

Study on the Feed-in Tariff Rates for Renewable Energy in Hong Kong

Executive Summary

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Electrical and Mechanical Services Department

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1. Executive summary

1.1. Review of FiT regimes in other jurisdictions

1.1.1. Background of review

We (Atkins) were commissioned to study on the Feed-in Tariff (FiT) Rates for Renewable Energy (RE) in Hong Kong. We have carried out a review and analysis of the FiT regimes covering Australia, Germany, Japan, the UK, and Taiwan; and to understand the FiT rates for RE when FiTs were introduced and how they have changed with time. The renewable technologies considered were solar photovoltaic (PV), small scale wind and combined heat and power by biogas and biodiesel.

1.1.2. Findings of review

Use of levelised cost of electricity (LCOE) model

The most commonly adopted approach for the initial calculation of FiT rates is through a levelised cost of electricity (LCOE) model. This method is used in Germany and the UK with Taiwan using a simplified LCOE. The LCOE is a measure of the overall cost (including capital investment and operational costs) required to generate a unit of electricity from a given generation technology including RE, usually expressed in cost per kilowatt hour (\$/kWh) of generation. If FiT rate is set to the LCOE of a renewable technology, and paid to the RE generators over the same period as the LCOE was calculated, the RE generators should expect to recover the costs invested.

The LCOE of a renewable technology often vary by technology and installed capacity. Often, smaller projects have higher LCOE owing to higher unit cost of equipment and installation (on a \$/kW basis) and lower levels of power generation.

The advantage of using LCOE modelling is the clarity and transparency it provides for investors of RE.

Use of gross-metering approach for FiT

The calculation of LCOE and hence the application of FiT can be based on either gross-metering (paid for every unit of generated electricity) or net-metering (paid for the excess electricity exported to the grid only). Most of the jurisdictions covered in the review such as Germany, the UK and Taiwan have applied a variant of the gross-metering approach.

Other findings

For the jurisdictions under review, the ratio of initial FiT rate to residential tariff at the year of first launch for PV ranged from about 1 to 4.5 as shown in the table below.

Table 1-1 Ratio of initial FiT rate to residential tariff at the year of first launch for PV in the reviewed jurisdictions

Jurisdictions	Year of first launch	Initial FiT rate at the year of first launch ⁽¹⁾	Residential tariff at the year of first launch ⁽¹⁾	Ratio of initial FiT rate to residential tariff at the year of first launch
Germany	1991	8.5 EUR c/kWh ⁽²⁾ (0.8 HK\$/kWh)	9.4 EUR c/kWh ⁽²⁾ (0.9 HK\$/kWh)	~1
Australia	2010	60 AUD c/kWh (4.3 HK\$/kWh)	21.55 AUD c/kWh (1.5 HK\$/kWh)	~3
Taiwan	2010	11.8 NTD/kWh (2.9 HK\$/kWh)	2.61 NTD/kWh (0.6 HK\$/kWh)	~4.5

Jurisdictions	Year of first launch	Initial FiT rate at the year of first launch ⁽¹⁾	Residential tariff at the year of first launch ⁽¹⁾	Ratio of initial FiT rate to residential tariff at the year of first launch
UK	2010	42.7 p/kWh (5.1 HK\$/kWh)	10.86 p/kWh (1.3 HK\$/kWh)	~4
Japan	2012	39 JPY/kWh (3.8 HK\$/kWh)	22.01 JPY/kWh (2.2 HK\$/kWh)	~2

Note 1: All equivalent HK\$ are based on the exchange rate in the respective years.

Note 2: Assuming 1DM = 0.51EUR

The eligible technologies for the receiving of FiT within the jurisdictions reviewed vary. PV is eligible for FiT in all of the jurisdictions under review. Wind is an eligible technology in Germany, Japan, the UK and Taiwan; while combined heat and power by biogas is found to be only eligible in Germany and the UK.

Our review found that the range of FiT rates can vary largely among jurisdictions. As an example, the current FiT rate for small scale PV installations of less than 10kW capacity varies between HK\$0.27/kWh in the UK to HK\$1.89/kWh in Japan. The variation in FiT levels is owing to the differences in the method of determination such as the underlying LCOE modelling of the capital investment and operational costs (implicitly the assumed costs of materials, labour, expected rate of return, tax, insurance, uptake of renewable technology, etc.) and other factors such as policy considerations and acceptable level of incentivisation of RE within individual jurisdiction as well as the maturity of the FiT regime. It is therefore not possible for us to draw direct comparisons with the FiT levels of other jurisdictions although useful practice and lessons can be learnt from these regimes.

The review of the lifespan assumptions applied to relevant installations was through international research as well as manufacturers' data sheets. Our recommendations based on this research are summarised in Table 1-2 below:-

Table 1-2 Summary of recommended lifespan by technology

Technology	Recommended Range (years)
Solar PV	25-30
Onshore wind	20-25
Combined heat and power	20-25

1.2. Determination of FiT rates for Hong Kong

1.2.1. Details of study

We have also carried out a LCOE assessment for a range of renewable technologies relevant to Hong Kong for determining the applicable FiT rates. Major assumptions of assessment are as follows:-

- FiT rates are applied on gross-metering basis
- The LCOE is calculated over 10 years. This means that, in theory, if FiT rates are set at the same value, the investor will see a payback in 10 years
- 4% is used as the real discount rate in the model

The results of this LCOE assessment for FiT rates determination are presented below:

Table 1-3 Summary of initial indicative FiT rates from LCOE modelling

Technology	LCOE (HK\$/kWh)	Payback year
PV \leq 10kW	4.9	10
10kW < PV \leq 200kW	3.8	10
200kW < PV \leq 1MW	3.1	10
Wind \leq 10kW	7.0	10
Combined heat and power (biogas)	1.4	10

1.2.2. FiT Rates Determination

The LCOE model for determination of the FiT rates for Hong Kong has included the following considerations:

- FiT rates are determined after review of LCOE results for each renewable technology and its capacity band;
- The recommended FiT rates will be applied for a maximum of about 15 years (having regard to the regulatory regime in Hong Kong), at rates set to be equal to the LCOE calculated over a 10-year period. All additional revenue after the 10-year payback period will belong to the investors of RE;
- Regular periodic reviews of the FiT rates will be undertaken to ensure new customers into the FiT scheme are receiving a proportionate and fair benefit from payments and having regard to changes in costs in installing and maintaining RE systems; and
- Inflation has been taken into account.



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