

# Incorporating a Tendering System into Feed-In Tariff (FIT) Schemes in Developing Photovoltaic Power —The Experience of Taiwan's FIT Reform

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**Abstract.** The adoption of a feed-in-tariff (FIT) scheme is an effective tool in promoting photovoltaic (PV) power development. This scheme establishes long-term contracts with PV installers, provides a price guarantee in the power markets, and creates a friendly investment environment for PV industries. This has led to a PV-boom phenomenon in many countries and to windfall profits for PV investors. The resultant total PV installed capacity far exceeded government expectations and caused a controversy with the public, as electricity ratepayers are the ones who bear the burden of the tariff payments. In order to strike a balance between PV development and the public burden, the FIT mechanism was reformed. Such reforms took place in Taiwan and France, where a bidding (tendering) system was introduced and adopted as part of the FIT system in 2011. Austria, India, South Africa, and the state of California (USA) all have plans to follow suit. As Taiwan has a wealth of experience in implementing bidding schemes, this pioneer experience could serve as a guideline for other countries attempting to introduce a bidding system. Through a competitive bidding mechanism, a restricted eligibility for FIT payments, reduced tariff levels, and hard caps in place on seasonal/annual total PV installed capacity, the use of tendering systems significantly mitigated the rapid development of PV power. Taiwan adopted the FIT mechanism in 2009 and soon suffered PV-burst problems. In 2011, Taiwan's FIT reform enforced new tariff levels, determined by the equation = (1-discount rate) \* rate caps. Under the competition bidding (tendering) process, the discount rate in PV rooftop installation (100 ~ 500 KW) was as high as 4.19 %. What are the lessons from Taiwan's experience in the use of tendering systems? Is the competitive bidding mechanism a necessary and useful tool to cope with a PV-boom phenomenon? Did the use of tendering damage PV industrial development? This study will analyze Taiwan's experience in FIT reform and will offer suggestions on constructing a comprehensive PV-power promotion plan.

**Keywords:** Feed-in-Tariff, PV power development, tendering system

## 1. Introduction

In a solar photovoltaic (PV) feed-in tariff (FIT) dynamic, the government provides a price guarantee and a long-term contract with PV operators with the purpose of establishing an investment-friendly environment for the PV industry. Power markets consisting of power transmitters and distributors are imposed with a mandatory purchase and connection obligation. The power markets have to buy PV power with a certain level of tariff depending on the FIT contract. The tariff levels are typically determined by the costs of renewable energy and the government's attitude toward PV development. If the rate is high, PV investors are rewarded with a windfall profit with the cost being borne by electricity ratepayers. Figure 1 shows the relationship dynamics between the major players in a typical FIT scheme.

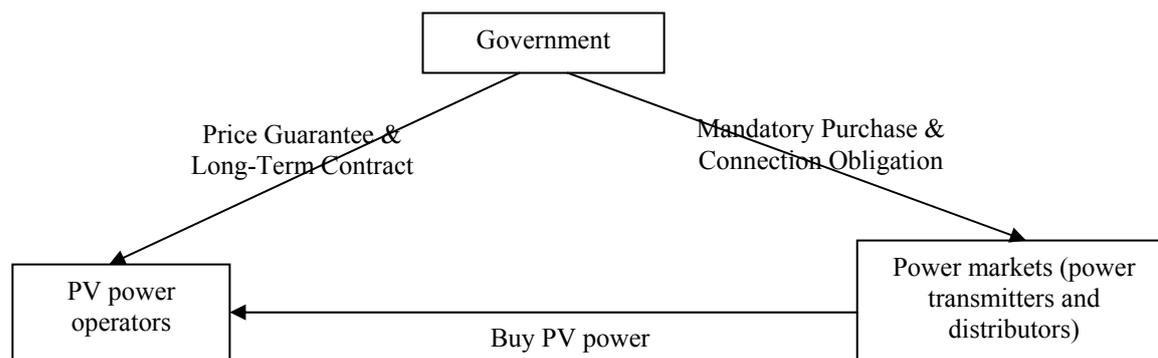


Fig. 1: Relationship dynamics in the FIT scheme. Source: The authors

As the FIT scheme is an effective tool in promoting PV development, Taiwan experienced a boom in PV installations in 2010. Taiwan's total PV installed capacity reached ten times the expected 2010 goal - 75 MW. This figure was almost equal to the PV installation goal for 2015 - 2020 (Gao, 2011: 6). Incorporating a tendering system into a traditional FIT scheme became an option in order to reform the FIT mechanism. The reform led to: significantly reduced PV tariffs; restrictions on the eligibility for FIT payment; and an imposition of hard caps on PV installed capacity. Such reforms took place in Taiwan and France, where a bidding (tendering) system was introduced and adopted as part of the FIT system in 2011. Austria, India, South Africa, and the state of California (USA) all have plans to follow suit. As Taiwan has a wealth of experience in implementing bidding schemes, this pioneer experience could serve as a guideline for other countries attempting to introduce a bidding system.

## 2. Incorporating a tendering system into FIT schemes

In 2011, tendering systems were incorporated into FIT schemes in Taiwan. This reform allowed the government to introduce caps on tariff levels (see Table 1). Participants (PV installers) in the competitive bidding process provided a tender for the FIT contract. Under the fixed total PV installed capacity, competitors having a lower-priced tender won the bid and got approval for project registration (Ministry of Economic Affairs, Taiwan, 2011). Figure 2 shows the process of tendering scheme in Taiwan.

In the early phase of the tendering process in 2011, 123 rooftop PV installation applications won their bids and received approval for registration. The total installed capacity for rooftop installations was 12173.123 kW with the tariff-level discount rate ranging from 0% - 25 %. The average discount rate is 2.62%. Only 2 ground-mounted applications won their bids and received approval for registration. The total installed capacity for ground-mounted applications was 1379.4 kW with the tariff-level discount rate ranging from 0 % - 0.51 %. The average discount rate was 0.31 % (Bureau of Energy, Ministry of Economic Affairs, Taiwan, 2011b). Table 2 shows the results of Phases I - III of the 2011 tendering process.

The tendering system utilized a mathematical structure to fix the tariff levels: tariff level = (1 - discount rate) \* rate caps. This equation determined the actual rate of FIT payments. When comparing the highest tariff levels in 2011 Phase III to the 2010 tariff levels, it was found that the difference in tariff rates was as high as 37.86 %. This clearly shows the significant effect a competitive bidding system has on varying the FIT payment scheme. Table 3 shows the altering PV FIT payments from 2010 to 2011.

Table 1: Caps on tariff levels by types of PV installations

| Types of PV installations    |                 | Caps on tariff levels (NTD/kWh) |
|------------------------------|-----------------|---------------------------------|
| Rooftop installations        | 1 kW - 10 kW    | 10.3185                         |
|                              | 10 kW - 100 kW  | 9.1799                          |
|                              | 100 kW - 500 kW | 8.8241                          |
|                              | ≥ 500 kW        | 7.9701                          |
| Ground-mounted installations | ≥ 1 kW          | 7.3297                          |

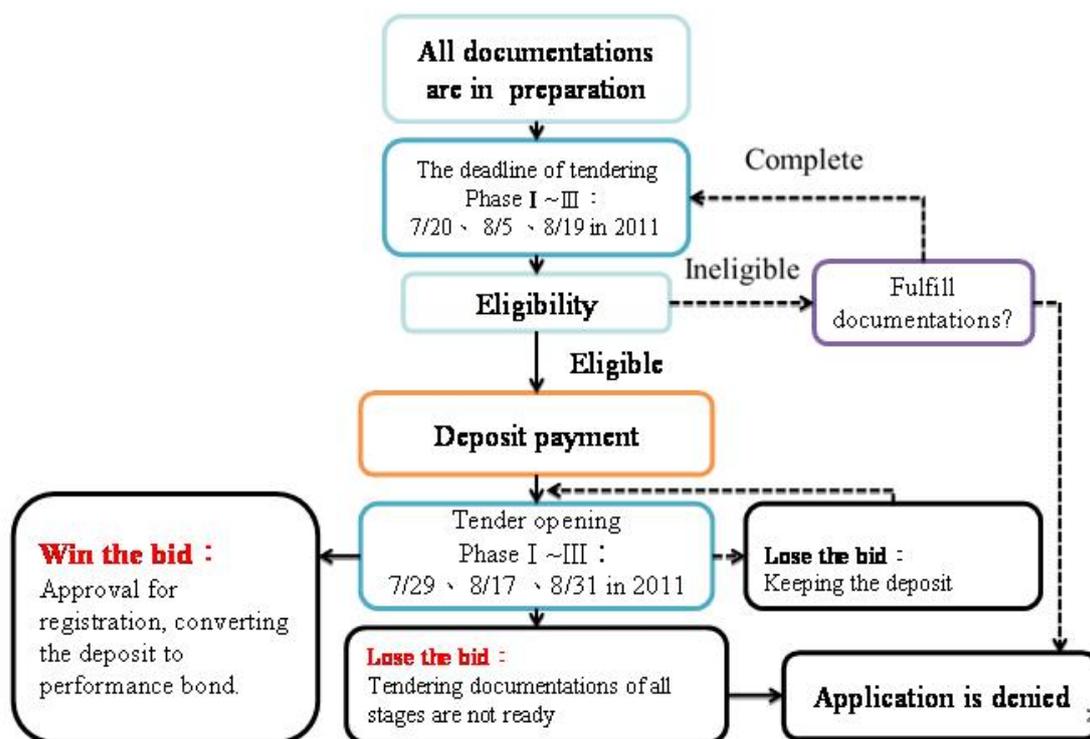


Fig. 2: The tendering process in Taiwan. Source: Bureau of Energy, Ministry of Economic Affairs, Taiwan, *PV Tendering in 2011 Phase II*, 2011. Retrieved November 10, 2011, from <http://www.moeaboe.gov.tw/>

Table 2: The results of Phases I – III of the 2011 tendering process

| Types of PV installations    |                      | 2011 Phase I  | 2011 Phase II   | 2011 Phase III  |
|------------------------------|----------------------|---|---|---|
|                              |                      | Eligible for FIT payment if discount rate of the price: | Eligible for FIT payment if discount rate of the price: | Eligible for FIT payment if discount rate of the price: |
| Rooftop Installations        | $\geq 1 - <10$ kW    | $\geq 0.00\%$   | $\geq 1.24\%$   | $\geq 2.22\%$   |
|                              | $\geq 10 - <100$ kW  |   | $\geq 2.64\%$   | $\geq 3.13\%$   |
|                              | $\geq 100 - <500$ kW |   | $\geq 3.19\%$   | $\geq 4.19\%$   |
|                              | $\geq 500$ kW        |   | $\geq 0.00\%$   | $\geq 0.00\%$   |
| Ground-mounted installations | Not specified        | $\geq 0.00\%$   | $\geq 0.00\%$   | $\geq 0.31\%$   |

Source: Bureau of Energy, Ministry of Economic Affairs, Taiwan. Completion of PV Tendering in 2011 Phase I. 2011b. Retrieved July 5, 2011, from [http://www.moeaboe.gov.tw/Policy/Renewable/news/SENewsDetail.aspx?serno=01116&TYPE\\_KIND=News](http://www.moeaboe.gov.tw/Policy/Renewable/news/SENewsDetail.aspx?serno=01116&TYPE_KIND=News)

Table 3: Altering PV FIT payment from 2010 to 2011

| Types of PV installations       |   | 2010<br>Tariff levels<br>(NTD/kWh)              | 2011<br>Highest Tariff<br>level in Phase III<br>(NTD/kWh) | Altering rate<br>(2010 to 2011) |
|---------------------------------|---|---|---|---------------------------------|
| Rooftop<br>installations        | $\geq 1$ - <10 kW<br>(Not installed by<br>building owner) | 11.1883<br>(14.603 if<br>included<br>subsidies) | 10.0894   | 30.91%                          |
|                                 | $\geq 10$ - < 100 kW                                      | 12.9722   | 8.8926  | 31.45%                          |
|                                 | $\geq 100$ - <500 kW                                      |   | 8.4544  | 34.83%                          |
|                                 | $\geq 500$ kW   | 11.1190   | 7.9701  | 28.32%                          |
| Ground-mounted<br>installations | $\geq 1$ - <10 kW   | 11.1883   | 7.3070  | 37.86%                          |
|                                 | $\geq 10$ - < 500 kW                                      | 12.9722   |   |                                 |
|                                 | $\geq 500$ kW   | 11.1190   |   |                                 |

Source: The authors

This considerable difference in FIT payment led to numerous complaints from PV operators (Yi Yang, 2011); apart from small domestic solar PV installations ( $\geq 1 \sim <10$  kW), all PV installations were conditionally eligible for FIT payment. Although the adoption of a tendering system is sensitive to the actual costs of PV energy power, the low-levels of payment restricted PV industrial development and caused uncertainty in the PV markets. The caps on total installed capacity even limited the financial support for new PV installations. Consequently, a conflict arose in the PV arena.

### 3. Assessment and suggestions

The purpose of FIT reform is to cope with the PV-boom phenomenon, balancing the needs between PV development and the public burden. Incorporating a tendering system into FIT schemes requires a sophisticated policy design to accurately predict technological development and estimate the costs of PV energy power. Effectively differentiating tariff levels by types of PV installations and categories is needed. Professionalism in FIT scheme decision-making committee plays an essential role here.

FIT reforms in France, Italy and U.K. led to an adoption of multi-level FIT rates divided by PV installed capacities and the integrated degree into buildings (Gao, 2011: 59). In contrast, Taiwan's experience of simply differentiating two types of PV installations into rooftop and ground-mounted ones was not sophisticated enough to respond to the diversity in PV facilitates. The 101 kW rooftop installations and the 499 kW one are substantially different when it comes to the cost, production, and detailed operation.

The use of a tendering system largely reduces the tariff levels in the FIT payment scheme, causing PV investors' concerns. Considering the progression of the consumer price index (CPI) in Taiwan, the government should adopt a regular progression mechanism in response to the changes of the general economic environment. France's progression mechanism applied rates as high as 80% of the changes of CPI (Couture, 2010), whereas the U.K. government used a flexible progression rate depending upon retail price index (RPI) in the measured year (The U.K. Tariff Levels Table, 2011).

In conclusion, some suggestions are provided to enhance Taiwan's FIT reform. Instead of simply dividing PV facilitates into rooftop and ground-mounted installation, a more sophisticated design is needed for accurately estimating the costs of PV power and effectively setting up FIT tariff levels as well as caps. In addition, a regular progression tool might be useful to mitigate the consequence of tendering system against

PV industrial development, and, simultaneously, take into account the public burden and situation in electricity environment.

#### 4. Acknowledgements

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