

Evolution of Feed-in Tariffs
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Feed-in tariffs are a generic description of a policy that pays a price, a “tariff”, for the electricity generated by renewable sources of energy that is “fed” into or sold to the grid. Policies built upon this principle go by many different names in the English-speaking world. They are sometimes called Standard Offer Contracts, Renewable Tariffs, Advanced Renewable Tariffs, Renewable Energy Payments, and more generally, feed laws.

The terminology describing feed-in tariffs and the way they are viewed relative to electric utility regulation has changed over the years. The terminology has changed in part because of changes in how the tariffs are determined and whether there is only one tariff offered, or many.

Feed-in tariffs were first introduced in California in 1984 by the California Public Utility Commission as Standard Offer Contract No. 4. There were several Standard Offer Contracts available at the time. As the name suggests, each contract was standard and each offer, or tariff, was standard. These contracts were offered in response to the Public Utility Regulatory Policies Act (PURPA), a part of the 1978 National Energy Act, which allowed connection of renewable generators to the grid and specified that they should be paid for the cost of generation that they avoided.

Standard Offer No. 4 stands out because it fixed the amount that would be paid per kilowatt-hour based on the estimated long-term avoided cost of conventional generation. The fixed-tariff period covered ten years of a 30-year contract. The other “offers” were based on wholesale costs at the specific time of delivery to the grid.

Standard Offer No. 4 was the first successful feed-in tariff, and resulted in 1,200 MW of new wind generation in California by the mid to late 1980s. This capacity produces nearly 3 TWh of wind generation per year, or about one percent of California’s consumption, and has done so consistently for more than two decades.¹

Following the collapse in the price of oil, no new Standard Offer contracts were offered in California after 1984.

¹ For a discussion of this period, see Gipe, Paul, *Wind Energy Comes of Age*, (John Wiley & Sons: New York, 1995), pp. 32-34.

Germany implemented its Stromeinspeisungsgesetz (StrEG), literally the law on feeding in electricity to the grid, in 1991.² The StrEG is Germany's original electricity feed law and was proposed by Germany's conservative parties, the CDU & CSU, in response to demands by members in rural southern Germany with access to small, disused hydropower plants.³

It is the Anglicization of this German policy that gives the English expression "electricity feed law" and the "feed-in tariffs" that make it work. Tariffs are the rates paid per kilowatt-hour for electricity. Thus, feed-in tariffs are the tariffs or rates paid per kilowatt-hour of electricity generation "fed into" or sold to the grid.

Germany broke with California practice in setting the feed-in tariffs. In the StrEG, Germany based its tariffs on the retail rate, not the wholesale rate. For example, wind energy and solar energy were paid 90 percent of the retail rate and hydroelectric plants were paid 80 percent of the retail rate. In the German context, tariff setting had less to do with the wholesale avoided cost than taxes on retail electricity consumption, since a large part of German retail electricity rates are consumption taxes.

Further, CDU & CSU backbenchers in Germany's federal parliament specifically suggested that feed-in tariffs greater than the avoided cost were justified in offsetting the environmental costs from conventional coal-fired power plants. As such, the tariffs were determined outside traditional measures of the monetary cost of generation or the value of the electricity produced.

Because the retail rates fluctuated over time, renewable generators had difficulty finding low-cost financing. Banks preferred a stable and, more importantly, a predictable revenue stream than the StrEG provided by its emphasis on the retail rate. Additionally, the use of avoided externalities alone were insufficient to provide a tariff sufficient to pay for generation from solar photovoltaics.

To remedy this problem, Germany turned to a more traditional concept of electricity pricing in 2000 with the introduction of the Erneuerbare Energien Gesetz (EEG), the Renewable Energy Sources Act, or the act granting priority to renewable resources.⁴ In the EEG, Germany stipulated with public policy that renewable sources of electricity had priority access to the grid, and that renewable sources of generation had priority on the grid for a host of environmental, social, and economic reasons.

² Stromeinspeisungsgesetz (StrEG) in English, <http://www.wind-works.org/FeedLaws/Germany/ARTsDE.html>, visited March 13, 2009.

³ See the section on the 1990 Feed-in Law in [Three decades of renewable electricity policy in Germany by Volkmar Lauber \(doc\)](#), visited March 13, 2009.

⁴ Original (2000) version in English <http://www.wind-works.org/FeedLaws/Germany/GermanEEG2000.pdf>, visited January 7, 2006; current version (2004) <http://www.wind-works.org/FeedLaws/Germany/EEG-New-English-final.pdf>, visited January 7, 2006.

The EEG established that the tariffs would be based on the cost of generation from each technology plus a reasonable profit and these tariffs would be guaranteed for twenty years. Thus, there would be different feed-in tariffs for different technologies, and different tariffs within technologies based on project size, application, or resource intensity.

The principle is the same as that followed by electricity regulators in North America and Europe for much of the 20th Century. In classic electric utility regulation, a power plant is built; the utility then seeks recovery of its expenditure plus a reasonable profit. Regulators determine the reasonableness of the costs incurred and the profit required and award tariffs or rates based on their findings.

The EEG follows the same practice except that it determines reasonableness in advance of construction. Through a transparent policy-making process, reasonable costs are determined from existing experience and the profit necessary to attract capital in sufficient amounts to reach public policy goals for renewable energy development are found and tariffs subsequently set.

Policies that use a system of feed-in tariffs differentiated by technology, size, application, and resource intensity, like those in Germany's EEG, have been dubbed Advanced Renewable Tariffs. These systems of differentiated tariffs are the most modern, hence, "Advanced" form of feed-in tariffs.

France, Spain, Switzerland, Great Britain and several other European countries have since introduced variations on the German practice.

Differentiating tariffs in this manner breaks any remaining link between the rates paid for renewable energy and the cost of conventional generation which renewable resources offset. This is most obvious in the case of solar PV. In the 2004 revision of Germany's EEG, the tariff for residential rooftop solar was raised to € 0.57/kWh (~\$0.75 USD/kWh). Public policy makes a determination that a particular resource is desired, such as solar PV, then the tariff necessary to bring on the amount of the technology desired determined, and the rate posted and made available to all comers.

It is noteworthy that though early Spanish tariffs were expressed as a percentage of the retail rate, there were in effect based on the cost of generation plus profit. For example, the original Spanish tariff for solar photovoltaics was 575 percent of the Average Electricity Tariff. It should be clear that there is no connection between the Spanish solar PV tariff at this level and the wholesale or avoided cost from conventional generation. Subsequent Spanish policy has fixed the tariffs in the manner of the French and German programs. That is, current Spanish tariffs under the fixed-price portion of the program are independent of the Average Electricity Tariff.⁵

⁵ There are two pricing systems in the Spanish program. This section refers only to the fixed-price portion.

Ontario's Standard Offer Contract (SOC) program provided standard contracts in 2006, but not standard "offers". There were two tariffs offered, one for solar and one for everything else. Though the Ontario program was the first system of feed-in tariffs in North America in two decades, it was not a system of Advanced Renewable Tariffs and has been subsequently revised.

Ontario's SOC program hearkened back to an earlier era. The tariffs in Ontario were based on the "value" of the electricity to the system, in a sense the value of generation offset, and not on the cost of generation. Thus, the original Ontario program was not an implementation of modern feed-in tariffs.

In the fall of 2009, the Government of Ontario launched a comprehensive system of feed-in tariffs as part of its ground-breaking Green Energy and Green Economy Act.⁶ In early October, the Ontario Power Authority (OPA) began accepting applications for the program.

OPA's tariffs are fully differentiated by technology, size, and application. For example, there are three tariffs for wind energy, and five different tariffs for solar PV.⁷ The proposed tariff of \$0.80 CAD/kWh (\$0.78 USD/kWh) for residential rooftop solar PV is clearly a tariff based on the cost of generation and not one derived from the wholesale avoided cost, or the value of the electricity to the system. OPA has made this point in public presentations on its proposed tariffs that they are in fact based on "the cost of generation plus a reasonable profit".⁸

Ontario's feed-in tariff program is the first North American application of Advanced Renewable Tariffs. The Ontario policy more closely resembles comparable contemporary policies in Europe than California's Standard Offer Contract No. 4 of the mid 1980s.

In summary, modern policies of Advanced Renewable Tariffs require

- Priority access to the grid,
- Priority purchase of generation from renewable resources, and
- Differentiated tariffs based on the cost of generation plus a reasonable profit.

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⁶ See [Ontario Launches Comprehensive System of Feed-in Tariffs](#), visited October 6, 2010.

⁷ See [Official OPA Feed-in Tariff \(Price\) Schedule](#), visited October 6, 2010. Note that there are now six solar PV tariffs. The MicroFIT tariff has been split into two tranches.

⁸ See http://www.powerauthority.on.ca/fit/Storage/29/10117_Session_1_Presentation_-_March_17.pdf.