

# Policy Brief

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## Renewable energy diffusion schemes in Japan and European countries

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### Introduction

A shift from a heavy dependency on conventional energy sources, such as fossil fuels, to well-balanced renewable energy sources (RESs), such as wind and solar photovoltaics (PV), has been carried out globally to reduce carbon emissions and dependencies on conventional energy sources. A Feed-in Tariff (FiT) policy, which was enacted in Japan on July of 2012, has accelerated the diffusion of RESs. However, the rapid expansion of RESs can cause instability in the energy grid because of their heavy dependence on weather conditions. In fact, five out of ten regionally monopolistic Japanese utility companies have announced that they intend to cease purchasing electricity from large-scale RES generation facilities, which was planned to be in operation as of 2014, mainly due to a limited capacity for grid stability. [1].

In this brief, for consideration of an approach that can cope with these issues, we review countries that have also implemented renewable energy policies and might face similar issues, after summarizing the background and mechanism of the Japanese FiT scheme.

### Japanese renewable diffusion schemes

As a renewable support scheme, with the exclusion of subsidy programs, the Renewable Portfolio Standard (RPS) was the first regulation to be enforced; it came into effect in 2003 [2]. The RPS obligated utility companies to supply electricity from RESs, including hydroelectric generation (less than 1MW), PV, wind power, biomass, and geothermal sources. The objective was for the RESs to contribute to up to 1.35% of total electricity production in 2010, which is a lower target in comparison with similar policies enacted by other countries. Moreover, the price of RES electricity was

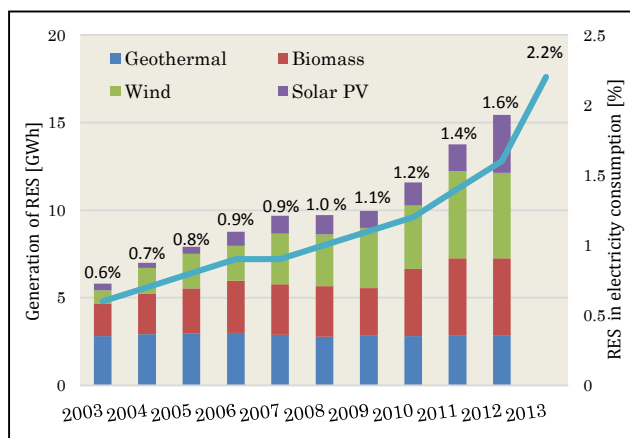


Figure 1. Transition of electricity generation from RES [GWh], and its proportion of electricity consumption in Japan. [3]

comparatively low (PV: 24 yen/kWh, wind: 10 yen/kWh).

In order to stimulate the diffusion of PV, another renewable support program was introduced in 2009. Under this program, utility companies are obligated to purchase electricity at the rate of 48 Yen/kWh, which is twice the cost of RPS. However, this program was only applied to surplus electricity generated from PV, minus the electricity consumption by households. This has been maintained for PV at below 10 kW in the FiT, although other RESs, including PV of more than 10 kW, have been ensured to sell the full amount of the power produced.

### Japanese Feed-in Tariff

The Japanese FiT, which has been in effect since July 2012, forces utility companies to purchase electricity generated from RES at fixed prices under certain terms determined by the Ministry of Economy, Trade, and Industry (METI), after considering the opinions of “the Procurement Price Calculation Committee,” and taking power sources and generation sizes into account [2].

The tariffs are estimated such that RES operators can provide a stable supply during purchase periods, while receiving adequate profits. Such profits are calculated from the expected cost and the amount of electricity generated, and evaluated with a pre-tax Internal Rate of Return (IRR) because differing set of taxes apply on different RESs. In order to expand the usage of RESs, the government has set a higher IRR than originally estimated, so that higher tariffs can be implemented for 3 years after the effective date of the FiT. The tariffs are revised annually to reflect the progress of RES technology and the reduction in capital costs.

End-users have been paying the surcharge of the FiT, which is included in their electricity bill as a levy. To be specific, the levied cost for the households is 0.75 yen/kWh, as of November 2014.

### Current situation in other countries

**Spain.** Royal Decree (R.D.) 2366/1994 [4], which first prescribed a FiT for RES, cogeneration, and the generation from waste sources in Spain, entered into force in 1994. To further stimulate the usage of RESs, especially PV generation, R. D. 436/2004 and R. D. 661/2007 were formulated in 2004 and 2007, respectively. These provisions offered a significantly higher value on the tariffs of PV generation, which attracted so many investors that the government enforced R.D. 1578/2008 in order to reduce PV tariffs.

In 2012, the FiT for new plants was suspended with R.D. Law 1/2012, and the FiT for new operators was finally repealed in 2013 due to a remarkable tariff deficit. The Spanish government announced the formulation of a new regulation replacing the FiT at the same time, and published it on June 2014 (R.D. 413/2014). The

new regulation classified the tariff into numerous groups, and applied them even to pre-existing RES.

**Germany.** The generation of RES in Germany has been steadily increasing through the enactment of two renewable energy acts: the Act on Supplying Electricity from Renewables (StrEG) in 1991, and the Renewable Energy Sources Act (EEG) in 2000. The diffusion of RESs was mainly encouraged by the FiT program, which was initiated in 1991. However, as additional RES was introduced, a higher cost was imposed on the consumers as a surcharge. In fact, this surcharge has been increasing annually, and incurs a cost of 6.24 euro cents/kWh as of September 2014.

The EEG was largely revised in 2014 with two major changes. First, the government set an annual limit to RES capacity. Second, new RES plants are obliged to directly market their electricity. RES operators receive the market premium (the RES tariff minus the monthly average electricity price in the market) as an incentive [5].

**United Kingdom.** The Renewable Obligation (RO) system, which obligates utility companies to retain a fixed rate of RESs for the total amount of supplied electricity, was introduced in 2002 as a primary means to support the development of renewable energy [6]. However, the regulation procedure was too complicated for small-scale RES operators to follow, and the promotion of PV generation was poor as a result. Therefore, an FiT was introduced in 2010 to promote small-scale RES generation facilities, which have the capacity to produce no more than 5 MW, with cogeneration of less than 50 kW. The FiT in the UK has set tariffs for a given amount of generated electricity regardless of its usage in terms of being sold to utility companies or being used for self-consumption. Hence, this scheme encourages self-consumption by applying lower tariffs to the sale of electricity, as compared to the retail price. The tariffs were changed several times so as to reduce compensation [6].

The Energy act 2013, passed in December 2013, contained a FiT-Contract for Difference (FiT-CfD), a mechanism that clarified the difference between the market price and a strike price decided after governmental negotiations with utility companies. The FiT-CfD accommodates nuclear and conventional power plants with carbon capture and storage, in addition to RES.

**Italy.** Several renewable support schemes have been implemented in Italy, such as FiT (1992~1997), green certificate (2002~2015), and Feed-in premium (FiP) for PV (2005~) and solar heat (2008~),

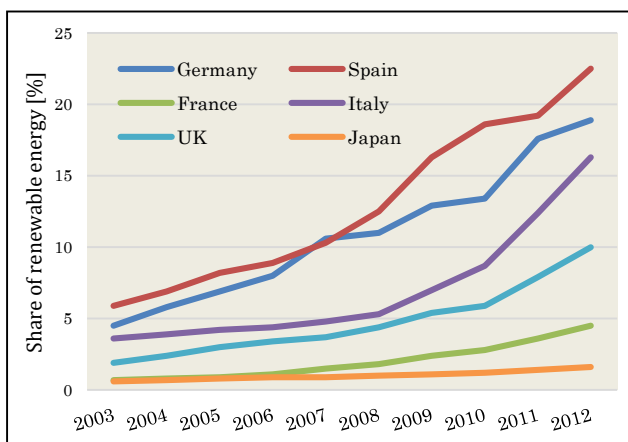


Figure 2. The share of renewables in electricity production, excluding hydropower. [1, 9]

which offers the sum of the market price of electricity and a fixed premium as tariff [7]. This FiP was amended in 2012, and the incentive was replaced by an all-inclusive tariff (fixed tariff) and premium, which was applied to self-consumption.

In 2008, a FiT for small scale RES, excluding solar energy, was resumed. This regulation was also revised in 2013, which has enforced large-scale RES operators to register in advance, or attend a tender system. For RES generating less than 1 MW of power, the government offers fixed tariffs, while those producing between 1 MW and 5 MW can receive a premium, which is defined as the fixed tariffs minus market prices. Under this same regulation, RES exceeding 5 MW are called for tender.

**France.** By EU directive (2009/28/CE), France is obligated to achieve 23% of its final energy use from RES by 2020. In 2000, the government enacted "Loi n° 2000-108," initiating a FiT [8]. The FiT in France introduced a tender system for certain modes of power generation, which considers RES operators eligible to receive incentives, providing that they meet several criteria. In the case of PV systems adopted from 2011, those systems generating more than 100 kW were to be selected by these criteria. The criteria were that the electricity price of the system was employed for systems generating 100 kW to 250 kW, and for systems exceeding 250kW, the electricity price, environmental impact measures, product quality regulation, and recycling means were adopted. As of 2014/11, seven tenders have been carried out.

## Conclusion

In Japan, there are already calls to amend the current FiT because of an increasing trend of imparting levies on electricity bills, and a suspension of transactions with regionally monopolized utility companies.

Upon reviewing renewable energy support schemes in five European countries, we found that these countries had also faced, or are now facing, similar situations, and have since revised their support regulations. They have employed a detailed classification of renewable technologies, adopted pre-registration and tender systems, implemented feed-in premiums, and introduced an annual cap on RES capacities, thereby preventing an intensive diffusion of RES within a short time period. These regulations could be applied to amend the current Japanese renewable support scheme.

Renewable energy has played an important role in electricity generation, which is expected to expand further with a phase-in of a Japanese electricity market liberalization to be completed in 2020. Therefore, establishing an appropriate support scheme for RES by considering previous support regulations is required not only for success in Japan, but also in developing countries where the potential for RES diffusion is significant.

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