Ray Neff; rpneff@efn.org

Executive Summary: ***The Right FIT for Oregon: Solar PV in Eugene as a Case Study in Feed-in Tariff Policy Design***

Research and experience demonstrates that a well-designed Feed-in Tariff (FIT) is the most effective policy instrument to encourage widespread adoption of renewable energy technology and growth throughout the renewable energy industry. A well-designed FIT encourages community buy-in and support, builds the local economy with "green-jobs", and provides stable markets that encourage local investment (Cory, Couture, & Kreycik, 2009; Farrell, 2008; Rickerson, Sawin, & Grace 2007). The design of feed-in tariff laws are still relatively new and can vary considerably, yet Germany and Denmark have had programs in place since the 1990s, while more recently Spain and over 40 other countries are refining the ideas to meet their policy goals. Ontario, Canada, states like Vermont, and the City of Gainesville, Fl, have also implemented FIT policies in 2009, while states from Michigan to Arizona to Washington explore adopting or improving existing FIT laws.

A whole-systems approach, FIT policy addresses the inter-related challenges of climate change, job creation, energy security, and sustainable economic development. Best practices in FIT policy require the electric utility to offer all customer-generators a guaranteed, fixed price for all electricity produced by any market-ready renewable energy technology. The rate is designed to pay off the generation equipment with a reasonable rate of return while program costs are spread across all ratepayers equitably. Payment rates tiered to different technology types, project sizes, or locations encourage technology diversity and efficient operation without generating windfall profits. The result is investment security that encourages banks to loan, often with a reduced cost of capital, as guaranteed contracts provide ample investment security. In turn, market stability encourages industry growth and manufacturing innovation, and creation of family wage jobs in the local community.

A well-designed FIT lays the foundation for sustainable economic development through the use of clean energy resources, encourages energy conservation and the most efficient use of energy, promotes flexibility by encouraging technology diversity and innovation, and encourages community support for renewables since all energy consumers have the opportunity to participate in energy generation (Farrell, 2008; Mendonça, 2007; Rickerson, et al., 2007). Unlike market driven policies and those that rely on individual or business tax liability to encourage capital-intensive investments, a FIT democratizes the generation of energy, by allowing anyone in the community with adequate natural and capital resources to participate, freeing up tax revenue for other government services and programs. In short, energy dollars recirculate longer in the local and regional economy from banks to community members who become energy providers, to the local labor force necessary to manufacture, install and maintain energy generation equipment.

The solar sector in Germany has grown significantly as a result of a diverse FIT policy, and now comprises 26% of the world's installed base of solar PV spread across the country (Martin, 2009). Spain surpassed Germany significantly in 2008 when they offered very generous FIT rates for solar PV, which they now have had to scale back due to oversaturation of the marketplace, illustrating the flexibility of FIT policy to quickly respond to the learning curve and on-the-ground implications of FIT design. This explosive growth has been accomplished not by installation of vast solar farms on large expanses of land, but instead by utilizing available resources that support small, medium, and large installations. Success of the German FIT, particularly after it was updated in 2004, has allowed the federal government to completely eliminate all other subsidies (Mendonça, 2007). In Denmark, that also has a strong FIT law, "over 150,00 families have invested in wind turbines individually or through cooperatives, owning over 80 percent of the country's turbines (with about 60 families per MW)" (Farrell, 2009, p. 10).

When we consider the unstable or unpredictable nature of climate that society will inevitably face as a result of global climate change—increased summer drought and reduced winter snowpack that will impact historically-significant hydropower capacity for the Pacific Northwest, and potential floods and forest fires that can disrupt transmission infrastructure, energy produced closer to the end-user becomes even more important.

Ray Neff, a recent graduate of the Master of Community & Regional Planning program at the University of Oregon has completed two research projects related to solar photovoltaics in Oregon or renewable energy feed-in tariff policy design. In 2006, Neff estimated Eugene's solar capacity to be 68 MW annually from solar PV on large commercial and public buildings. In 2009, Neff extrapolated the state's solar potential to be at least 331 MW annually and calculated the impact on ratepayers in Oregon using FIT policy design. This is the equivalent of 0.8% of total residential and commercial/industrial customer demand in Oregon for 2007, and enough electricity to power close to 33,300 homes each year (U.S. Energy Information Administration (EIA), 2009; Oregon Public Utility Commission (PUC), 2008). While 331 MW displaces a relatively small percentage of total 2007 electricity demand, as illustrated below, the cost is less than the potential impact on residential energy costs that could result from climate change.

While best practices in FIT policy design encourage the use of all renewable energy technologies, to illustrate the effectiveness of FIT policy in Oregon, Neff's calculations address the solar component exclusively. Calculations are based on an installed cost of $7 per watt and it is estimated that it would take 10 years to deploy 331 MW of solar PV in Oregon. Two tiers of customer-generators were suggested for setting the FIT rate – those eligible for the Federal Investment Tax Credit (ITC), and those not able to take advantage of the ITC. The latter could include government agencies, non-profit organizations, schools, and homeowners or small businesses with little disposable income yet good credit and a suitable rooftop, or a farmer with under-utilized agricultural land. Project-owners eligible for Oregon's Business (BETC) or Residential Energy Tax Credit (RETC) would have to choose between receiving a tax credit or long-term FIT payments, but could not participate in both.

Governor Kulongoski signed legislation to establish a FIT pilot-program in Sept 2009. The program is only for solar PV and only customers within the Investor-owned Utility (IOU) service districts can participate. The program begins April 1, 2010 and is effective until March 31, 2015 or a 25 MW program cap is reached. The legislation requires 15-year contracts and caps the increase to residential ratepayers at 0.25% (Oregon Legislative Assembly, 2009). This legislation can provide some economic and environmental benefits to Oregon, but the rate cap makes it difficult to set an adequate FIT rate to ensure program success while providing adequate return on investment to encourage new customer-generators. Neff estimates that this policy could create as many as 825 jobs in the solar industry by full deployment, and reduce the state's CO2 emissions by approximately 11,500 metric tons. The latter is the equivalent of 0.1% of the state's 2007 CO2 emissions from electricity generation according to the US EPA's statewide reporting measurements (EPA, 2009a).

An alternative approach, proposed by Oregonians for Renewable Energy Policy would have established 20-year contracts, had no rate cap, was available for all market-ready renewable energy technologies, and all potential customer-generators across the state were eligible to participate (OREP, 2009). The FIT rate necessary to meet a target solar PV capacity of 331 MW would pay 36.1¢ per kWh for generators eligible for the Federal ITC, and 50.4¢ per kWh for generators not eligible for the ITC. The return on investment for generators would be 6.15% and 7.11%

respectively. In this scenario, the impact on residential customers' electric bills throughout Oregon would be about 35¢ per month ($4/year) each year. The impact on commercial and industrial customers would be approximately $3 per month ($37/year), each year to deploy. At full deployment in ten years, this would be about $3.50 per month and $42 annually for residential customers, and approximately $31 per month and $375 annually for commercial and industrial customers across the state.

In February 2009, Ernie Niemi, a Senior Economist and Policy Analyst with ECONorthwest and a Climate Leadership Initiative Fellow, along with a team of academic and private economists, produced *An Overview of Potential Economic Costs to Oregon of a Business-As-Usual Approach to Climate Change*. Recognizing the very complex nature of climate modeling and the difficulty of localizing the impacts that might occur as well as the full economic impacts of those potential changes, their work provides "an estimate of costs that might materialize if climate change is not reined in, not a forecast of how things will actually unfold" (p. iii).

Niemi and his colleagues address three primary components regarding energy-related costs in detail that could result from climate change in Oregon — reduced hydropower generation, increased energy consumption for residential indoor air cooling, and increased energy loss during transmission. Based on a recent regional assessment of climate change impacts, a reduction in streamflow could result in a 664 MW reduction in annual average productivity of the Pacific Northwest hydropower system by 2020. Regional assessment of climate change impacts also suggest that July-August temperatures will increase 2.9°C (5.2°F) by 2040. This could increase average residential electricity demand by 200 MW in the region due to increased demands for indoor air conditioning. Local, distributed energy generation reduces the impact of energy-loss as it is converted to waste heat during transmission. Higher temperatures during a heat-wave further increase the amount of this energy loss. According to the *American Planning Association Policy Guide on Energy*, the August 2003 blackout across much of the Eastern U.S. was not the result of a lack of power supply but instead "the inability of the stressed transmission system to deliver on the demand" (APA, 2004, P.15). Oregon's share of these energy-related impacts in 2020 are summarized in the following table:

	$Million	**MW**
Reduced Hydropower Generation	$74	175
Increased Indoor Air Conditioning	$16	23
Energy Loss During Transmission	$29	47
Totals:	**$119**	**245**

Applying the 2007 average number of retail electricity customers in the state to the figures above illustrates the potential cost of energy loss as a result of climate change on household ratepayers in Oregon (Oregon PUC, 2008). The table below compares the cost of a business-as-usual approach to climate change, to the proactive approach of the cost of the solar component of a well-designed FIT on ratepayers in Oregon. The latter could result in a savings of approximately $33 per household while deploying a net gain of 86 MW of energy generation from solar PV.

Cost…	**2020 Cost per Resid. Cust.**	**Total MW**
Due to Climate Change	$74.38	245
FIT based on Best Practices	$41.56	331
Difference:	**$32.82**	**86**

Direct jobs in the solar industry include on-site labor for installation, auditors to conduct on-site energy analysis to determine optimal energy saving and generation opportunities, manufacturing, and to a lesser degree, maintenance. Oregon is already home to five companies that manufacture various components for the solar industry including silicon wafers, solar panels and inverters, and it continues to grow. Fried states that according to a 2007 University of California study of renewables, "Solar photovoltaics (PV) creates more jobs per megawatt of capacity than any other energy technology - 20 manufacturing and 13 installation/maintenance jobs per installed megawatt" (2007, para. 4). Excluding jobs lost in parallel industries that generate electricity for Oregonians, installing 331 MW of solar across the state has the potential to create close to 11,000 family wage jobs in Oregon communities. Oregon is already home to two nationally-recognized community college renewable energy training programs – Lane Community College's Northwest Energy Efficiency Institute and the Columbia Gorge Community College Renewable Energy Technician Training program – both prepare the next generation of solar and wind technicians, respectively.

The State of Oregon's energy mix is already a low-carbon fuel source due to historically abundant hydropower resources, especially compared to the rest of the U.S. Yet, since the early 1990s, Oregon's CO2 emissions from electricity have generally grown steadily, from 1.79 million metric tons (MMT) in 1990 to 9.52 MMT in 2007 (EPA, 2009a). As streamflows are impacted by reduced snowpack, traditional hydropower resources could be replaced by much dirtier sources of energy such as coal or natural gas. The U.S. Environmental Protection Agency (EPA) estimates that .41 metric tons of CO2 are emitted for every MWh of electricity within the Western Electricity Coordinating Council (WECC) Northwest region (EPA, 2009b). At full deployment, 331 MW of solar across Oregon would displace approximately 153,000 metric tons of CO2, or the equivalent of 1.6% of the state's 2007 CO2 emissions from electricity generation.

Recent climate change debate includes a claim by some that addressing the impacts of climate change are simply too costly to the American economy to pursue aggressively. Neff's work, along with others, negates that argument and illustrates that a proactive approach now to climate change, at least as it relates to energy use, could actually be cheaper than continuing with business-as-usual. This is the case, even though the current up-front cost to install solar PV remains higher than almost any other market-ready energy generation technology on a per kilowatt-hour basis. More research is needed to determine the additional impact of including all renewable energy technologies that are open to all potential energy generators in the next generation of FIT policy in Oregon, as the most successful policies do. Given that other RE technologies cost less than solar PV, it seems reasonable to assume that the additional impact on ratepayers may still be less than the cost of a business-as-usual approach to climate change, while meeting our urban and rural energy generation potential.

Establishing the right renewable energy feed-in tariff policy design and taking advantage of the policy mechanism's design flexibility, provides citizens, businesses, farmers, government agencies and all members of the Oregon community the opportunity to demonstrate a commitment to mitigate the impacts of climate change while improving the economy for Oregonians, now and into the future.

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