Feed-in Tariffs and Renewable Energy in the USA – a Policy Update

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Abstract

Feed-in tariff policies have driven rapid renewable energy growth for electricity in Europe, but have not been widely adopted in North America to date. This paper reviews the experience of six US states which have introduced feed-in tariff legislation, surveys feed-in tariff proposals in eight other states, and discusses the outlook for Community-Based Energy Development policies, which have the potential to be implemented in a way that is similar to feed-in tariffs. The paper also discusses a federal feed-in tariff bill proposed by Congressman Jay Inslee.

Some states are proposing policies which follow the European model of creating performance-based electricity incentives based on different technologies' generation costs, whereas other states are considering alternative approaches. To date, no broad, open-ended feed-in tariffs have been created in the US, but political momentum for the policy appears to be building, and the US dialogue on feed-in tariffs is continuing to evolve.

Introduction

During the past decade, there has been remarkable progress in renewable energy policy development in the US, particularly at the state level. As can be seen in figure 1 below, there are currently 26 states with mandatory renewable portfolio standards (RPS) in the United States, and another six states have established non-binding renewable energy goals. Although it is projected that RPS policies will require the development of over 60 gigawatts of renewable sources by 2025, this will only account for 15% of projected electricity demand growth in that year (Wiser and Barbose, 2008). These gains, although impressive by today's standards, are modest in comparison to the scenarios for renewable energy market growth (American Council on Renewable Energy, 2007), renewable energy job creation (Bezdek, 2007; Inslee and Hendricks, 2008), and climate protection (IPCC, 2007; Kutscher, 2006; Socolow, 2006, Stern, 2006) that have been recommended by experts and industry organizations during the past few years. In order to meet increasingly aggressive environmental and economic development goals, US policy makers are looking at new ways to accelerate renewable energy market growth. Among the emerging policy mechanisms that are being considered are feed-in tariffs.

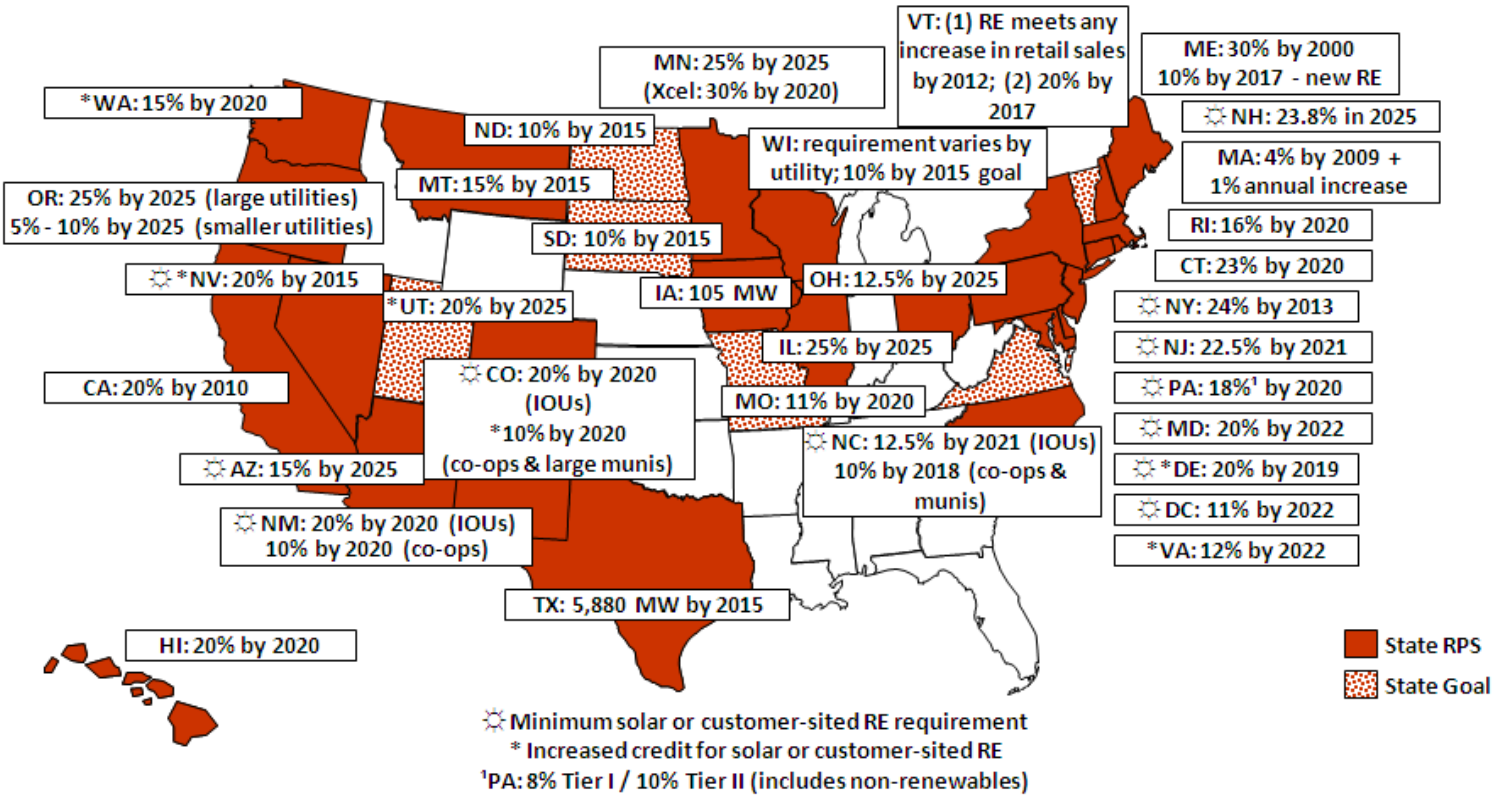

Figure 1: Renewable Portfolio Standards and Goals in the United States. Source: DSIRE, 2008

Feed-in tariffs[1] have become a term of art to refer to the style of incentives adopted (most notably) by Germany to increase the adoption of renewable energy resources[2]. Under the German feed-in tariff legislation, renewable energy technologies are guaranteed interconnection with the electricity grid, and are paid a premium rate that is designed to generate a reasonable profit for investors over a 20-year term. The rates are differentiated by technology such that each renewable resource type (e.g. solar, wind, biomass, etc.) can profitably be developed. This approach stands in contrast to the Public Utilities Regulatory Act (PURPA) in the US, under which long-term contracts are based on the avoided cost of conventional fuels. German feed-in tariff rates decrease each year, such that a generator locking into a feed-in rate in 2008 would get a slightly lower rate than a generator locking into a rate in 2007. The German feed-in tariff has caused explosive renewable energy market growth during the past decade, and Germany is now the world's largest market for photovoltaic systems and wind energy. Germany more than doubled its national supply of renewable electricity between 2000 and 2007, and

[1] The term "feed-in tariff" derives from the German *Stromeinspeisungsgesetz* of 1990, which literally translated means "electricity feeding-in law." In the United States, industry stakeholders have begun to refer to feed-in tariffs as renewable energy payments.

[2] For overviews of feed-in tariff structures and design considerations, see: Klein et al. (2007) and Held et al. (2007)

met its 2010 target of 12.5% renewable electricity three years ahead of schedule (Böhme et al., 2008)[3]. The majority of European Union countries have adopted a feed-in tariff, and the policy is diffusing to other countries around the world (Martinot, 2008). In 2006, Ontario became the first government in North America to establish a set of European-style feed-in tariffs, called the Standard Offer Contract (Ontario Power Authority, 2007).

There has been vigorous debate in Europe as to whether feed-in tariffs or policies based on tradable renewable energy credits (RECs) are more efficient for promoting renewable energy (Rickerson and Grace, 2007a). The European Commission (2005) determined that feed-in tariffs were both more effective and efficient than tradable renewable energy credit systems, largely because feed-in tariffs provide greater investor security. European REC systems are viewed as direct descendents of US renewable portfolio standard (RPS) policies (Lauber, 2004). As a result, it has been assumed that US states would not adopt feed-in tariffs, given the conflict between feed-in tariffs and tradable credit policies in Europe. The past two years have seen a remarkable shift in the US policy landscape, however, as numerous states have introduced feed-in tariff legislation to supplement RPS policies, and proposals for a federal feed-in tariff have been developed. This paper provides an overview of state and federal feed-in tariff proposals, and discusses potential future directions for US energy policy.

State Level Policies

By mid-2006, several US states had established limited policies that shared some feed-in tariff design features, but no state had yet introduced feed-in legislation (Rickerson and Zytaruk, 2006). Two years later, six states have introduced feed-in tariff bills, and another eight states have considered, or are considering, similar legislation (Figure 2). This section reviews the experience of each of these states, and a summary table of legislation is included as an Appendix.

[3] Germany's actual share of renewable generation was 14.2% in 2007, up from 11.7% in 2006.

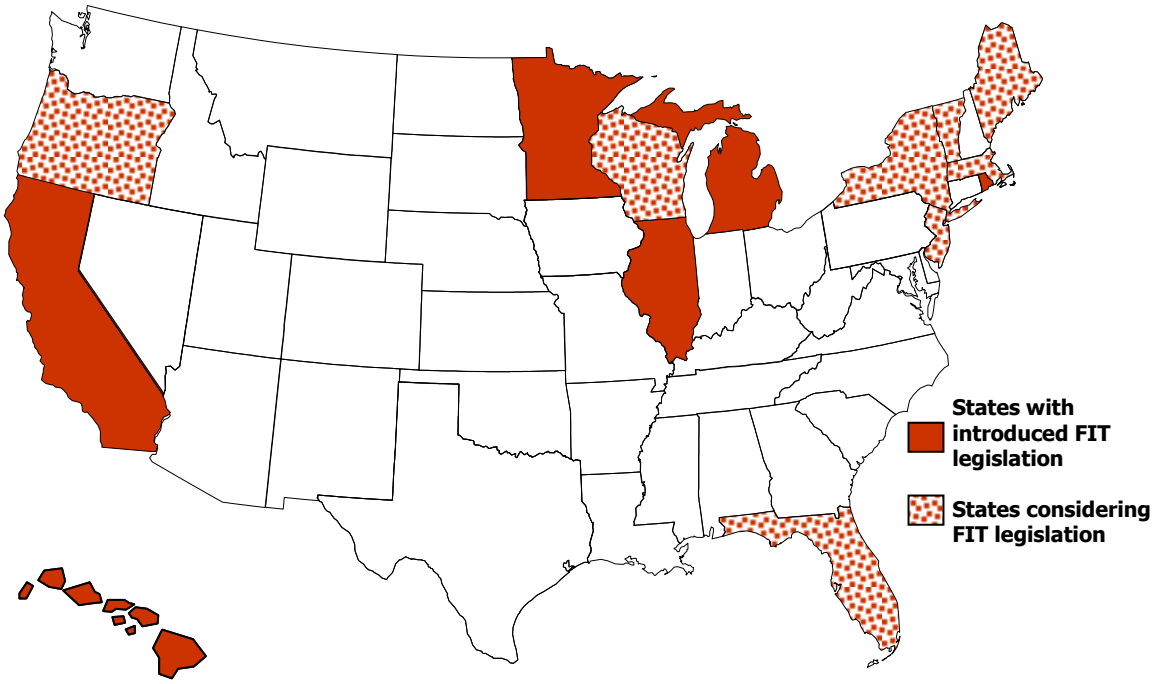

Figure 2: Status of State Feed-in Tariff Proposals in the US

California

As discussed in previous papers (e.g. Rickerson and Grace, 2007a), California has played a leading role in developing feed-in tariffs in the US. California Assembly Bill (AB) 1969 of 2006 established a feed-in tariff for systems with a capacity of 1.5 MW and below, capped at 250 MW total statewide. Generators can choose 10-, 15-, or 20-year contracts, and can opt to sell either 100% of their power, or offset their retail load and sell only their excess electricity. Unlike in the German law, California's tariff rates are based on time-of-delivery, rather than the generation cost of individual technologies. This means that all technologies are offered the same price, but that this price varies depending on whether the electricity is generated during peak or off-peak times. In Southern California Edison territory, peak payments can be up to $0.31/kWh in the summer (Rickerson et al., 2008). The original program was limited to facilities sited at wastewater and water treatment facilities, but the California Public Utilities Commission (CPUC) extended the program to all customer-types, and expanded the cap to 478.4 MW in 2007. Subsequent bills have sought to expand both the overall program cap and the individual project cap[4], and a recent bill (AB 1807 of 2008) is seeking to increase the system capacity limit to 20 MW, and shift to a more European-style structure based on technology-specific payments.

In a parallel effort, the California Energy Commission (CEC) has been exploring feed-in tariffs through its Integrated Energy Policy Report (IEPR) process. After a series of workshops (Porter, 2006;

[4] SB 451 (Kehoe) of 2007 and SB 1714 (McLeod) of 2008.

Rickerson, 2007), the CEC (2007) published its 2007 IEPR, which concluded that the current state RPS needs "greater transparency, less complexity, and full valuation of renewable energy". In order to achieve these goals, the IEPR recommended that "the CPUC…immediately implement a feed-in tariff…for [all] renewables up to 20 megawatts in size" and that the CEC should "begin a collaborative process with the CPUC to develop feed-in tariffs for larger projects." The CEC IEPR process is ongoing, and the 1.5 MW feed-in tariffs have only recently become available to generators, so it remains to be seen how these policy efforts will impact California's markets or set a precedent for the rest of the United States.

The Michigan Model

While California was pursuing its time-of-delivery feed-in tariff, several states introduced feed-in tariff bills modeled more closely after Germany's 2004 Renewable Energy Sources Act and Ontario's 2006 Standard Offer Contract. The first of these states was Michigan, followed soon thereafter by Illinois, Minnesota, and Rhode Island.

Michigan

Representative Kathleen Law (D) introduced the "Michigan Renewable Energy Sources Act" (HB5218) in September 2007. The bill was inspired by Ontario's Standard Offer, but contained higher tariffs, especially for solar power. The bill enables generators to receive 20-year, technology-specific payments for wind, hydropower, biomass, landfill gas, geothermal, and solar electricity. Wind systems are eligible for a sliding scale of payments that start at $0.105/kWh for systems that produce 700 kWh/m^2 of swept area per year, and progress downward to $0.08/kWh for systems that produce 1,100 kWh/m^2 per year. Small wind turbines (2,000 sq. ft of swept area or less) are eligible for a $0.25/kWh tariff.

The bill has been referred to committee, but is on hold while the legislature focuses on an RPS bill for Michigan[5]. There is support for the bill both within the administration and the House, but it is unlikely that it will make further progress until the end of this legislative session[6], and considerable opposition is expected in the Senate.

[5] HB 5548 (Mayes) and HB 5549 (Palsrok) were passed by the House; now in committee in the Senate
[6] Personal communication with Rep. Kathleen Law.

Illinois

Representative Karen May (D) learned about the Michigan law in December 2007 at a National Caucus of Environmental Legislators meeting and introduced a similar bill (HB 5855) in Illinois. The original Illinois bill contained the same rate structure as Michigan's bill does, but it was met with significant opposition in the legislature. The state had recently passed legislation to provide $1 billion in electricity rate relief after steep electricity price increases (Meitrodt, 2007), and it was thought that ratepayers would be sensitive to legislation that could raise electricity prices. As a result, HB 5855 was amended to replace the feed-in tariffs with a net-metering provision that would compensate photovoltaic generators for their excess generation at 200% of the retail rate[7]. Despite these modifications, the bill will not move back to the floor this session, but might be reintroduced as an enhanced net-metering bill for a broader array of technologies in the next session [8].

Minnesota

In Minnesota, Representative David Bly (D) introduced a bill (HF3537) based on the Michigan model. The bill's structure is similar to Michigan's, although there are no rates for geothermal resources, and small wind generators are limited to systems with 1,000 square feet of swept area or less. The Minnesota bill differs significantly in that generators must be majority-owned by Minnesotans[9] as defined in the state's Community-Based Energy Development (C-BED) statute. Minnesota has an established history of cooperative ownership, and several recent studies have advocated for the establishment of feed-in tariffs to support community-owned wind (Farrell, 2008; Kildegaard, 2006, 2007; Windustry, 2007).

The concept of community-based feed-in tariffs builds on the precedent set by the state's C-BED law. The C-BED tariff structure is similar to that of feed-in tariffs in that utilities are required to develop 20-year contracts for renewable generators. Unlike feed-in tariffs, however, utilities are not required to enter into C-BED contracts, the contracts are negotiated rather than standardized, and the contracts were at first only available to wind power. The C-BED statute originally limited the contracts to a net present value of 2.7¢/kWh over the 20 year period. This corresponds to roughly 4.7 to 6.3 ¢/kWh for discount rates of 6% and 10% respectively. Subsequent 2007 legislation eliminated the 2.7 ¢/kWh cap and extended the C-BED to other technologies in addition to wind, but did not establish technology-specific rates. The state's 2007 RPS legislation also created a C-BED Advisory Task Force charged with

[7] e.g.14 ¢/kWh in 2006 per the Energy Information Administration.

[8] Personal communication with Susan Hedman, Illinois Attorney General's office and Barry Matchett from the Environmental Law & Policy Center.

[9] Including residents, limited liability companies owned by residents, non-profits, governments, tribal councils, and electric cooperatives.

studying potential improvements to the statute – including whether C-BED could be structured as a feed-in tariff. The Task Force recommended developing a standard C-BED contract, but stopped short of recommending feed-in tariffs (Management Analysis & Development, 2008).

The current feed-in tariff bill is co-sponsored by, among others, Rep. Bill Hilty, who chairs the Energy Finance and Policy Committee where the bill was referred, and Assistant Majority Leader Aaron Peterson (D), who introduced a successful 2007 C-BED amendment. Despite democratic majorities in the House and the Senate, the bill will not move to the floor during this session. Should the Minnesota bill pass, it could have important ramifications for the region. Other states have passed or are considering C-BED legislation similar to Minnesota's, including Nebraska (LB 629 (Dierks)), South Dakota (SB71 (Kloucek)), Iowa (SF 355 (Kibbie)), and Ohio[10] (Figure 3). If Minnesota transitions to a C-BED feed-in tariff, it could diffuse to the other states that are considering similar policies.

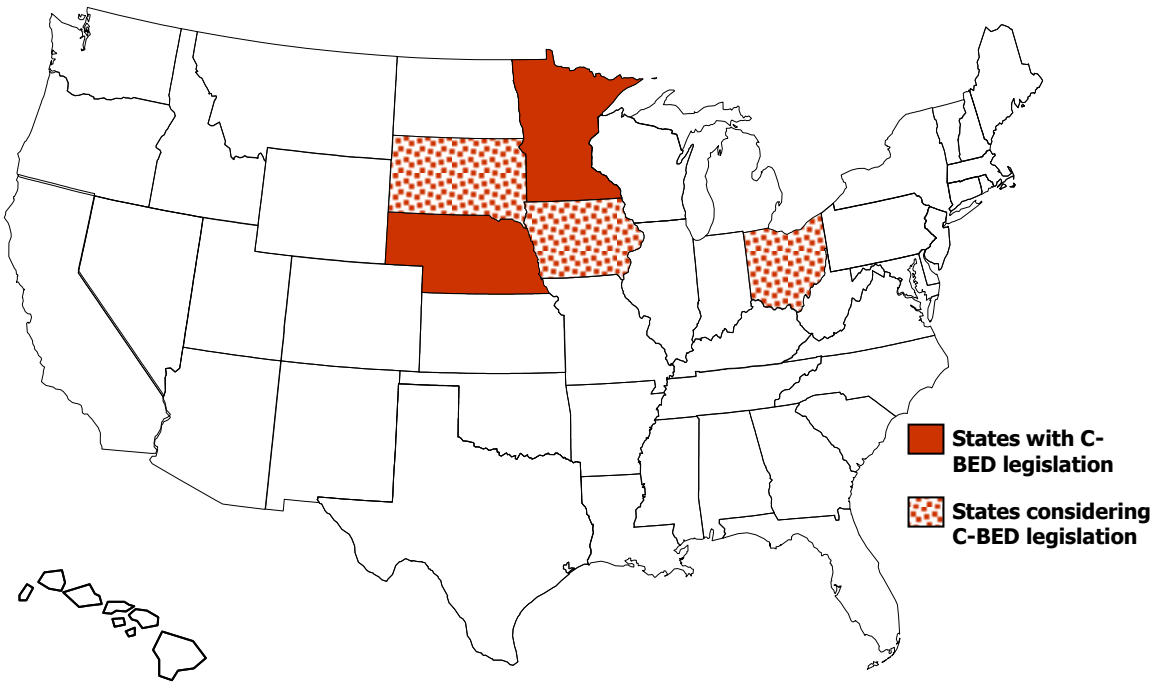

Figure 3: Status of C-BED Legislation in the United States

[10] Personal communication from Joe Logan, President of the Ohio Farmer's Union.

Rhode Island

In 2008, Rep. Ray Sullivan introduced H7616, which is also based on the Michigan Model, but which has several key differences. Unlike the other three bills, the Rhode Island bill does not use a sliding scale for wind turbines. Instead, systems 20 MW and under are eligible for a $0.115 payment, and systems between 20 MW and 50 MW are eligible for a $0.105 payment. Additionally, the bill's PV payments are significantly lower than those of the other bills, and resources without specific rates are guaranteed a payment that is 1.15 times greater than avoided cost. To date, the bill is still being negotiated and sponsors are examining strategies to merge it with other bills currently under consideration.

Hawaii

Hawaii saw several pieces of feed-in tariff legislation during the 2006-2007 session, with one house bill (HB 1748 (Saiki)) and two senate bills (SB 1223 (Menor) and SB 1609 (Hanabusa)). All three bills contained language establishing a 20-year, $0.70/kWh feed-in tariff for photovoltaic systems up to 20 MW in size. Unlike the Michigan-style feed-in tariffs, which assumes that 100% of the system output is fed into the grid, the proposed Hawaii feed-in tariffs apply only to excess electricity from net-metered systems. Furthermore, the feed-in tariff is capped at 5% of utility peak demand. In January 2008, HB 3237 (Thielen), which included a broad package of renewable energy legislation, also contained a PV feed-in tariff similar to that in the other bills, but with a rate of $0.45/kWh. None of the bills were passed out of committee, and will have to be reintroduced next session.

Other States

In addition to the states that have introduced legislation, several other states have recently considered feed-in tariffs, but have not introduced legislation.

Florida

In 2007, Florida Governor Crist (R) issued several Executive Orders aimed at greenhouse gas emission reductions and renewable energy generation. He also formed a State Environmental Task Force to review various policy options for achieving these objectives. The Task Force is due to report on its final recommendations in October 2008.

It is likely that solar energy legislation will be introduced in 2009, but it is unclear whether the State will pursue a REC program similar to New Jersey's, or whether it will consider alternative policies such as feed-in tariffs. A number of Florida organizations have endorsed feed-in tariffs in recent months,

including the largest Florida solar industry organization, FLASEIA (Florida Solar Energy Industry Association) (Gipe, 2008). Environmental Defense Fund is sponsoring a white paper on renewable energy policies for Florida which will include a study of feed-in tariffs for the state.

Maine and Massachusetts

In the Northeast, Maine and Massachusetts have considered feed-in tariffs during the past year, although no formal regulatory or legislative proceedings have been initiated in either state. In Maine, a non-profit organization called the MidCoast Green Collaborative has called for feed-in tariffs as part of a broader renewable energy strategy (Kando, 2008). The Collaborative worked with the Boston University (BU) Legislation Clinics to develop draft legislative language for a feed-in tariff. The BU proposal would require the establishment of 20-year fixed-price contracts for renewable generators at rates based on generation cost plus a reasonable profit (Babayan, 2007). The rates themselves would be determined by the Maine Public Utilities Commission (PUC). Bill advocates have identified prospective legislative sponsors, but the Maine legislature is currently out of session for the year.

In Massachusetts, Governor Deval Patrick (D) announced a target of 250 MW of solar electricity by 2017. The State considered a broad range of policy options to meet the new target, including feed-in tariffs (Rickerson and Grace, 2007b). The State opted to expand the existing rebate program for solar power in order to meet a short-term goal of 27 MW by 2011, highlighting the comparative ratepayer impact of the two policies, and raising concerns as to whether PURPA could limit state authority to enact a full feed-in tariff[11].

New Jersey and New York

On the East Coast, both New Jersey and New York considered feed-in tariffs as part of their RPS formal design proceedings. In New York, the New York State Energy Research and Development Authority (NYSERDA) centrally procures long-term REC contracts on behalf of the utilities to meet the state's RPS obligation. NYSERDA has been authorized to use several different mechanisms to procure RECs, including requests for proposals, a declining clock auction, and standard offer contracts (which would be similar to a REC-only feed-in tariff). NYSERDA has thus far chosen not to use the standard offer contracts.

New Jersey was one of the first states to enact an RPS target specifically for solar, and the state rapidly grew into the second largest solar power market in the country after California (Prometheus Institute, 2006). Until 2008, New Jersey's solar program was based on a mixture of upfront rebates and

[11] Personal communication with Jim Christo and Jon Abe from the Massachusetts Technology Collaborative, and Dwayne Breger from the Massachusetts Division of Energy Resources.

RECs, but state officials were concerned that rebate budgets would be insufficient to reach the full solar target (Winka, 2006). New Jersey launched regulatory proceedings to transition to a budget-independent system, and the state considered a broad range of options to securitize the REC market, including price floors, fixed-price REC contracts, and feed-in tariffs (Wobus et al., 2007). Ultimately, the New Jersey Board of Public Utilities (BPU) opted for a pure solar REC market, although BPU-commissioned analyses demonstrated that the investor security created by feed-in tariffs would lead to comparatively low rate-payer impacts (Kallock et al., 2007).

Vermont

In 2005, Vermont passed legislation creating the Sustainably Priced Energy Enterprise Development (SPEED) program as part of its renewable portfolio goal legislation. Under the SPEED statute, the legislature directed the Vermont Public Service Board (PSB) to establish long-term contracts for facilities one megawatt or less in size. The legislation did not set specific contract rates or length, but the Board was directed to establish contracts "at a specified margin below the hourly spot market price[12]." On March 19th, 2008 Senate Bill 209 (Lyons) amended the SPEED statute such that projects of one MW or less are allowed to sell power under 15 year long-term contracts at levels that are "adequate to promote" renewable resources, rather than linked to the spot market price. The PSB was also directed to establish standard long-term contracts for generators over one MW, which utilities are encouraged to enter into. The state goal is that 20% of retail electricity sales will come from SPEED resources by 2017, but the legislation contains clauses that would suspend SPEED contracts if it is determined that sufficient market growth has occurred by 2012[13].

The amendment gives the PSB authority to create contracts that could evolve into a form of feed-in tariff. The statute states that the Board "shall consider…least-cost provision of energy service" in setting contract rates, but Vermont stakeholders note that "least cost" can be defined to take environmental externalities into account, which could allow rates to be set above conventional benchmarks such as avoided cost or the spot market price. The PSB is currently planning to gather stakeholder input in order to define the contract structures more precisely.

[12] Roughly 6-7 cents/kWh, based on historical data from ISO New England from 2006-07 (www.iso-ne.com).

[13] "If the board finds that the amount of qualifying SPEED resources coming into service…after January 1, 2005 and before July 1, 2012 equals or exceeds total statewide growth in electric retail sales during that time, and in addition, at least five percent of the 2005 total statewide electric retail sales is provided by qualified SPEED resources…or if it finds that…SPEED resources equal or exceeds 10 percent of [2005] statewide electric retail sales…the portfolio standards established under this chapter shall not be in force."

Oregon

The State of Oregon initially explored the creation of a policy that would combine elements of a tradable credit market with a feed-in tariff for distributed generators (De Winkel, 2006). The Oregon Department of Energy's Wind Working Group recommended that a feed-in tariff be explored, but the state passed RPS legislation in 2007 that did not include feed-in tariff elements.

Wisconsin

In April 2007 Governor James Doyle (D) of Wisconsin created the Governor's Task Force on Global Warming (TFGW). The Task Force is currently finalizing its policy recommendations, but an "advanced renewable tariff" is under consideration (TFGW, 2008b). The current proposal (TFGW, 2008a) recommends a feed-in tariff for renewable generators 15 MW or smaller. The Wisconsin Public Service Commission would set the tariffs in 2009, with the guidance that the tariffs would be long-term, and based on generation cost plus profit. The feed-in tariff would be a component of an "enhanced RPS", and any renewable certificates generated under the tariff would be granted to the utility company engaging in the power purchase agreement. The advanced renewable tariff discussion in Wisconsin grows out of several years' advocacy on the part of groups such as RENEW Wisconsin to create standard, premium contracts for distributed generators (Anthony and Vickerman, 2006; Gipe, 2006; Vickerman, 2006). One Wisconsin utility (We Energies) has established "buy-back rates" for biogas and solar power, and other utilities (Madison Gas and Electric, Alliant, and Xcel) have either established or have proposed similar premium purchase rates for solar, biogas, and wind. These buy-back rates are similar to feed-in tariffs in that they are contracts for 100% of system electricity and RECs, but these programs are linked to the utilities' voluntary green pricing programs and both the system size and total capacity eligible under the programs are capped (e.g. only 10 MW of biogas systems can be interconnected under the We Energies program) (Vickerman, 2008).

A Federal Feed-in Tariff?

In addition to the state-level feed-in tariff bills, there is a significant effort to move feed-in tariff legislation forward at the federal level. In May, 2008, Congressman Jay Inslee (WA-1st-D) introduced a national feed-in tariff bill, which he refers to as a renewable energy payment (REP). The bill includes three main design elements that are modeled on the most successful national policies in Europe: 1) guaranteed interconnection through uniform minimum standards, 2) a mandatory purchase requirement through fixed-rate 20-year contracts and 3) rate recovery through a regionally partitioned national system benefits charge.

1) Under the proposed law, the Federal Energy Regulatory Commission (FERC) would set standards for the priority interconnection and transmission of power from new "renewable energy facilities", which include renewable energy facilities 20 MW or less. The FERC and the states would then be required to implement these standards within their own respective areas of jurisdiction when renewable energy facility owners request interconnection.

2) The bill would then require all electric utilities in the US to enter into fixed-rate, 20-year power purchase agreements at the request of any new renewable energy facility owner. The FERC would set minimum national REP rates at levels designed to provide for full cost recovery, plus a 10% internal rate of return on investment, for commercialized technologies under good resource conditions. REP rates would be differentiated on the basis of energy technology, the size of the system, and the year that the system was placed in service. Utilities would earn any associated RECs in order to help meet RPS requirements. As with interconnection, the FERC and the states would each implement the rules of the Inslee bill for all renewable energy facilities that fall within their respective regulatory jurisdictions.

3) The bill would facilitate cost recovery through a private renewable energy utility organization (called, "RenewCorps") that would be independent, yet subject to FERC oversight. Utilities would be reimbursed by RenewCorps for the additional cost of their power purchases, plus all costs associated with interconnection and network upgrades needed to accommodate these new facilities. To reimburse utilities, RenewCorps would raise revenues through a regionally partitioned national system benefits charge on every electric customer in the US[14].

Given its success in Europe, there are multiple reasons for introducing a national feed-in tariff bill in the US, but Inslee's primary motivation is to create long-term investment security for the rapid deployment of renewable energy technologies (Inslee, 2008). Furthermore, with renewable energy tax credits on track to expire again at the end of 2008, there is a growing interest in establishing a more stable policy support mechanism for the US renewable energy industry.

From a regulatory perspective, the three design elements central to Inslee's proposal challenge state-federal jurisdictional boundaries and arguably conflict with certain trends toward market competition in the US electric sector. For example, any attempt to guarantee or prioritize the interconnection and transmission of electricity from renewable energy sources would mark an exception to existing "open access" rules, which are designed to be non-discriminatory. On the other hand, there

[14] If FERC were to manage the system benefits charge, it would be required, as a federal government entity, to first deposit the revenues into the US Treasury. Then, cost recovery to utilities would depend on annual appropriations from Congress, which is a process that is unlikely to provide an acceptable high level of investment security.

is a growing recognition that existing, first-in-first-out interconnection queuing practices have become a serious impediment to renewable energy deployment throughout the country[15].

Another concern is that states are generally protective of their ratemaking authority. This precedent goes back to at least 1935, when the Federal Power Act assigned interstate wholesale transmission of electricity to federal authority, while reserving legal authority over ratemaking for retail service and over utility cost recovery to the states. This precedent changed somewhat in 1978, when Congress passed PURPA. PURPA's Section 210 requires all electric utilities to interconnect "qualifying facilities" (non-utility renewable and cogeneration power producers) and to purchase their electricity at an "avoided cost" rate. Implementation of this "avoided cost" requirement was left to the States, with mixed results from the renewable generation perspective (Guey-Lee, 1999).

Inslee's bill seeks to avoid a politically untenable expansion of FERC jurisdiction wherever possible. It is arguable that providing flexibility to states could risk the potential for a national policy to not be properly adopted and implemented in every state. From a practical standpoint, however, FERC lacks the capacity on its own to effectively manage a new national renewable energy policy on the scale of Inslee's proposal. Furthermore, there are significant benefits to preserving local control over interconnection and transmission, especially since an increasing number of states are actively engaged in the technical challenge of regional planning and integration of renewable electricity generation into the grid. Since the program is optional for new generators, the Inslee bill would not preempt state programs.

Under current law, utility cost recovery for investments in new generation is also mostly left up to each state's authority. State utility commissions generally review proposed projects and approve the ones that serve customers in the most cost-effective manner. Though the Inslee bill would impose a national system benefits charge, this would be done as a transparent line item on each electric customer's bill. Since the federal tax credits have not been entirely reliable, some states and utilities may welcome a rate recovery mechanism for new generation and network upgrades. Also, to limit the amount of interstate wealth transfer, cost sharing under the bill would be done regionally.

From a political perspective, moving the Inslee PBI bill through the US Congress is not expected to be easy (Tezak and Stanco, 2008), despite the bill's attempts to balance federal and state jurisdictional concerns. In addition to resistance to national renewable energy legislation from the conventional energy industry, there is not unanimity among solar industry stakeholders that the Inslee proposal is the best place for limited lobbying efforts to be focused (Browning, 2008; Hering, 2008;

[15] At a recent FERC conference on interconnection, one participant indicated that under current rules, it could take between 40 and 300 years to process all current requests for wind interconnection in the Midwest ISO queue (Norris, 2007).

Hoexter, 2008; Kho, 2008). On the other hand, there is substantial grass-roots support for the concept from investors, renewable energy companies, and non-governmental advocacy groups (Inslee, 2008).

Some aspects of a national feed-in tariff policy are already familiar to many policy-makers on Capitol Hill. For example, nationally uniform interconnection standards have been proposed in several bills that were introduced in the 110th Congress (e.g. HR729; S1016; HR2848). Another way forward could be to embed into a federal cap-and-trade policy a cost recovery mechanism for utility investments in renewable energy generation and new electric transmission. For example, revenues from the auction of greenhouse gas emissions allowances would presumably be redirected from a dedicated climate protection fund toward a number of related purposes. Depending on how a climate protection fund is ultimately structured, as with Inslee's proposed RenewCorps, it could provide significantly increased long-term investment security for renewable energy technology investments, compared to the current federal tax credit mechanisms.

Discussion

From a technical perspective, feed-in tariffs in the US appear not to be mutually exclusive with RPS policies – unlike in Europe. The concept of RPS in the US has evolved and diversified to the point that it has no fixed definition, and the current RPS policies each rely on different compliance mechanisms to meet their targets. As a result, there is no monolithic definition of "RPS" against which feed-in tariffs must compete. Instead, feed-in tariffs can be seen as yet another mechanism to meet RPS targets, and most of the states that are considering feed-in tariffs already have RPS frameworks in place (Rickerson et al., 2007). Moreover, RPS policies have been frequently and iteratively revised during the past several years. During this revision process, there has been a trend towards technology differentiation, and towards long-term contracts or other mechanisms to protect investors from REC market volatility (Wiser and Barbose, 2008). Given this focus on technology differentiation and investor security, RPS policies appear to be converging with some of the design characteristics typically associated with feed-in tariffs. As a result, it could become increasingly possible to incorporate elements of feed-in tariffs into RPS policy making.

Given the burgeoning momentum of feed-in tariffs, it is striking to note that the fourteen states that have considered feed-in tariffs during the past two years have done so without national support or coordination. While policies such as the federal tax credits and state renewable portfolio standards have benefited from the resources of national environmental and renewable energy industry associations, there has been little such support for feed-in policies. Whether or not feed-in tariffs are adopted in the US, the parallel and seemingly grassroots development of feed-in tariffs in so many states will be an important trend for policy makers and advocates to monitor during the next years.

Conclusions

The rapid emergence of both federal and state feed-in tariff proposals in the US represents a significant development for the renewable energy industry. A federal feed-in tariff law could transform the US renewable energy market. Enacting the current state proposals, meanwhile, would represent an important precedent for other states to consider. In looking ahead to future feed-in tariff policy development, several trends stand out. First, feed-in tariff policies and US RPS policies are potentially complementary, and most of the states that are proposing feed-in tariffs already have renewable portfolio targets in place (with the exception of Michigan). Second, current feed-in tariff proposals are generally limited in their scope and target specific technologies (e.g. PV), small renewable generators (e.g. under 20 MW), or ownership structures (e.g. community-owned) that might not otherwise successfully compete in RPS markets. These limitations also serve to address concerns over policy costs, and directly promote policy goals such as rural and economic development. If additional US feed-in tariff legislation is proposed, it will be unsurprising if it will be limited to certain subsets of generators, rather than creating broad and open-ended incentives for renewables as in Germany. Just as many RPS policies have been iteratively revised to be more aggressive, however, feed-in tariffs could likewise evolve to become broader over time if initial efforts in the US prove successful. Finally, the emergence of feed-in tariffs in the US represents a dramatic shift in the policy landscape and could signal the beginning of a new trend of more aggressive renewable energy policies at the national and state levels.

Appendix 1: Summary of State Feed-in Tariff Bills and Laws

Bill	Status	Project Cap	Reasonable Profit	Contract length in years	Incentives	Electricity	Review	Interconnection costs	Wind
Minnesota HF 3537 (Bly)	Referred to Committee on Finance (2/28/2008)	• 51% ownership by Minnesotans (residents, LLCs of residents, non-profits, governments, tribal councils, electric cooperatives; see 216B.1612, subdivision 2, paragraph (c)) • 20 MW • Distribution grid only, with option to extend to transmission if RPS not met	10% or higher	20	No other state and federal incentives	100% to utility	2 years	Utility	• $0.105 (< 700 kWh/m2/year) • linear in between 700 to 1,100 kWh/m2/year) • $0.08 (> 1,100 kWh/m2/year) • $0.25 (1000 sq. ft. swept area)
	Hydropower	**Biomass or Biogas**	**Landfill Gas**		**PV**		**Geothermal**		**Other**
	• $0.10 (< 500 kW) • $0.085 (500 kW to 10 MW) • $0.065 (10 MW to 20 MW)	• $0.145 (< 150 kW) • $0.125 (150 kW to 500 kW) • $0.115 (500 MW to 5 MW) • $0.105 (5 MW to 20 MW) (60% or greater efficiency)	• $0.10 (< 500 kW) • $0.085 (> 500 kW) (60% or greater efficiency) (or sewage treatment gas)		• $0.71 (façade cladding < 30 kW) • $0.68 (façade cladding 30 kW to 100 kW) • $0.67 (façade cladding > 100 kW) • $0.65 (rooftop < 30 kW) • $0.62 (rooftop 30 kW to 100 kW) • $0.61 (rooftop > 100 kW) • $0.50 (ground mounted)		None		None
Bill	**Status**	**Project Cap**	**Reasonable Profit**	**Contract length in years**	**Incentives**	**Electricity**	**Review**	**Interconnection costs**	**Wind**
Rhode Island H 7616 (Sullivan)	Referred to House Corporations 02/26/2008	• 20 MW	10%-30%	20	None	100% to utility	2 years	Utility	• $0.115 (< 20 MW) • $0.105 (20 MW to 50 MW)
	Hydropower	**Biomass or Biogas**	**Landfill Gas**		**PV**		**Geothermal**		**Other**
	• $0.10 (< 500 kW) • $0.085 (500 kW to 10 MW) • $0.065 (10 MW to 20 MW)	• $0.145 (< 150 kW) • $0.125 (150 kW to 500 kW) • $0.115 (500 kW to 5 MW) • $0.105 (5 MW to 20 MW)	• $0.10 (< 500 kW) • $0.085 (> 500 kW) (or sewage treatment gas)		• $0.54 (rooftop < 30 kW) • $0.52 (rooftop 30 kW to 100 kW) • $0.44 (rooftop 100 kW to 2 MW) • $0.48 (ground mounted)		• $0.19 (< 5 MW) • $0.18 (5 MW to < 10 MW) • $0.115 (10 MW < 20 MW) • $0.09 (> 20 MW)		All others: avoided cost x 1.15

Bill	Status	Project Cap	Reasonable Profit	Contract length in years	Incentives	Electricity	Review	Interconnection costs	Wind
Michigan HB 5218 (Law)	Referred to Energy and Technology Committee, 9/15/2007	• 20 MW • Electric distribution grid only	10%-30%	20	Reduce rates to reflect any other incentives	100% to utility	2 years	Utility	• $0.105 (< 700 kWh/m2/year) • linear in between 700 to 1,100 kWh/m2/year) • $0.08(>1,100 kWh/m2/year) • $0.25 (1000 sq. ft. swept area)
	Hydropower	**Biomass or Biogas**	**Landfill Gas**		**PV**		**Geothermal**		**Other**
	• $0.10 (< 500 kW) • $0.085 (500 kW to 10 MW) • $0.065 (10 MW < 20 MW)	• $0.145 (< 150 kW) • $0.125 (150 kW to 500 kW) • $0.115 (500 MW to 5 MW) • $0.105 (5 MW to 20 MW)	• $0.10 (< 500 kW) • $0.085 (> 500 kW) (or sewage treatment gas)		• $0.71 (façade cladding < 30 kW) • $0.68 (façade cladding 30 kW to 100 kW) • $0.67 (façade cladding > 100 kW) • $0.65 (rooftop < 30 kW) • $0.62 (rooftop 30 kW to 100 kW) • $0.61 (rooftop > 100 kW) • $0.50 (ground mounted)		• $0.19 (< 5 MW) • $0.18 (5 MW to 10 MW) • $0.115 (10 MW 20 MW) • $0.09 (> 20 MW)		None
Bill	**Status**	**Project Cap**	**Reasonable Profit**	**Contract length in years**	**Incentives**	**Electricity**	**Review**	**Interconnection costs**	**Wind**
Hawaii HB 1748 (Saiki), SB 1223 (Menor), SB 1609 (Hanabusa)	Carried over from 2007	• 20 MW • nameplate capacity = 5% of utility peak demand	N/A	20	Ineligible if claiming income tax credit	Premium excess net metering	N/A	Generator	None
	Hydropower	**Biomass or Biogas**	**Landfill Gas**		**PV**		**Geothermal**		**Other**
	None	None	None	$0.70	None	None			
Bill	**Status**	**Project Cap**	**Reasonable Profit**	**Contract length in years**	**Incentives**	**Electricity**	**Review**	**Interconnection costs**	**Wind**
Hawaii HB 3237 (Thielen)	Referred to EEP/WLH/TRN, CPC, FIN, 1/25/2008	• 20 MW • nameplate capacity = 5% of utility peak demand	N/A	20	Ineligible if claiming income tax credit	Premium excess net metering	N/A	Generator	None
	Hydropower	**Biomass or Biogas**	**Landfill Gas**		**PV**		**Geothermal**		**Other**
	None	None	None	$0.45	None	None			

Bill	Status	Project Cap	Reasonable Profit	Contract length in years	Incentives	Electricity	Review	Interconnection costs	Wind
Illinois HB 5855 (May)	Amended to PV net metering bill (see below), 3/12/2004	• 20 MW • Electric distribution grid only	10%-30%	20	Reduce rates to reflect any other incentives	100% to utility	2 years	Utility	• $0.105 (< 700 kWh/m2/year) • linear in between 700 to 1,100 kWh/m2/year) • $0.08 (> 1,100 kWh/m2/year) • $0.25 (1000 sq. ft. swept area)
	Hydropower	**Biomass or Biogas**	**Landfill Gas**		**PV**		**Geothermal**		**Other**
	• $0.10 (< 500 kW) • $0.085 (500 kW to 10 MW) • $0.065 (10 MW < 20 MW)	• $0.145 (< 150 kW) • $0.125 (150 kW to 500 kW) • $0.115 (500 MW to 5 MW) • $0.105 (5 MW to 20 MW)	• $0.10 (< 500 kW) • $0.085 (> 500 kW) (or sewage treatment gas)		• $0.71 (façade cladding < 30 kW) • $0.68 (façade cladding 30 kW to 100 kW) • $0.67 (façade cladding > 100 kW) • $0.65 (rooftop < 30 kW) • $0.62 (rooftop 30 kW to 100 kW) • $0.61 (rooftop > 100 kW) • $0.50 (ground mounted)		• $0.19 (< 5 MW) • $0.18 (5 MW to 10 MW) • $0.115 (10 MW 20 MW) • $0.09 (> 20 MW)		None

Bill	Status	Project Cap	Reasonable Profit	Contract length in years	Incentives	Electricity	Review	Interconnection costs	Wind
Illinois HB 5855 (May) Amendment Number 001 to 16-107.5 of the Public Utilities Act	Referred to Rules Committee 3/14/2004	• 2 MW • 1% of customer's previous year's peak demand	N/A	N/A	N/A	Net metering	N/A		None
	Hydropower	**Biomass or Biogas**	**Landfill Gas**		**PV**		**Geothermal**		**Other**
	None	None	None		All gross kWh generated through net metering at 200% of the retail price		None		None

Bill	Status	Project Cap	Reasonable Profit	Contract length in years	Incentives	Electricity	Review	Interconnection costs	Technology tariffs
California AB 1969 (2006) (Yee)	Approved by Governor (9/29/2006)	• 250 MW program cap (proportionate caps for each utility) • 1.5 MW system cap • Water and wastewater facilities only	N/A	10, 15, 20	RECs transfer to utility	100% or net metering	N/A	N/A	TBD

Bill	Status	Project Cap	Reasonable Profit	Contract length in years	Incentives	Electricity	Review	Interconnection costs	Technology tariffs
California SB 451 (2007) (Kehoe)	Vetoed (10/13/07) because of REC transfer issue	• 1,000 MW program cap (proportional caps for each utility) • 1.5 MW system cap	N/A	10, 15, 20	RECs transfer to utility	100% or net metering	N/A	N/A	TBD
Bill	**Status**	**Project Cap**	**Reasonable Profit**	**Contract length in years**	**Incentives**	**Electricity**	**Review**	**Interconnection costs**	**Technology tariffs**
California AB1807, AB1920, AB1714	In committee	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Bill	**Status**	**Project Cap**	**Reasonable Profit**	**Contract length in years**	**Incentives**	**Electricity**	**Review**	**Interconnection costs**	**Technology tariffs Wind**
Vermont S 209 (Lyons)	Passed and signed	None, slight differentiation between < and > 1MW	N/A	15	RECs transfer to utility	To utility	2012	N/A	TBD

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The Heinrich Böll Foundation is a non-profit political foundation affiliated with the German political party of Alliance 90/The Greens. Since 1998, the Heinrich Böll Foundation has an office in Washington, DC. The Heinrich Böll Foundation North America focuses its work on the issues of foreign and security policy and transatlantic relations, global governance, sustainable development, social equity and gender democracy. On climate and energy issues, the promotion of renewable energies in general and the introduction of feed-in tariffs in particular have been a focusing point for engagement for the HBF and will continue to be. For more information about the Heinrich Böll Foundation, please visit the website: www.boell.org

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