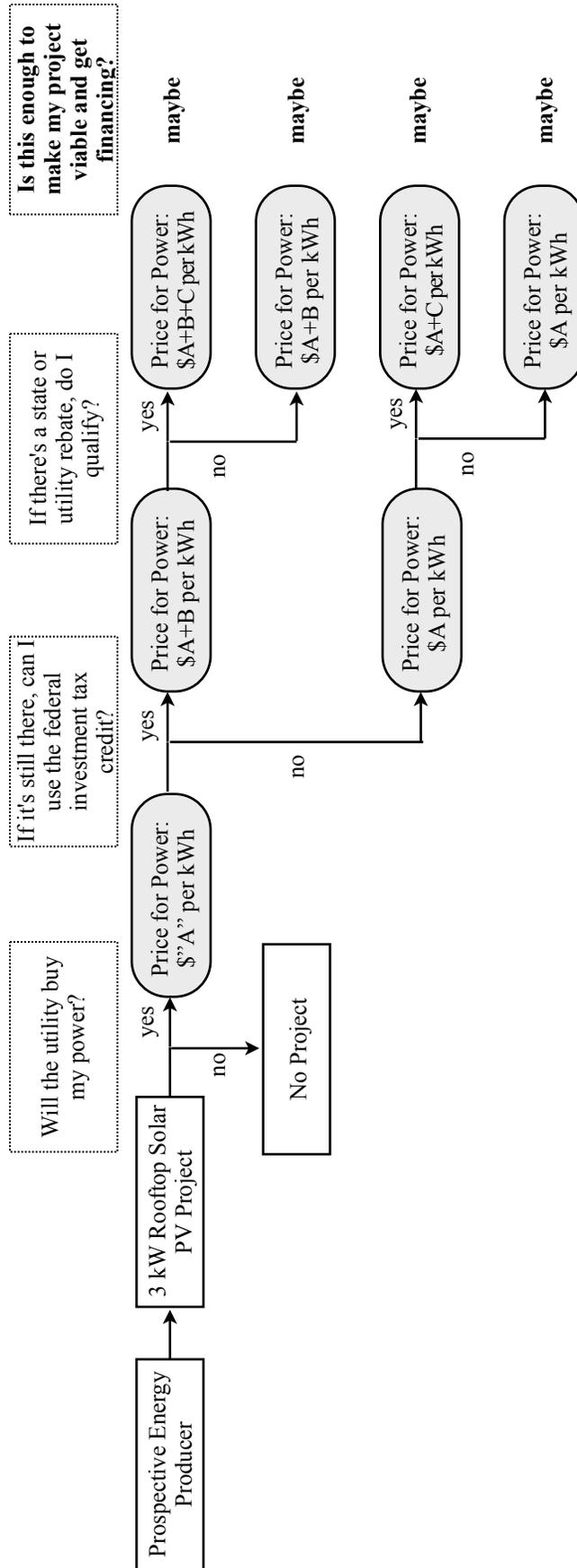
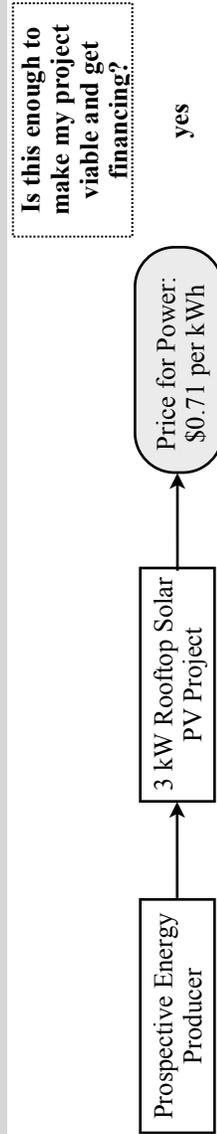


Figure 7 – FIT Simplifies Project Planning and Finance

Status Quo



Feed-In Tariff



Designing a Feed-In Tariff

There is no one-size-fits-all feed-in tariff policy. There are many variations as policymakers adapt the core design to their local context and needs.

Setting FIT Rates

Figure 9 (next page) illustrates the price setting process for a feed-in tariff that supports solar PV, biomass, and wind electricity generation. The following step-by-step process corresponds to the steps on the chart.

1. Offer a reasonable return

Utility investments in regulated states typically receive a guaranteed 10-12 percent return on investment. Feed-In Tariffs are often set to provide a 8-10 percent internal rate of return. This strategy is used in Germany and in a proposed national FIT for the United States (Renewable Energy Jobs and Security Act of 2008).⁴⁴ Spain and a few other countries also set a FIT as a premium over retail electricity rates.

2. Configure by technology

Feed-In Tariffs encourage multi-technology investment in order to accelerate the technological learning curve and achieve manufacturing economies of scale. Since costs to generate electricity differ for solar, wind and biomass, payments are adjusted accordingly to encourage a diversity of renewable energy technologies and industries.

3. Award innovation

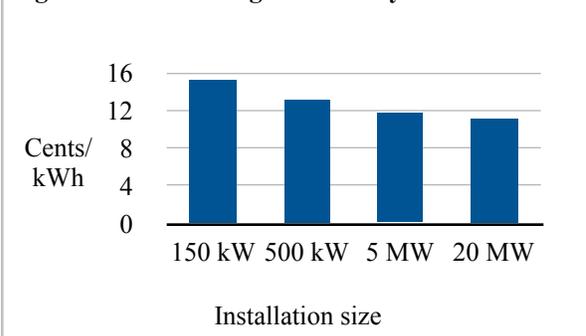
Some feed-in tariff plans are designed to foster innovation and to achieve social goals. For example, solar on rooftops instead of fields preserves open space and turns shelter into power generation. Placing solar panels on building facades helps increase a building's self-sufficiency. FIT rates can increase for these technologies to encourage their development.

4. Accommodate various sizes

In order to encourage a diversity of dispersed renewable generators, FIT rates are often slightly higher for smaller projects. For example, this may encourage development of wind power projects in areas with lower wind speeds, but greater available transmission capacity.

Figure 8 illustrates how Germany scales its biomass tariff to encourage projects at small and large scale.

Figure 8 – Size Scaling of Germany's Biomass Tariff



Adjusting FIT Rates

5. Adjust for experience

FIT prices for new projects often decrease each year to reflect improving technology.

6. Adjust for inflation

Though technological investment reduces costs, even wind and solar are subject to the prices of basic commodities like steel, concrete or silicon. FIT prices can be adjusted to help cover inflation.

7. Provide a long-term contract

A feed-in tariff guarantees a long-term purchase contract for electricity to help investors recover their investment. Renewable energy projects like wind and solar have no fuel costs, so their entire investment is up front. Long term contracts, generally 20 years, ensure that energy producers recover their costs and help them secure financing.

8. Share the Cost

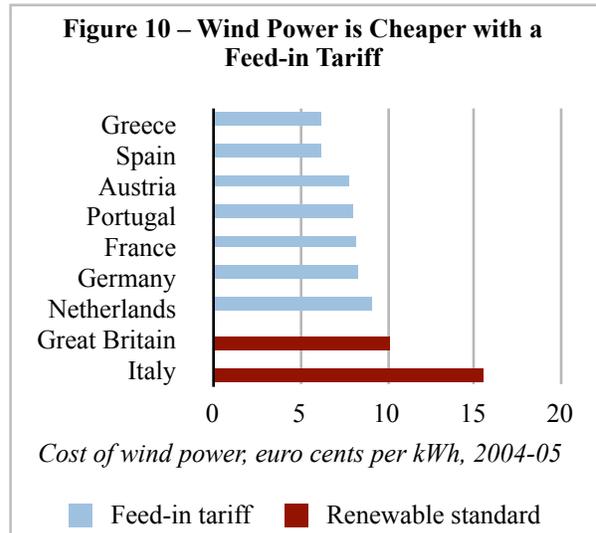
A feed-in tariff promotes simple cost-sharing of the benefits of renewable energy. Any incremental increase in the cost of electricity from projects using the FIT is spread across the entire set of electricity consumers. In European countries, this cost-sharing is national, with partial exemptions for electricity-intensive industries. In the U.S. it may be on a state or on a utility basis.

The Economics of a Feed-in Tariff

The motivation for simple renewable energy policy like a FIT is the potential to secure more of the economic and social benefits of a transition to renewable energy than using a patchwork policy approach. Evidence from European countries with feed-in tariffs suggests that this is exactly what happens. This section outlines several ways that feed-in tariffs have improved economic development in the countries that use them.

Cheaper renewable power

Studies of the European electricity markets find that electricity from wind turbines is less expensive in countries with feed-in tariffs than those with quantity-based renewable energy policies like renewable portfolio standards (**Figure 10**).⁴⁵ Great Britain, for example, requires wind producers to obtain much of their economic value from selling renewable energy credits (RECs) – a certificate of renewable energy produced that utilities must buy – and the uncertainty of REC prices increases financing costs and, ultimately, the cost of wind power for ratepayers.



Cheaper electricity

If renewable electricity is prioritized – e.g. utilities must buy and feed-in that power to the grid first – then renewable energy displaces other generators. This “merit order” reduces the use of expensive peaking plants and can drive down the overall cost of electricity supply (**Figure 11**).⁴⁶ This has been the case in Germany.

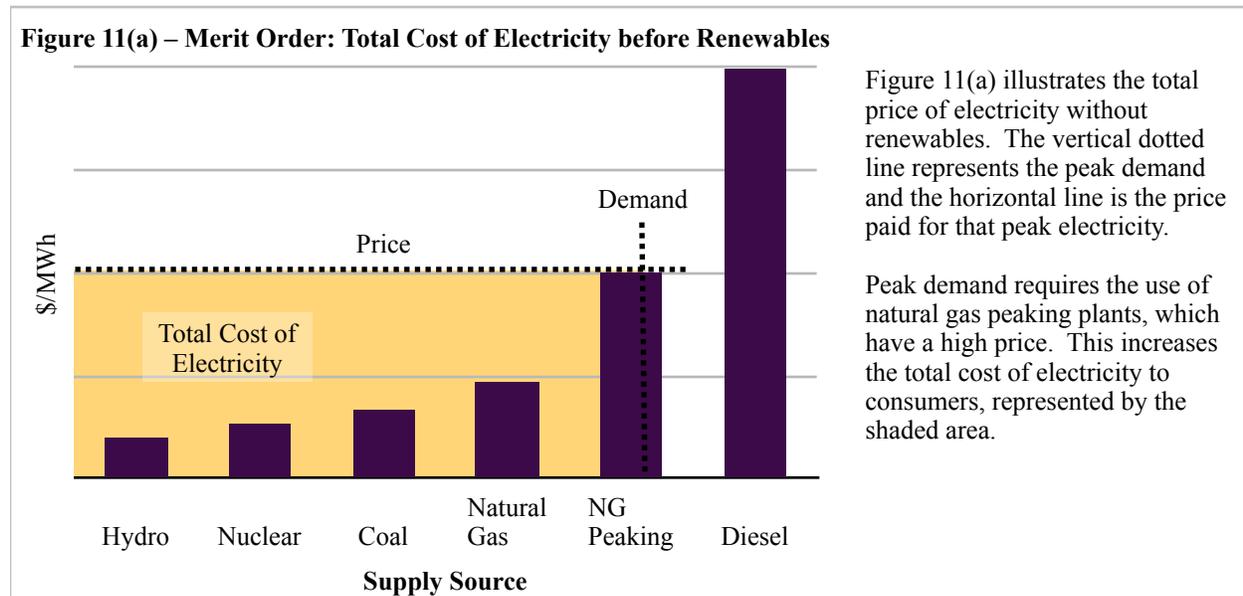


Figure 11(b) – Merit Order: Renewables Lower Electricity Cost

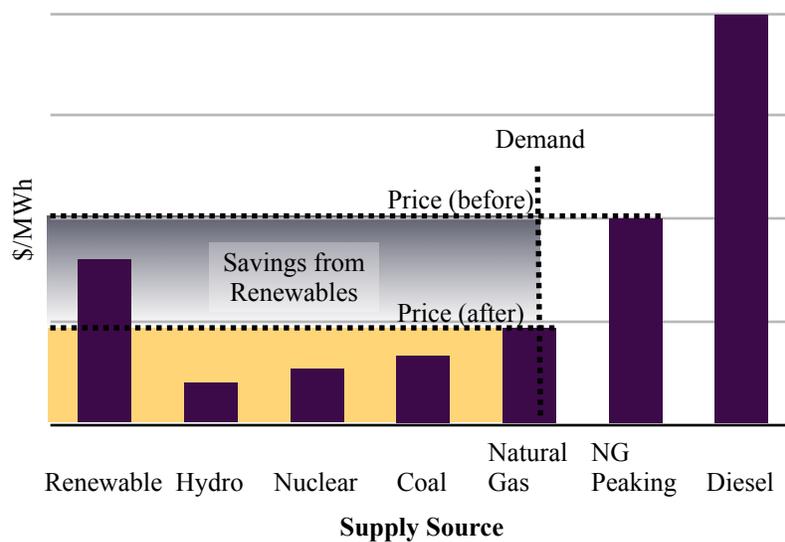


Figure 11(b) illustrates the total price of electricity *with* renewables.

The vertical dotted line (Demand) shows that prioritizing renewable generators reduces the use of natural gas peaking plants. The lower horizontal dotted line (Price - after) shows how this lowers the total cost of electricity. The gradient area shows how the lower wholesale price generates savings that offset and sometimes may eliminate the additional cost to the utility of buying renewables at a premium price (represented by the bar for renewables).

In Germany, the merit order savings from renewables exceeds the premium price paid under the feed-in tariff. In Denmark and Spain, the savings recoup over 80 percent of the higher feed-in tariff costs.

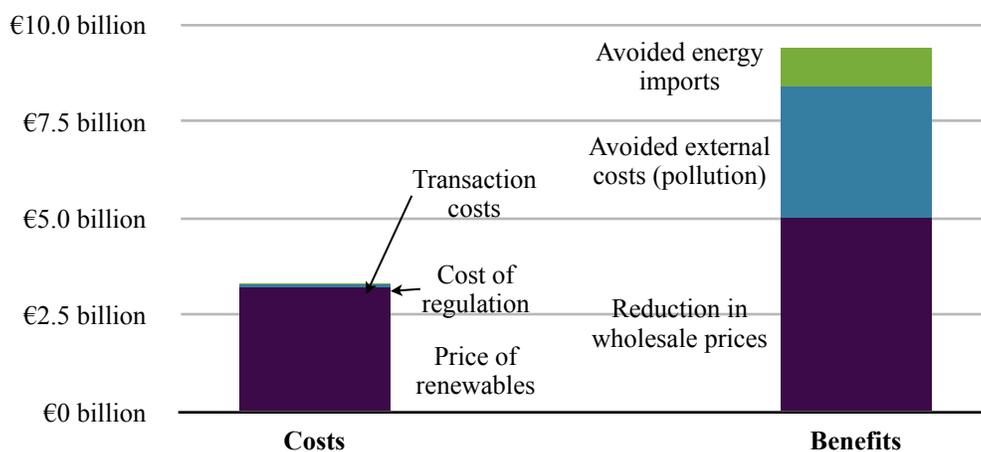
Substantial job growth

Both Germany and Denmark were early adopters of feed-in tariffs, and the investment in renewable power has paid back several-fold to their economies. In Germany, almost 280,000 jobs have been created in the renewable energy industry. In Denmark, there are over 21,000 jobs in the wind industry.

Total benefits far outweigh the costs

Overall, the benefits of a feed in tariff can outweigh the costs of the premium paid to renewables even without taking into account the economic development impacts. The German ministry overseeing their feed-in tariff estimates that the total benefits of the legislation have exceeded the costs by a factor of three (Figure 12).⁴⁷

Figure 12 – Benefits of German Feed-in Tariff far outweigh costs

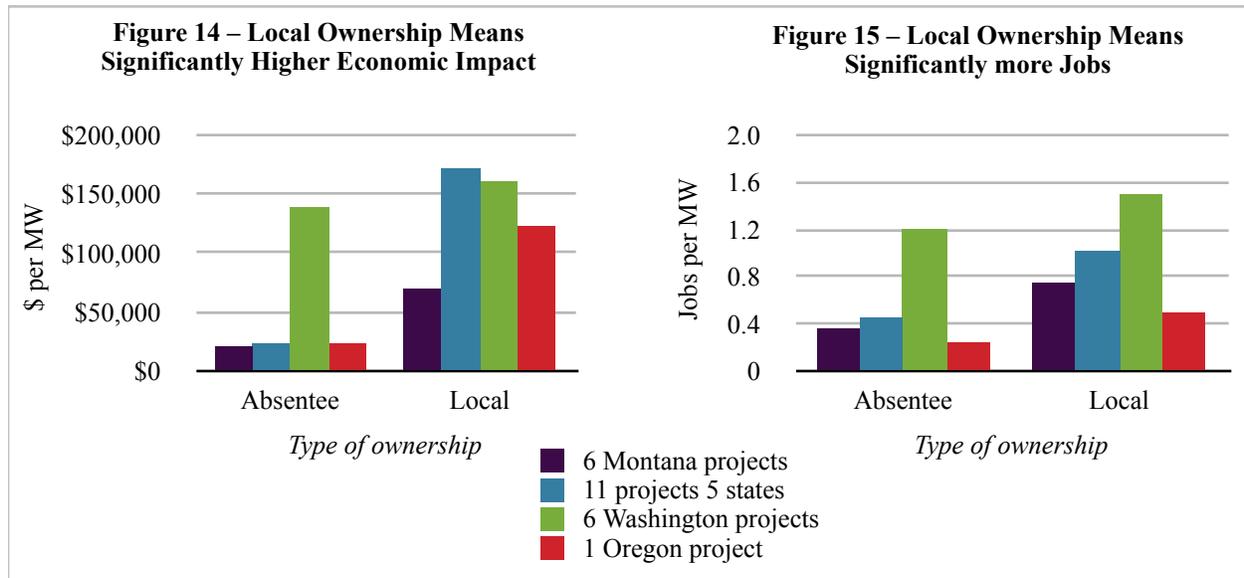
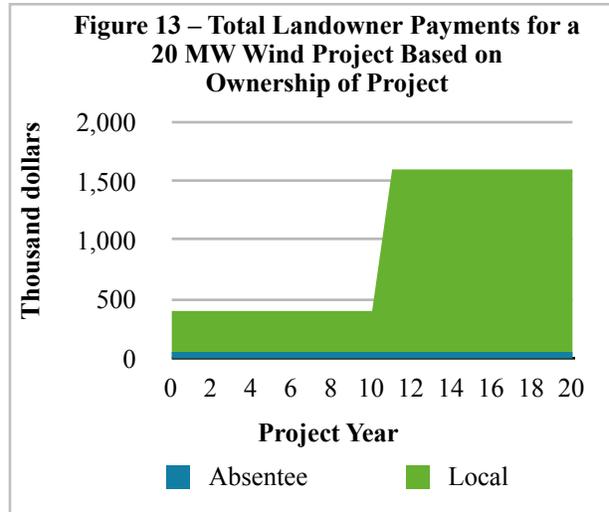


Local ownership

A feed-in tariff levels the playing field for local ownership because the all-in-one price drastically simplifies the development process for community-based or individually-owned projects. Rather than having to cobble together an unwieldy structure of local investors and tax equity investors as is the case in the United States, in European countries with feed-in tariffs the profits come from utility revenues, thus avoiding the need to find investors with tax liability. This is important since the economic benefits from encouraging this type of ownership are substantial.

Take a particular wind project, for example, with ten 2 MW turbines located on a farmer’s land. **Figure 13** shows that the cash flow for owning the turbines is significantly higher than if the farmer simply leases their land and wind rights to an absentee developer.⁴⁸

This drastic difference also accounts for the much higher economic benefits to a region when wind projects are locally owned rather than absentee owned. **Figures 14 and 15** show both the economic impact and employment impact advantages of local ownership.⁴⁹



Minnesota: A Case Study

Minnesota first considered a feed-in tariff in 2008 and the bill introduced in the 2009 session reflects an effort to adapt successful European policies to Minnesota's unique needs. Minnesota already has a nascent wind industry, with over 1,200 MW of wind projects in the ground and many hundreds more planned.

Additionally, the state has shown a strong commitment to encouraging locally owned, community-based renewable energy projects. Like Germany and Denmark, the state has a significantly higher rate of local ownership than other regions of the U.S (approximately 20 percent of wind projects). And yet, development of community-based projects has lagged as incentives continue to favor absentee ownership and larger scale projects and discriminate against locally owned and smaller projects.

Thus, the feed-in tariff proposal for Minnesota has a few key features:

- Local ownership – only locally owned projects can use the feed-in tariff incentive (as defined by the Community-Based Energy Development law)⁵⁰.
- Smaller wind projects –the revised FIT bill will only support wind projects under 20 MW in size.
- Program cap: the Minnesota legislation includes a capacity cap, set at 20 percent of the 25 percent Renewable Energy Standard by 2025 (approximately 5 percent of retail sales).

Costs and Benefits of a Minnesota Feed-in Tariff

What might be the costs and benefits of a Minnesota FIT as currently designed?

For illustration purposes, the following analysis assumes that the feed-in tariff in Minnesota would be enacted in 2010 and that up to 20 percent of the state's renewable energy goal could be covered by projects in the FIT program. This would be close to 5 percent of each utility's load. It is assumed that wind will be 95 percent of projects and solar 5 percent, equivalent to 1042 MW of wind power and 151 MW of solar PV by 2025.

Cost to ratepayers and taxpayers

The cost to Minnesota ratepayers of the amount of renewable energy generated in this example is very small, approximately 41 cents per household per month at its peak. Because the prices step down over time, however, the feed-in tariff will eventually lower electricity bills by more than this, saving households around 8 cents per month in 2025.

The ratepayer cost of Minnesota's feed-in tariff is small, peaking at 41 cents per household per month.

The primary reason for lower costs is 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.⁵¹ Mandate systems have volatile prices because the producers may rely on the sale of their renewable certificates to supplement the power purchase price. Because selling these credits on the market is more unpredictable than a long-term, fixed-price contract, feed-in tariffs create more investor confidence and lower the cost of capital.⁵²

“I live out on the Buffalo Ridge...I look out my window and I see hundreds of wind turbines. When I look at those turbines I'm happy and I'm sad... Most of those turbines are owned by our friends, the foreign multinationals. Out of two counties in Minnesota we export about 80 million dollars a year to France, Florida, Italy, Portugal, Spain.

All of our energy future is going out the door when we could be turning that into something real for us.”

–Dan Juhl, community wind developer, Minnesota

Benefits to the state

The renewable energy projects supported by a feed-in tariff will provide a premium in economic development, in jobs and financial impact on the local economy because of their broad ownership structure.

Several studies have documented the significantly higher impact of local ownership of renewable energy projects on employment and economic benefits. The research typically shows nearly two-thirds again as many jobs in a locally owned project compared to an absentee owned one, and anywhere from two to five times the total economic impact.⁵³ **Figure 16** illustrates the potential impact of a feed-in tariff on Minnesota’s economy, given the research findings.

Figure 16(a) – 1042 MW of Minnesota Wind Produces More Jobs if Locally Owned

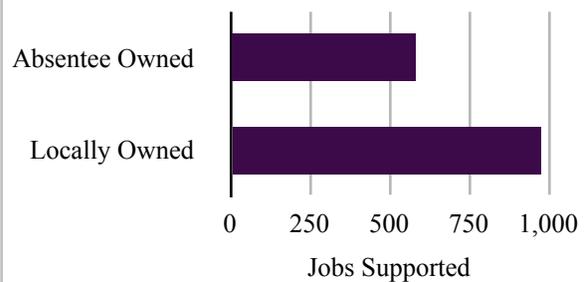


Figure 16(b) – 1042 MW of Minnesota Wind Produces More Economic Impact if Locally Owned



Questions about Feed-In Tariffs

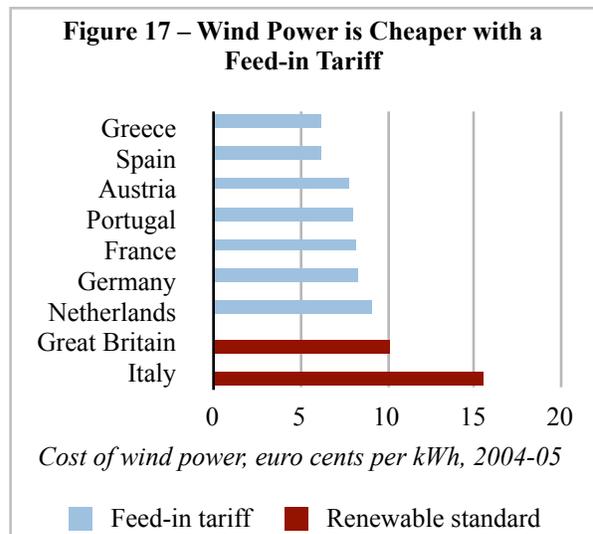
With a history of favoring market interventions based on quantity rather than price, many U.S. utility and regulatory representatives raise concerns about feed-in tariffs. Here are some answers to common questions or criticisms.

Won't a Feed-In Tariff be expensive?

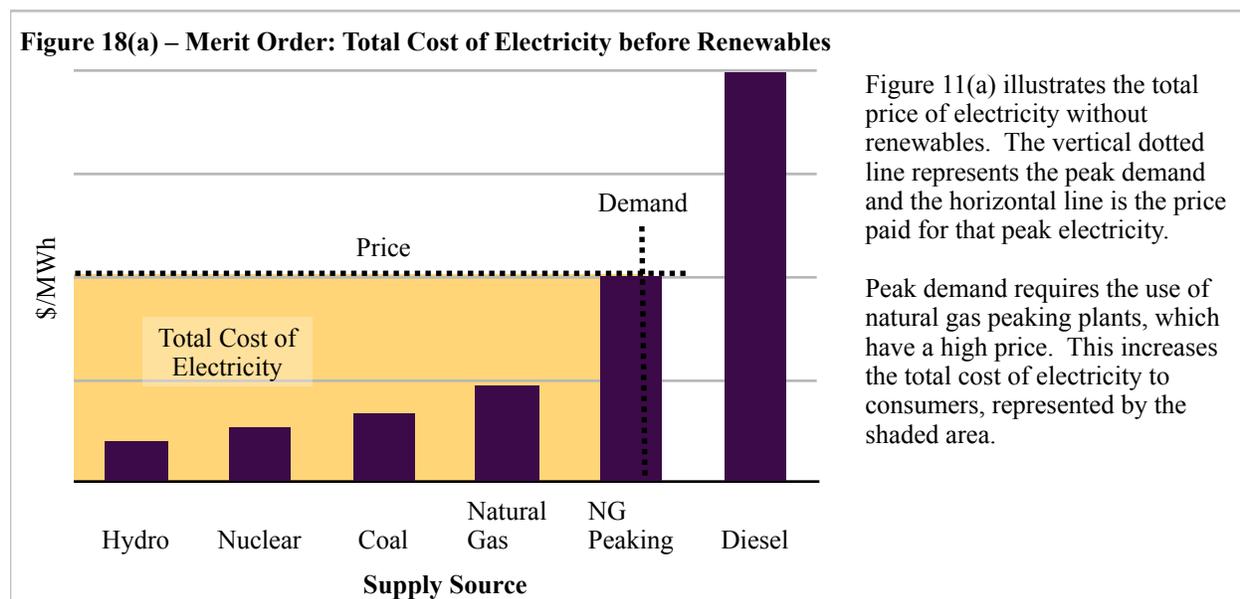
No. In fact, studies suggest that a feed-in tariff may be a less expensive route than other policies to expanding renewable energy production, while generating greater domestic or local economic benefits.

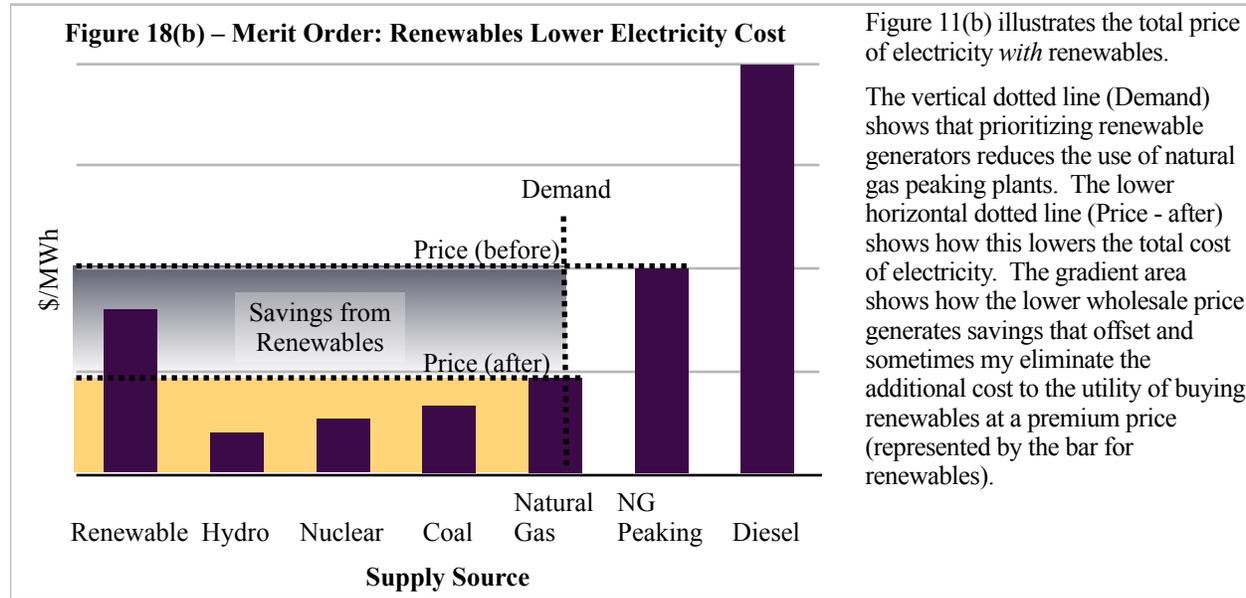
Because it sets all-in-one prices, a feed-in tariff often looks a lot bigger than the prices utilities are used to paying or governments are used to providing. The difference is an accounting one. Wind and solar producers will get a price under a FIT as they do in the current market with its byzantine array of incentives, rebates, and tax advantages. But a guaranteed, long term contract reduces the risk premium for financing renewable energy projects, often reducing the cost of capital and, thus, the cost of getting more renewable energy.

The cost difference is highlighted in **Figure 17**, which shows that European countries with feed-in tariffs have substantially lower acquisition costs for wind power than those with quantity-based policies.



Studies have also found that the additional cost of feed-in tariffs is offset, sometimes almost completely, by reducing the wholesale cost of electricity. In most countries with feed-in tariffs, renewable energy is the highest priority electricity source, so it supplants other generators such as nuclear, coal and natural gas. This “merit order” actually reduces the overall cost of electricity (**Figure 18**).





In Germany, the merit order savings from renewables exceed the premium price paid under the feed-in tariff. In Denmark and Spain, the savings recoup over 80 percent of the feed-in tariff costs.

If we have an RPS, do we need a Feed-in Tariff?

Yes. An RPS provides a timeline to the utilities, but does not push projects forward. A FIT sends a signal to investors; it makes projects happen. Moreover, a FIT can be designed to not only accelerate renewable energy but to do so in a way that achieves economic development or other important social goals, such as allowing more energy consumers to become energy producers.

By supporting local ownership and dispersed generation, a feed-in tariff can increase the economic benefits and reduce the cost of acquiring more renewable energy. Both policies can increase the level of renewable electricity generation, but the feed-in tariff is a more comprehensive strategy.

Isn't an RPS more market-oriented?

No. An RPS sets a quantity (and is often supplemented and driven by tax incentives, rebates, and other price interventions). A feed-in tariff focuses on price. Neither is a fully market-based policy. Nor is the abundant use of tax incentives and rebates a market-based policy.

The advantage of a feed-in tariff is that it shifts competition in the market. Instead of a free-for-all where wind fights solar fights biomass and large fights small for the lowest bid, the competition is among developers and manufacturers to reduce prices to maximize their welfare. And the data shows that this kind of market competition achieves less expensive renewable energy (**Figure 17**, previous page).

Conclusion

The United States would benefit from a change in renewable energy policy to a feed-in tariff. The lesson from Europe is clear: Americans can continue to debate “market-based” ideas and tax credits or they can jump to the solutions that work.

“We decided we will reduce CO₂ until 2020, 40 percent, [and by] 2050 with 80 percent. And then we debated the instruments.

I hear arguments [at this Conference] we discussed in Germany 10 or 15 years ago. It's the same debate....In Germany, we had a decision, we made a law...the Renewable Energy Resources Act. And it worked. You can see the results.”

–Willi Voigt, former minister in the German state of Schleswig-Holstein

In addition to turbocharging renewable energy development, a feed-in tariff unlocks the potential of dispersed generation and community ownership. Compared to the byzantine array of incentives and rules facing renewable energy producers, a feed-in tariff decreases the economic and legal costs of doing business and increases the social and economic benefits.

About the Author

John Farrell is a research associate on the New Rules Project at the Institute for Local Self-Reliance, where he examines the benefits of local ownership and dispersed generation of renewable energy. His latest paper (prior to this one) is *Rural Power: Community-Scaled Renewable Energy and Rural Economic Development*. You can find more of his work and more information on the New Rules Project at www.newrules.org.

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