World Future Council

FITness Testing:

Exploring the myths and misconceptions about feed-in tariff policies

Research & Writing:
Chad Laurent
Wilson Rickerson
Hilary Flynn
Meister Consultants Group, Inc.

Meister Consultants Group, Inc. (MCG) is a Boston-based consulting firm focusing on sustainable energy policy and markets in the US and internationally. MCG specializes in policy development and analysis, market strategy and research, and program planning and management. MCG has advised national, state, and municipal governments on energy policy development, and consulted to multi-national corporations and utilities on sustainable energy and climate change strategies.

CONTACT

Randy Hayes
US Director

US Liaison Office, Washington DC
World Future Council Foundation
660 Pennsylvania Ave, SE, #302
Washington, DC 20003, USA
Phone: +1 (202)547 9359
Fax: +1 (202)547 9429
www.worldfuturecouncil.org

US Satellite Office
World Future Council Foundation
PO Box 29314
San Francisco, CA 94129

Head Office, Hamburg
Stiftung World Future Council
Bei den Mühren 70
20457 Hamburg, Germany
Phone: +49 (0)40 3070914-0
Fax: +49 (0)40 3070914-14
info@worldfuturecouncil.org

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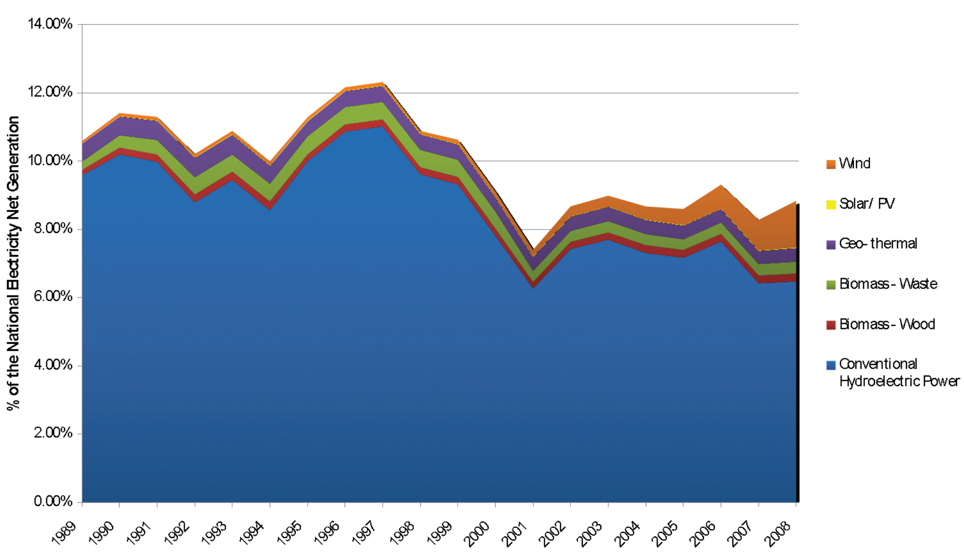
Introduction

The US currently generates close to nine percent of its electricity from renewable sources such as wind, solar, biomass, and hydropower. During the past several years, renewable electricity markets have surged as a result of new federal and state policies. Thirty-five states and Washington, DC, have established renewable energy targets designed to increase the amount of renewable electricity in utility portfolios. Despite the impressive amount of new policies that have been implemented, many policy makers in the US are evaluating how to further accelerate renewable energy growth. As can be seen in the graph below, renewable electricity generation has declined since a peak at over 12 % in the 1990s because of decreases in hydropower output. The US will need to dramatically increase the amount of installed renewable energy capacity in order to surpass recent historical highs, improve energy security, create new jobs, and address the growing risks of climate change. Since the start of this decade, non-hydro resources, especially wind and solar energy, have grown rapidly in key state markets (Sherwood, 2009; Wiser & Bolinger, 2009). The question remains, however: is current growth fast enough to transition to a more sustainable energy supply and meet the threat of climate change?

Electricity Net Generation: Electric Power Sector by Plant Type, 1989–2008



Source: US Energy Information Administration, Annual Energy Outlook

The growth of the US renewable electricity is important not only to US climate response, but also to US competitiveness in the emerging global clean energy economy. While the US has been struggling to again climb above the 10 % renewable electricity mark for the past decade, other countries such as Germany have fundamentally altered their electricity markets through the introduction of massive amounts of renewable generation. Between 2000 and 2008, for example, Germany's national share of renewable electricity more than doubled from 6.3 % to 15.1 %, primarily as a result of adding non-hydropower generation (Böhme, et al., 2009). As a result, Germany is further ahead of most other nations in integrating new renewable electricity generation into its grid, streamlining renewable energy development, and positioning its workforce to take advantage of new green jobs (DB Climate Change Advisors, 2009a).

In 2008, the amount of new investment in the clean energy sector was $ 155 billion, an increase of $ 120 billion over the $ 35 billion recorded four years earlier. The UN's Sustainable Energy Finance Initiative (SEFI) estimates that $ 500 billion in annual renewable energy investment will be required by 2020, rising to $ 590 billion by 2030. SEFI concludes that, "These levels of investment are not impossible to achieve, especially in view of the recent four year growth … However, reaching them will require a further scale-up of societal commitments (Greenwood, et al., 2009)". If the US is to scale up to both meet the challenge of global climate change, and attract its share of international renewable energy investment, it will need to increasingly benchmark itself against other countries' markets and policies.

By some accounts, the US is currently not well-positioned to compete globally. In a September 16, 2009 Op Ed in the New York Times, for example, Thomas Friedman pointed out that none of the fourteen factories built by US-based solar equipment supplier Applied Materials – a $ 1.3 billion enterprise – are located in the US.[1] The reason, according to Mr. Friedman, lies in the success of renewable energy policies in other countries around the world that:

1. Allow any entity to connect a renewable energy system to the grid;
2. Require utilities to purchase all the electricity generated by that system;
3. Mandate the price and timeframe during which the electricity must be purchased by the utility.

The policy that Friedman is referring to, without explicitly stating it in his column, is known as a feed-in tariff (FIT), and it has been the major driving force behind the growth of the clean energy industry internationally. Forty-five countries had adopted feed-in tariffs as national policy in 2008 (up from 37 in 2007), making FITs the world's most prevalent renewable energy policy (Martinot & Sawin, 2009). During 2009, a number of countries announced new feed-in tariffs, including China, India, South Africa, Ukraine, and the United Kingdom.

Although North America has been slow to adopt feed-in tariff policies, this is beginning to change. In 2009, the Canadian province of Ontario (home to 1/3 Canada's population) enacted a feed-in tariff similar in design to Germany's. In the United States, California, Hawaii, Oregon, and Vermont each established limited feed-in tariffs in 2009, while Gainesville, Florida, and San Antonio, Texas, announced citywide feed-in tariffs for solar power. Feed-in tariffs have also been proposed in more than ten other US states (Rickerson, et al., 2008), and a federal feed-in tariff bill was introduced in Congress by Representative Jay Inslee.[2]

The increase in interest in feed-in tariffs in the US has been accompanied by a corresponding increase in feed-in tariff criticism during the past twelve months. In this short report, we explore some of the arguments that have been made against FITs, along with an accompanying survey of counter argument derived from published literature and interviews with governmental representatives and industry experts.

1 http://www.nytimes.com/2009/09/16/opinion/16friedman.html?scp=1&sq=friedman%20solar&st=cse
2 H.R. 6401 "Renewable Energy Jobs and Security Act"

What is a feed-in tariff?

Although feed-in tariffs have been adopted around the world, there are significant differences among the policies used in different locales, and it is important to distinguish between feed-in tariff designs when drawing broad conclusions. Based on recent surveys of international best practices (Couture & Cory, 2009; Grace, et al., 2008; Klein, et al., 2007; Mendonça, Jacobs, et al., 2009), a well-designed FIT generally includes the following features:

1. Long-term contracts with pre-determined prices.
2. Rates (or tariffs) based on the cost of generation plus a reasonable profit, not based on avoided cost – in other words, the targeted resources receive a payment rate that reflects what they need to be profitable, rather than a rate tied to fossil fuel generation or average wholesale prices.
3. Tariff rates that are adjusted periodically, for example every two to four years, or automatically according to a pre-set schedule, in order to respond to changing market conditions and place downward pressure on prices.
4. Technology-specific rates (e. g. wind receives a different tariff than solar).
5. Policy costs that are incorporated into electricity rates, rather than recovered from taxpayers.
6. A streamlined application process that is open to all potential participants.

An Overview of the Arguments

Prior to 2007, there was very little dialogue about feed-in tariffs in the United States because so few policies had been proposed. During the past year, however, there have been several successful feed-in tariff policy initiatives. As a result, a number of formal arguments against feed-in tariffs have been made in published reports, in recent regulatory proceedings, and in the press. Some of these arguments are based on misinterpreted (or misrepresented) information, such as misquoted statistics or facts. This report will not attempt to address these. Instead, this report focuses primarily on the broad arguments that have been frequently repeated.

1 Feed-in tariffs are expensive.

SUMMARY: These arguments do not consider the myriad benefits of renewable energy and ignore the externality costs of traditional energy sources. Furthermore, studies have shown that the benefits of feed-in tariff policies can outweigh the costs.

One of the most frequent arguments against feed-in tariffs is that they are expensive. To a large extent, these arguments are the same that have been leveled at renewable energy technologies since the advent of the industry, and are not so much an argument against feed-in tariffs as they are against renewables in general. Essentially, the core of this argument is that the incremental costs of renewable energy above conventional fuels makes renewable energy investments a mistake for society. As has been abundantly discussed in other publications, however, this familiar argument does not:

a) include any of the externality costs associated with conventional fuels that motivate many renewable investments in the first place (e. g. climate change, environmental pollution, energy security, water consumption, etc.);
b) include any of the empirical market benefits that accompany large-scale renewable energy development, such as reductions in the demand for, and price of, natural gas, savings on imported fuels, long-term hedge value, and grid stability benefits;
c) take into account the billions of dollars in incentives and subsidies that support conventional technologies and keep fossil fuel prices artificially low. In a recent study, for example, the Environmental Law Institute (2009) determined that fossil fuels received $ 72 billion in subsidies from the US government between 2002 and 2008, compared to $ 12.2 billion for non-ethanol renewables during the same period.
d) take into account the fact that FITs can reduce wholesale electricity prices in ways that actually produce net benefits (i. e. they can generate savings greater than their costs) for consumers; these so-called merit order effects have been recorded in Germany, Denmark, Spain and other countries (Munksgaard & Morthorst, 2008; Sáenz de Miera, et al., 2008; Sensfuß, et al., 2008).

Studies that do not consider these additional benefits and costs significantly exaggerate the incremental costs, while ignoring the benefits, of renewable energy.

A recent example of this type of argument was put forth by the German think tank RWI (Rheinisch-Westfälisches Institut für Wirtschaftsforschung) (Frondel, et al., 2009), which claimed that solar feed-in tariffs would cost Germany 77 billion Euros over the next 25 years. This report has been cited in the US in recent months, although it has been largely debunked by the German government. A recent website from the German federal government sums up RWI’s assessment as “refuted a long time ago.”[3] A leading German economist pointed out that the calculation for photovoltaics used by RWI is high by approximately 27 billion Euro, and that the annual support level – approximately $ 2 billion each year – is less than Germany currently spends subsidizing domestic coal.[4] RWI’s report fails to account for PV’s ability to generate at periods of peak electricity price, and fails to take into account the grid stability benefits reported by German grid operators, among other oversights.

Beyond the specific critique of PV, formal cost-benefit analyses of the German feed-in tariff have demonstrated that the policy saves more than it costs. In 2008, the German government reported that the feed-in tariff cost 4.5 billion Euros, but saved 2.7 billion Euros in fossil fuel imports, and 2.9 billion Euros in avoided externality costs such as air pollution (Böhme, et al., 2009). In addition, the integration of long-term, fixed price contracts into the German electricity market reduced spot market prices and resulted in an estimated savings of 9.4 billion Euros (DB Climate Change Advisors, 2009c). It can be expected that rapid renewable energy growth in the US would create similar outcomes. However, there has been no comparable, empirical, cost/benefit analysis of renewable energy development undertaken by the federal government to date.

3 See e.g. http://www.bmu.de/english/renewable_energy/doc/45291.php
4 Claudia Kemfert, as quoted in: Ristau, O. (2009, August 27). *Sonnenstrom: Zu hochgerechnet*. Frankfurter Rundschau. Availabe online at: http://www.fr-online.de/in_und_ausland/wirtschaft/aktuell/1905473_Sonnenstrom-Zu-hochgerechnet.html

2 Feed-in tariffs do not contribute to greenhouse gas reductions.

SUMMARY: This argument is incorrect and stems from a lack of understanding of how cap-and-trade systems work.

This argument has also been put forth by the RWI report, and is patently false. RWI argues that renewable electricity generated in a cap-and-trade environment does not reduce greenhouse gas emissions. This would theoretically be true if the cap-and-trade baseline calculation did not include the impact renewable electricity policies (such as the feed-in tariffs). As pointed out by the German government, however, the European Trading Scheme has been designed to take the impact of renewable electricity policies into account. Renewable electricity generation therefore has a direct impact on greenhouse gas emissions. In Germany, the feed-in tariff reduced greenhouse gas emissions by 53 million tons in 2008 (Böhme, et al., 2009).

In the US, the Regional Green House Gas Initiative cap-and-trade system in the Northeast integrates the impact of state policies (such as the renewable portfolio standards) into its baseline. RWI's argument and others like it stem from an incomplete understanding (or willful misrepresentation) of cap-and-trade design.

3 Feed-in Tariff policy involves arbitrary government "price fixing."

SUMMARY: Well designed feed-in tariffs involve exhaustive analysis of the costs of generation not unlike the current method for determining the electricity rates of regulated utilities.

Feed-in tariff rates are typically set through government regulation or legislation. This has led to feed-in tariffs being characterized as being "determined by inexperienced politicians before the costs of generation are known (Barclay, 2009)". Such arguments are also typically accompanied by calls for "market based" renewable energy policies (see #4 below). These arguments tend to overlook the fact that energy policies for both conventional and renewable resources embed assumptions about generation costs into incentive levels. The use of "fixed" values is common practice in incentive design, even if those incentives are not in the form of a $/kWh payment. Utility regulators in the US, moreover, have been setting and approving electricity rates – not just incentives – for nearly 80 years. Analyzing and setting electricity rates and incentive rates is not a foreign concept to the US energy industry.

The "price fixing" argument demonstrates a lack of understanding for how feed-in tariffs are developed. Feed-in tariffs rates are typically implemented after exhaustive studies of generation costs that involve input from industry, utilities, regulators, academics, and other stakeholders. Recent studies of feed-in tariff design in California contain overviews of how different European countries have approached the tariff setting process (Grace, et al., 2009). Typically, these processes involve in-depth research, including comprehensive surveys of plant development and operations costs, cross-checked against published sources of data, and reviewed by research institutes and industry experts. In the Netherlands, for example, the initial estimates are developed by private sector and non-profit research institutions, at which point a transparent online financial model of the proposed rates is used to solicit stakeholder comment. Stakeholders can propose amendments to the rates, provided they supply evidence from actual contracts and projects to back up their proposals. The final recommendations are forwarded to the Parliament for consideration. Such approaches can provide a rigorous and effective method of generation cost discovery.

4 Feed-in Tariffs are not "market based."

SUMMARY: Market incentives exist under feed-in tariff incentives as much as other renewable energy incentives like tradable RECs. Instead of all sizes of generators competing against one another to building projects, equipment manufacturers and designers compete to offer cheaper and better performing equipment.

Statements that "market based" policies are more efficient than feed-in tariffs are related to the price fixing arguments above. Tradable renewable energy credits (an incentive system sometimes used to meet renewable portfolio standard goals), for example, have often been highlighted as a "market-based" policy to promote renewable energy. It is important to note that a market is characterized by both the price and quantity of a commodity. With tradable renewable energy credits, the quantity of renewable generation is fixed by policy, while the price is determined by market forces. Conversely, a FIT sets price and lets the market determine quantity. Both policies require government to intervene and dictate one aspect of the market price or structure. Under a short-term tradable renewable energy credit policy, policy makers make assumptions about the future balance of renewable energy supply and demand (e. g. 20 % in 2020). Under a feed-in tariff, policy makers set rates based on an understanding of near-term generation costs. It can be argued that both policies are "market based," in that both rely on market forces. It can also be argued that neither policy is truly market based, since both are established through government intervention. To date, empirical evidence from Europe and the US appears to demonstrate that near term generation costs can be more accurately ascertained than the long-term balance of supply and demand (Butler & Neuhoff, 2004). In other words, the process for setting fixed price incentives has been more accurate for determining appropriate incentive levels than the process of setting quantity targets.

It is also important to note that market competition exists under a FIT, but in a different form than that of a tradable credit market. In fact, competition can be greater and there can be more market dynamism in FIT markets than in REC trading markets. In both cases, project developers are interested in keeping costs down so that they can reap the most benefits from the renewable energy incentive (Fell, 2009). In the case of a FIT, the competition is more commonly between equipment manufacturers than between the generators themselves. Some have argued this type of competition is more appropriate for capital-intensive technologies, such as wind and solar power systems (Butler & Neuhoff, 2008; Hvelplund, 2001; Menanteau, et al., 2003), because it shifts competition from fuel price (which is non-existent for wind and solar) to equipment price.

5 Competitive bidding is "better" than standard offer feed-in tariffs.

SUMMARY: There are trade-offs between feed-in tariffs and competitive bidding. Bidding tends to create barriers to small project development, and typically results only in large projects being built.

Calls for competitive tenders (also known as competitive bidding, or requests for proposals (RFPs)) invite renewable energy generators to compete to supply renewable electricity at the lowest cost. This contrasts with feed-in tariffs, under which a standard rate is generally made available to all generators. Although RFPs may create competition between some renewable generators, they can also prohibit the participation of many generators because of the high transaction costs associated with competing for and then negotiating contracts. Thus, the question of whether one policy is "better" than another largely depends on the objectives of a given country or state (Cory, et al., 2009).

On the one hand, RFPs favor the least expensive projects being built, which historically has been large-scale wind developments. On the other hand, because these projects often take a long time to develop (due to siting, financing, and lengthy contract negotiations) the cost of finished projects are frequently higher than originally anticipated. This has led to significant historical rates of contract failure in both North America and Europe (Wiser, et al., 2006). Jurisdictions with uncapped feed-in tariffs, by contrast, have frequently met, or exceeded, their renewable energy targets. In Europe, countries such as France and Ireland initially used RFP systems, but then abandoned them for feed-in tariffs after the RFP systems proved comparatively ineffective. In the US, contract failure has caused state renewable portfolio standard (RPS) policies to under perform and not meet annual targets. California utilities signed over 7,000 MW worth of renewable energy contracts from 2002 to 2007, for example, but only 1,000 MW had come online by the end of 2007 (Wiser & Barbose, 2008). In its 2007 Integrated Energy Policy Report, the California Energy Commission (2007) recommended that the state explore feed-in tariffs in order to more effectively achieve the state's renewable energy goals.

RFPs also tend to concentrate renewable energy development only in areas with the best resources, which can lead to NIMBY concerns. They also tend to prevent smaller scale generators from participating in renewable energy markets. The barrier posed to small scale (e. g. 20 MW and under) generation by the high transaction costs inherent in competitive bidding was another primary driver for the California Energy Commission's feed-in tariff investigation (Grace, et al., 2009). Feed-in tariffs, by contrast, have successfully allowed a broad range of distributed generators and small-scale investors to participate in the renewable energy market (Bolinger, 2004). Policy makers that wish to encourage a portfolio that includes distributed, community-owned, or residential renewable energy generation may wish to choose feed-in tariffs, whereas policy makers that wish to only encourage large, utility-scale development may wish to explore RFPs.

Some analysts have suggested using different policies to target technologies at different stages of the product cycle. Feed-in tariffs might be used to support technologies in the early stage of development, for example, whereas competitive bidding or tradable credits might be used to support more mature technologies (Midttun & Gautesen, 2007). Ultimately, the policy choice should be dictated by the specific objectives of each country or state.

A related mechanism for creating competition between generators is an auction. Auctions have recently been suggested as an alternative, or a complement to, other policy mechanisms (Lesser & Su, 2008; Simonek & Chase, 2009). It could be possible, for example, to use auctions as a way to set feed-in tariff rates (Grace, et al., 2008). Experience with auctions to support renewable electricity generation has thus far been limited, however, and it remains to be seen whether auctions can effectively replace other policy types, or whether their complexity would create additional barriers to entry and/or other trade-offs for renewable energy generators.

6 My state is already committed to renewable portfolio standard program and a FIT cannot coexist with an RPS.

SUMMARY: Feed-in tariffs can be used to meet renewable portfolio standard goals, rather than replacing existing policies.

Some feed-in tariff critics argue that renewable portfolio standards and FITs cannot co-exist. As discussed in recent reports from Deutsche Bank, the National Renewable Energy Laboratory (NREL), the World Future Council, and others, feed-in tariff policies can complement RPS policies and can be used as a mechanism to achieve RPS targets (Cory, et al., 2009; DB Climate Change Advisors, 2009c; Mendonça, Jacobs, et al., 2009; Rickerson, et al., 2008). An RPS is a state target for renewable electricity. Across the country, different RPS policies utilize different compliance mechanisms to meet their targets. Some states use tradable credits, some states use competitive bidding, some states make rebates available on a first-come, first-served basis,[5] and some states use hybrid approaches. Viewed from this perspective, feed-in tariffs are simply another policy tool in the RPS toolbox. In fact, some states, such as California and Hawaii are already explicitly using FITs as a way to meet their RPS targets (Grace, et al., 2009).

As NREL discusses (Cory et al. 2009), FITs can be used to supplement RPS policies by:

- Providing project financing support by creating investor security
- Serving as a cost-effective procurement mechanism that minimizes investor risk and therefore policy cost
- Hedging against project delays and cancellations by minimizing transaction costs
- Assuring support for emerging technologies
- Enabling a broad range of project sizes, project types, and investors to participate in the RPS market

FITs and RPS are therefore not necessarily mutually exclusive policies in the United States. The RPS can set the overall renewable energy target while the FIT can provide the mechanism for achieving that target.

5 e. g. the New York State renewable portfolio standard customer-sited tier for onsite wind, solar, and biogas generators.

7 Feed-in tariffs cost more than other types of renewable energy policies.

SUMMARY: Analyses have shown that feed-in tariffs can actually be cheaper than other types of renewable energy policy.

With this argument, FIT critics assert that policies such as renewable energy credit (REC) trading encourage more competition among generators and therefore cost less (Menanteau, et al., 2003). Empirically, this argument is incorrect.

Research comparing policies that create variable revenue streams, such as tradable credits, with policies that create stable revenue streams, such as FIT programs, has consistently found that variable policies cost more per project than do stable and predictable policies. The reason for this is that the uncertain revenue (e. g. from tradable RECs) does not give investors confidence in their return on investment. This perceived risk significantly increases the financing costs of projects, and increases total policy cost (Mitchell, et al., 2006).

The Commission of European Communities released a report in 2006 showing that feed-in tariffs created significantly more renewable generating capacity than tradable RECs in Europe, despite the fact that generators in countries with tradable REC programs received far higher payments than generators in countries with FITs. By 2006, for example, Germany had installed nearly 10 times more wind power than the UK (which relied on tradable credits), but Germany's wind power was on average more than 20 % cheaper (Fouquet & Johansson, 2008). Similar findings have since been reported by the Stern Review on the Economics of Climate Change (2006), the International Energy Agency (de Jager & Rathmann, 2008), in analyses conducted on behalf of the New Jersey Board of Public Utilities in the United States (Summit Blue Consulting & Rocky Mountain Institute, 2007), and by Ernst & Young (2008).

The ability of feed-in tariffs to minimize investor risk, and therefore policy costs, has been highlighted to an even greater extent by the global financial crisis. In several recent studies, renewable energy investors have ranked feed-in tariffs as the most effective and most secure renewable energy policy internationally. This has been true for both banks and for venture capital firms (Bürer & Wüstenhagen, in press; Fritz-Morgenthal, et al., 2009). A recent global climate change policy assessment from Deutsche Bank (2009b), for example, found that countries with feed-in tariffs "represent the safest harbors for investors looking to finance clean-energy ventures (Lorinc, 2009)."

8 Market conditions change too quickly for FITs to respond effectively.

SUMMARY: Flexibility can be built into FIT policies, making them more responsive to changing financial and policy environments.

This argument assumes that there is no flexibility written into feed-in tariff regulations, when in reality FIT policies can be designed to be flexible and responsive to changes in the market. Feed-in tariffs can react to markets in a number of different ways by incorporating rates that decline ("degress") over time in anticipation of falling generation costs, rates that decline automatically when a certain capacity amount is reached, or rates that adjust automatically at the end of the year depending on how much capacity has been installed (Jacobs & Pfeiffer, 2009). Along this spectrum of flexible designs, there is a trade-off between flexibility and investor security (Del Río González, 2008). Changing the FIT too often, or designing a FIT that can change unexpectedly, does not create a stable investment environment, whereas creating a FIT that cannot react to changing market conditions can limit policy effectiveness and durability.

9 FITS encourage projects that are not efficient in terms of size, location and technology.

SUMMARY: Feed-in tariffs do not have to be designed to target specific project sizes, technologies, or locations. Many jurisdictions have done so, however, in order to satisfy explicit policy objectives.

This argument results from a clash in policy objectives and energy development philosophies. Some feed-in tariff policies, such as those in France, Ontario and Germany, set rates to encourage a broad range of different generator sizes and locations – on purpose. Support for small projects has several benefits. First, it reduces NIMBY-ism because smaller projects can have comparatively minimal aesthetic impacts. Second, feed-in tariffs for small projects create opportunities for a broad range of investors – including residences and cooperatives – to profitably participate in renewable energy markets. In Germany and Denmark, the vast majority of early wind development was community and cooperatively owned (Toke, 2005), and the large majority of solar installations installed in Germany (76 %) are rooftop mounted systems that are smaller than 100 kW (Chrometzka, 2009).

Size differentiation is not a necessary component of feed-in tariff design, however. Feed-in tariffs can easily be designed to target only the largest renewable electricity generators in only the strongest renewable energy resource locations. This is ultimately a policy decision that will reflect the specific goals of a given country or state. Some policy makers may prioritize multi-megawatt projects in order to capture economies of scale, whereas others may design their policies to ensure that, in the words of Thomas Friedman, “any business or homeowner can generate solar energy … at a price that is a no-brainer good deal for the family or business putting the solar panels on their rooftop.”

10 Lower income individuals are disproportionately impacted by the added cost of a FIT. Only the wealthy can afford to install renewable energy systems.

SUMMARY: Feed-in tariffs can enable individuals from different income levels to invest in renewable energy.

This argument is again primarily aimed at renewable energy technologies, rather than at feed-in tariffs specifically, and has been a persistent part of the renewable energy dialogue for many years. It is true that lower income individuals are often disproportionately affected by any shift in energy prices. Lower income individuals, however, also frequently bear a larger share of the environmental externalities associated with conventional power generation. As discussed above, analyses that ignore the externalities associated with “cheap” electricity ignore the health, security, environmental, and social benefits of renewable energy.

With regard to whether or not lower income individuals can take advantage of feed-in tariffs, feed-in tariffs are better suited for less affluent individuals than most other renewable energy policy mechanisms (Mendonça, Lacey, et al., 2009). Many state RPS policies, for example, support only large-scale wind projects which are not structured to allow average Americans to invest in them. Renewable energy project developers in the United States can also apply for federal tax credits, but those that qualify are typically either companies with sizeable tax liability or wealthy individuals. FITs on the other hand, typically permit a broad range of investors to participate. Depending on the design, a FIT may be scaled to varying project sizes, making smaller projects financially attractive. Furthermore, because there is a steady revenue stream guaranteed via contract, banks are much more likely to lend individuals the initial capital to install a renewable energy system. In Germany, for example, banks will typically lend 80 % to 100 % of a residential solar energy system's cost based on the security of the feed-in tariff. Feed-in tariffs based on generation cost are designed to generate enough revenue to cover debt service over the life of a loan. As a result, a solar energy system covered by a 100 % loan under a properly designed feed-in tariff can be a low-risk investment for lower income individuals.

11 A FIT is too expensive and will force energy-intensive industries out of business or force them to relocate.

SUMMARY: This has not been the case in countries with FITs and provisions within FIT policies often exist to relieve some of the burden on industries with high electricity use.

This argument is another one that has been frequently recycled whenever a new renewable energy policy is proposed, and stands in sharp contrast to states and countries that are using renewable energy policy to successfully attract new industries. Setting aside the cost/benefit analysis discussion above, the gross electricity price impact of a FIT depends on the scale of renewable energy technology adoption and the scale of the FIT program. FITs can and have been designed to encourage new renewable development on the one hand, but at the same time minimize ratepayer impacts that might theoretically cause electricity-intensive industries to relocate.

To date, renewable energy policy rate impacts in general have been minimal, especially when compared to factors that have far larger impacts on competitiveness, such as extreme volatility in oil and natural gas prices. Similar analyses have also been conducted for the European carbon trading scheme (Kenber, et al., 2009), and have found that businesses have not been adversely impacted, despite all the doom and gloom of carbon regulation critics. When there are concerns about industrial competitiveness, there are policy approaches that can mitigate these concerns. The German FIT law, for example, has provisions energy to protect energy-intensive industries them from high rate impacts[6] (van Mark & Dürrschmidt, 2009). These types of policies, however, increase the potential burden on other classes of ratepayers.

6 In order to qualify for rate relief under the German law, a company must prove 1. it consumes more than 10 gigawatt-hours, and 2. the ratio of its electricity costs to its gross value added must exceed 15 %. See *Act Revising the Legislation on Renewable Energy Sources in the Electricity Sector and Amending Related Provisions*, available online at: http://www.bmu.de/files/pdfs/allgemein/application/pdf/eeg_2009_en.pdf

12 Renewables require additional fossil fuel generation as "back up."

SUMMARY: Modern grid management strategies and resource forecasting allow renewable energy to be integrated into generation portfolios with minimal back-up requirements.

While this argument does not specifically target feed-in tariffs, it attempts to caution against building "too many" renewables by suggesting that intermittent generators, such as solar and wind power, require significant fossil fuel back-up generation. This argument has been refuted again and again by a number of studies over the past several years (see, e. g. Milligan, et al., 2009). Amory Lovins of the Rocky Mountain Institute, for example, recently summarized why the argument is an erroneous one (Lovins, 2009):

1. The need for steady, reliable power is met by generating plants collectively delivering power to the grid, not individually. Naturally shifting load and weather patterns mean that geographically dispersed renewable energy generators can often balance each other out.
2. No kind of power plant or energy source is perfectly reliable. For example, in the US during 2003–07, coal capacity was shut down an average of 12.3 % of the time; nuclear, 10.6 %; and gas-fired, 11.8 %. Grid operators are familiar with accommodating shifting generation patterns, whether they are fueled by fossil or renewable resources.
3. Modern solar and wind power systems are more technically reliable than coal and nuclear plants; with technical failure rates typically around only 1–2 %.
4. While renewables are variable in output (depending on sunlight and amount of wind) this variability can be managed by proper resource choice, siting, and operation, as has been done in countries like Denmark, Spain, and Germany.

A recent survey of electricity industry stakeholders concluded that, "intermittency of renewables can be predicted, managed, and mitigated, and … the current technical barriers are mainly due to the social, political, and practical inertia of the traditional electricity generation system (Sovacool, 2008)."

The German think tank RWI has attempted to claim that renewable energy requires significant fossil fuel capacity. As with most of RWI's arguments, the German government refuted it using empirical evidence from German's actual experience.[7] Rather than increasing the amount of fossil fuel required, Germany's feed-in tariff has reduced natural gas consumption by 55 terawatt-hours (TWh), and domestic coal consumption by 140 TWh – even when taking into account the resources required to balance renewable energy's intermittency. Forecasting for intermittent sources has improved dramatically in the past decade, and has reduced the uncertainty surrounding wind availability, and the need for "back-up" fossil generation. In addition, biomass and hydropower are increasingly being used to support intermittent renewables when needed. The need for fossil fuels back-up, therefore, is grossly overstated.

7 See: http://www.bmu.de/english/renewable_energy/doc/45291.php

13 Even though green jobs are created, many other jobs are lost as a result of a FIT.

SUMMARY: The studies that have made this claim have been debunked.

A controversial draft report[8] from King Juan Carlos (KJC) University in Spain (Álvarez, 2009) claims that the jobs creation argument made by renewable energy supporters and policymakers is unwarranted. The study suggests that 2.2 jobs are "destroyed" in Spain for each job created as a result of renewable energy policies. Furthermore, the authors found that for every megawatt of renewables installed, over five jobs were lost throughout the economy.

The KJC University draft report has been celebrated by conservative commentators such as Glenn Beck, but criticized by economists for its lack of adherence to conventional approaches to employment impact analysis. An analysis from NREL (Lantz & Tegen, 2009) concluded that the study "represents a significant divergence from traditional methodologies used to estimate employment impacts from renewable energy. In fact, the methodology does not reflect an employment impact analysis. Accordingly, the primary conclusion made by the authors – policy support of renewable energy results in net jobs losses – is not supported by their work."

NREL cites several limitations to the analysis and shortcomings in assumptions. Among the criticisms, aside from not following standard methods to determining jobs impact, were:

1. The researchers use faulty job analysis methodology, effectively stacking the deck against renewables by including direct, indirect, and induced job numbers for conventional jobs lost, but including only direct and indirect jobs for jobs created by renewables.
2. The KJC University study does not quantify the export value of Spanish renewable energy products.
3. Projections used in the analysis were from 2003, and do not reflect the current Spanish situation.

The study was also reviewed by a panel of economists from Spain, the US, and Germany, who concluded that, "The study's findings on job effects are not methodologically sound" (Morris, 2009).

In Germany, meanwhile, the federal government has relied on its job growth statistics (280,000 in 2008, up from 120,000 in 2004) to dispel similar criticisms of job loss from renewable energy: "recent well-founded scientific studies … have shown that not only a large number of new jobs has been created in the [renewables] sector, but the net job effects of renewables, are clearly positive in all realistic scenarios, even when taking job losses in other sectors … into account.[9]"

Across the European Union, renewable energy was estimated to account for 0.6 % of gross domestic product, with over 1.4 million people employed in 2005 (Ragwitz, et al., 2009), and it is likely that this number has increased significantly as renewable energy markets have expanded during the past four years. In the US, meanwhile, it was estimated that there were 452,000 renewable energy jobs in 2006, and that the number could expand to between one and three million over the next two decades (Bezdek, 2007). Both historical statistics and recent projections support the job creation impact of renewable energy.

8 To date, a final version of KJC report has yet to be released. The original was published in March, 2009.
9 http://www.bmu.de/english/renewable_energy/doc/45291.php

14 States may not have the legal authority to set FIT rates because of PURPA restrictions on setting wholesale prices above avoided cost.

SUMMARY: This is an area of law that has not been specifically decided on by a court. Legal analysis is being conducted and FIT policies may be able to co-exist under the current legal framework.

There is concern that the Federal Power Act (FPA) and the Public Utilities Regulatory Policy Act (PURPA) will prevent states from setting FIT rates that are higher than utilities' "avoided cost." This has been a concern in states such as Iowa, Wisconsin, and in California, where utilities have challenged proposed feed-in tariffs by saying that states lack the authority to set them.

Whether or not federal law restricts states from establishing feed-in tariffs remains to be decided (Firestone & Dworkin, 2009). NREL is currently working on a legal analysis of this issue, and the Waxman-Markey bill[10] contains language that would amend federal law to clearly give states authority to set feed-in tariffs.

California's Attorney General has weighed in on the topic, stating in a memo to the California Public Utilities Commission that he believes the state does have authority to set FIT rates above avoided cost (Brown, et al., 2009). He provides several supporting reasons, including the fact that there are environmental benefits associated with renewables that should be added to the price given to renewables, and the fact that fixed price renewable energy credits can be added to fixed price avoided cost payments to achieve the equivalent of a feed-in tariff rate.

Conclusions and Observations

As the US continues to ponder its position in the global renewable energy market, and to debate the future of its national and state-level renewable energy policies, feed-in tariffs will likely continue to be a topic of interest. The dialogue over feed-in tariffs is complex and there are a wide range of opinions about the potential for feed-in tariff policies in the US context. Based on our analysis of this discussion, there are several broad themes that stand out.

First, Europe leads the way. It is interesting to note that many of the arguments for and against feed-in tariffs in the US are based on experience to date in Europe. Commentators that are not in favor of renewable energy have tended to rely on studies generated by conservative European think tanks, whereas analysts that are in favor of renewable energy development have tended to rely on European government analyses and statistics – particularly those from Germany. This has led to interesting transatlantic debates wherein US organizations, such as the National Renewable Energy Laboratory, have written responses to European analyses, such as the King Juan Carlos University job analysis. Part of the reason for this is that Europe's renewable energy markets are larger and more mature than those in the US, and Europeans have more data to draw on and analyze. Another important reason for this dynamic, however, is that European governments have done

10 H.R. 2454 American Clean Energy and Security Act 2009.

a more thorough job of gathering and analyzing renewable energy market information than the US has. It is noteworthy that the US government, for example, has not published renewable energy job statistics or attempted to quantify the benefits of renewable energy development to the extent that the German government has. Current US renewable energy analysis tends to focus more on "what will happen" or "what could happen" rather than "what has happened."

A second interesting theme from the current discussion is that many of the arguments against feed-in tariffs that have been found in recent publications are recycled arguments from earlier eras of renewable energy development. Policies that are more well-established in the US than feed-in tariffs are have previously had to overcome the same criticisms while on their way from concept to adoption. Broadly, these generic arguments against renewable energy have only been weakened by feed-in tariffs. Feed-in tariffs have driven renewable energy development to unprecedented levels in Europe. The result of this has been that there are now empirical case studies of large-scale renewable energy markets through which to examine questions related to jobs, costs and benefits, fossil fuel back-up requirements, carbon market interaction, etc. The good news for renewable energy advocates is that the results are mostly positive. In Germany, for example, the federal government has reported that policy benefits outweigh costs, and that renewable energy growth has had positive impacts that have been previously been underappreciated in the US (e. g. wholesale electricity price suppression impacts). There are certainly criticisms specific to feed-in tariffs that have been prominently advanced, such as calculations of the cost of solar energy in Spain, but these arguments are mostly associated with specific feed-in tariff design choices (i. e. how to set the price for solar) and do not reflect on the merits of feed-in tariff policies more broadly.

In closing …

This report has reviewed a series of criticisms of feed-in tariff policies drawn from recent published reports, academic literature, and the press. Wherever one's opinions lie, it is noteworthy that these arguments exist in the first place. The fact that feed-in tariff policies have attracted vigorous, and growing, discussion in the past twelve months reflect the fact that feed-in tariffs are emerging as a viable policy option in North America. Put another way, if they weren't even a possibility, they wouldn't be worth discussing. The next twelve months will likely see an increase in discussion as feed-in tariffs enacted at the state, provincial, and municipal levels in North America begin to generate results.

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