Environmental and Energy Study Institute

Issue Brief

Feed-in Tariffs

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EXECUTIVE SUMMARY

Feed-in Tariffs (FITs) is the name of a policy measure used to accelerate the deployment of renewable energy technologies in the electricity sector. Under a FIT policy, utilities pay renewable energy producers a guaranteed rate per unit of electricity in a long-term agreement that guarantees priority access to the electrical grid. The rate paid to the producer is set at an amount that provides a reasonable rate of return to producers over the entire length of the contract. This certainty has proven key as it enables developers to secure financing more easily and helps rapidly expand the renewable energy market. In turn, renewable energy companies are able to achieve economies of scale, allowing the cost of producing renewable energy to drop over time.

This policy has been practiced early and often in Europe to develop the renewable electricity sector. The use of FITs in Denmark helped its wind power industry grow to become the world leader, while in Germany, FITs helped the country reach its 2010 target of obtaining 12.5 percent of its energy from renewable sources three years ahead of schedule. In the United States, utilities, municipalities and states have begun to implement FIT policies to help meet renewable energy targets and expand these industries in local markets. Though introduced in Congress (H.R. 6401 by Rep. Jay Inslee (D-WA)), no bill has yet been passed that would create a FIT policy on the national level. But increasingly, policymakers in all levels of government have begun considering FITs as a way to bring down the costs of renewable energy technologies and shift to a low-carbon supply of electricity. The experiences of early adapters of this policy can be used to gain insight into how to design a successful and cost-effective FIT policy.

INTRODUCTION

Feed-in Tariffs (FITs), also sometimes referred to as renewable energy payments, are a policy option used to rapidly develop renewable energy technologies by setting a fixed, long-term price per unit of renewable energy that guarantees financiers a reasonable rate of return on their investment. This price signal stimulates private investment, allowing companies to achieve economies of scale and drive down the price to the level required for mass implementation. FITs have three distinct components:

- cash payments per kilowatt hour (kWh) of electricity that utilities pay to renewable energy producers (typically above market price), sufficient to earn the producer a reasonable rate of return on the project,
- a long-term power purchasing agreement with utilities, usually 15, 20, or 25 years, and
- guaranteed access to the electricity grid for renewable energy producers.[1]

FITs can be set either at a fixed or premium cost. Under fixed cost FITs, utilities pay a preset rate to renewable energy producers per kWh. The rate is typically set at the renewable energy technology's cost of production plus a

predetermined rate of return. With premium cost FITs, utilities pay producers a specified margin over the retail (spot) electricity price.[2] The payments to producers decline each year in order to provide an incentive for companies to reduce the cost of their technologies, in what is known as tariff regression. In many cases, cost recovery for FITs is obtained through a charge on all of the electric utility's customers. FIT contracts typically last 15 to 25 years, which ensures investors the long-term stability they need to make investments. In addition, utilities are required by law to connect renewable energy projects to the grid, usually with priority given to renewable energy supplies over conventional energy sources.[3]

Germany was the first country to implement FITs by passing its Energy Feed-in Law in 1990. Many early FIT policies set one rate for all renewable energy technologies;[4] more recently, FIT programs use varying rates depending on the type of technology, location, size of the project, and the quality of resource, allowing FITs to promote multiple renewable energy technologies (Table 1).[5]

Table 1: Selected Provisions of the German Feed-in Tariff Program, 2004

Technology	Location	Size	Payment (€/kWh)	Tariff Regression/year
Solar Photovoltaic	Installed on Buildings	<30 kV	0.574	5%
		30-100 kV	0.546	5%
		>100 kV	0.540	5%
	All Other Systems		0.457	6.5%
Geothermal		5 MW	0.150	1%
		10 MW	0.140	1%
		20 MW	0.090	1%
		>20 MW	0.072	1%
Wind	Onshore		0.087	2%
	Offshore		0.090	2%

Source: Dr. Mario Rawtiz and Dr. Claus Huber, "Feed-In Systems in Germany and Spain and a Comparison"[6]

POLICY PROFILE

FITs are able to rapidly develop renewable energy technologies by creating cost certainty and providing a reasonable rate of return for investors, making it easier for developers to secure financing. These attributes also reduce the interest rate required by investors for renewable energy projects.[7] FITs make renewable energy projects easier to implement because developers do not have to prepare a bid and negotiate power purchasing agreements with utilities. This allows households and small businesses to install renewable energy, which ensures the investment, and the resulting economic benefit, stays local. Another advantage of FITs is that they can be used to develop multiple technologies by setting different rates for each. Furthermore, FITs shift the burden of renewable energy development from taxpayers to ratepayers.[8]

There are legitimate weaknesses that need to be addressed when designing an effective FIT policy. FITs require a detailed analysis to determine the appropriate payments before the policy can be implemented. Failure to set the correct rates can lead to underinvestment and not enough renewable energy development to lower prices, or conversely, overinvestment and windfall profits for producers and a large burden on ratepayers. FITs can also have an uncertain impact on ratepayers since the government sets the price and lets the market determine the quantity of

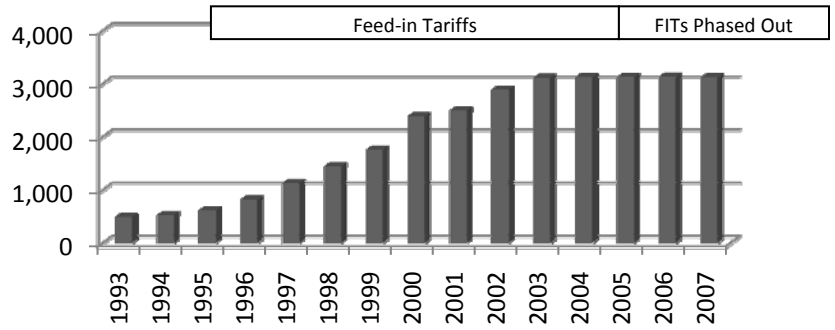
renewable energy produced. Because FITs typically result in higher electricity rates, which make up a larger portion of low-income families' budgets, they are considered a regressive tax. Higher electricity rates also mean FITs have a disproportionate impact on energy-intensive industries.[9]

FITs INTERNATIONALLY

FITs have been deployed by many European countries, including Denmark, Germany, and Spain. In 2006 Ontario, Canada became the first government in North America to establish FITs. China implemented FIT s for wind energy on July 20, 2009, and intends to finalize them for large-scale photovoltaic solar projects in the near future.[10]

Denmark implemented a FIT program through an amendment of its *Promotion of Renewable Energy Act* in 1993, helping it to become the world leader in wind energy production (Figure 1). Payments for wind were set at 85 percent of the utility's distribution and production costs (a premium cost FIT). From 1993 to 2003, installed wind power grew from 500 MW to 3,000 MW.

Figure 1: Denmark's Installed Wind Capacity (MW)



Source: Danish Energy Agency[10]

Denmark now obtains 21 percent of its electricity from wind, 83 percent of which is owned by individuals and local electricity cooperatives. Implementing this policy also helped Denmark create 21,000 jobs in the wind industry as of 2007. Denmark phased out its FIT program in 2003 and since then growth in installed net wind capacity has remained relatively flat; from 2004 to 2007, only 25 MW of new net capacity was added.[12]

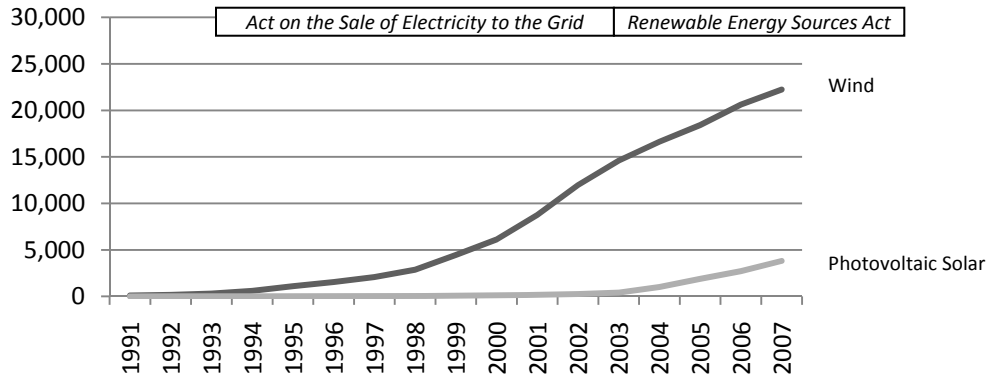
Germany created a FIT program for wind power in 1991 through the *Act on the Sale of Electricity to the Grid*. Germany then became the first country to establish a modern system of FITs with different payments for different technologies, locations, project sizes, and resource qualities (wind) when the *Renewable Energy Sources Act* was passed in 2000 (Figure 2).

With the help of this policy, Germany was able to meet its 2010 target of 12.5 percent renewable electricity in 2007, while creating 249,000 jobs in the country's renewable energy sector. FITs are also a major reason why Germany has the world's largest photovoltaic (PV) solar market.[13]

Spain passed an *Electric Power Act* in 1997 that established an FIT program, which was later modified in 2004 through *Royal Decree 436/2004* to increase support for renewable energy. The payment for PV solar was set at 41.4 eurocents per kWh, with the Spanish government anticipating 400 MW of installed PV solar between 2007 and 2010.[14] However, the high rate that was set for PV solar spurred developers to install 344 MW of PV solar in the first nine months of 2007

alone. Due to the Spanish government's subsidization of electricity, there was a cost to Spanish taxpayers totaling over $1.4 billion. In response, the Spanish government imposed a cap of 500 MW for PV solar in 2009 and reduced the payments to 32-34 eurocents per kWh.

Figure 2: Germany's Installed Wind and Photovoltaic Solar Capacity (MW)



Source: Federal Ministry for the Environment, Nature Conservation and Nuclear Safety[11]

This change in policy had a profound impact on the global solar business. A number of solar companies had built new manufacturing capacity based on their expectations for PV solar demand at Spain's initial rates. The reduction in rates and a cap on PV solar left companies with excess capacity. The resulting supply/demand imbalance contributed to a significant drop in global PV solar panel prices, which reached as high as $4.50 per watt in 2007, to below $3.00 per watt by the end of 2008, forcing solar companies to cut back production and jobs.[15] The situation was further exacerbated by global recession.

FITs IN THE UNITED STATES

In the United States, FITs have recently been selected as a policy option by several utilities, municipal governments, and state governments to help meet their renewable energy targets. Two of the early domestic actors are Gainesville, Florida, and the state of California.[16]

In February 2009, the city of Gainesville, Florida, adopted a solar photovoltaic FIT policy. Those PV solar producers that installed capacity in 2009 receive a payment of $0.32 per kWh for 20 years from the municipal utility. This rate was set to ensure producers a five percent rate of return on their investment. A cap of 4 MW per year was also established to ensure electricity costs for consumers did not increase more than $0.74 per month. In its early stages, the program is considered quite successful and the list of participants is oversubscribed, with future openings not available until 2011.[17]

California implemented FITs for PV solar projects under 1.5 MW in 2008. The payments were set at the cost to operate a combined cycle natural gas power plant in California, which is roughly $0.08 per kWh for offpeak electricity and $0.31 per kWh for peak electricity. This rate was too low to spur PV solar development: only 9.6 MW of PV solar has been installed since FITs were introduced.[18] On October 11, 2009 Governor Schwarzenegger modified California's FITs by signing S.B. 32, which ordered the rate-setting commission to include environmental externalities when setting the payment and raised the cap for eligible PV solar projects to 3 MW.[19]

FEDERAL ACTION

A federal FIT program does not currently exist in the United States. In June 2008, Representative Jay Inslee (D-WA) introduced the *Renewable Energy Jobs and Security Act* (H.R. 6401), which would have established FIT s for renewable energy facilities producing less than 20 MW of electricity. FIT rates would have been set to ensure a 10 percent rate of return with tariff digression occurring each year, with contracts lasting 20 years. The bill would have guaranteed access to the grid for renewable energy facilities and established a policy review every two years.[20] No further action was taken on this bill in the 110th Congress, but Rep. Inslee has indicated that he intends to introduce a similar FIT bill with Rep. Delahunt (D-MA) in the 111th Congress.[21]

LESSONS LEARNED

Important lessons on how to design an effective FIT policy can be drawn from the experiences that utilities, municipalities, states, and nations have had with them. Beginning implementation of an FIT program with an introductory or trial phase offers policymakers the opportunity to make adjustments if payments or caps are inappropriate. Spain's FIT experience suggests there are benefits to placing a binding cap on the amount of renewable energy that receives payments in the trial period. Furthermore, setting intentionally low rates for power generators in a trial phase could help ensure developers do not receive windfall profits and the cost to stakeholders is acceptable. These steps could allow the government the opportunity to find the appropriate payment levels while limiting the total costs of the FIT program initially. In addition, periodic revisions of the FIT rates may be useful in ensuring that development is moving forward at an acceptable pace. Rates can be raised or lowered to maintain a competitive price that drives further renewable energy development. Ultimately, keeping an FIT program as simple as possible will help maintain transparency and allow the greatest access to interested parties. The strength of the FIT policy, however, is its ability to lower barriers that otherwise exist with renewable energy projects and create a stable financial environment that can widely deploy these technologies as quickly and cheaply as possible.

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