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Renewable energy feed-in tariffs

Methodological note for data compilation

Prepared for the Working Party on Climate, Investment and Development (WPCID)

This is a methodology note to accompany a dataset to be regularly published on OECD.stat - the OECD's data portal.

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1. Introduction

Feed-in tariffs (FITs) are prevalent support policies for scaling up renewable electricity capacity. They are market-based economic instruments, which typically offer long-term contracts that guarantee a price to be paid to a producer of a pre-determined source of electricity per kWh fed into the electricity grid.

Given the importance of FITs for the deployment of renewable electricity in many countries, it is essential to consider them in qualitative and quantitative analyses of environmental policy and the energy sector. The OECD dataset on renewable energy feed-in tariffs has the objective of supporting cross-country studies in this field. The dataset provides FIT values which were derived in a manner that is comparable across countries, years and renewable energy sub-sectors.

The dataset includes country-level values on the tariff (in current USD/kWh), and length of the awarded power-purchasing agreement. They cover the period between 2000 and 2019 and include all OECD and G20 countries, including all countries of the European Union. The dataset also covers seven renewable electricity sub-sectors: wind, solar photovoltaic (concentrated solar power (CPS)_is excluded unless included in a common solar tariff), geothermal, small hydro, geothermal, marine, biomass and waste.

The initial version of the FIT dataset was developed by an ad-hoc research consortium led by the OECD. The dataset is now fully maintained by the OECD secretariat, drawing on government sources (e.g. websites or official documents) and information from research institutes. In addition, the data are cross-checked against other renewable energy policy databases (e.g. REN21, IEA/IRENA, OECD PINE).

FIT rates often vary within a sub-sector, typically across technology type and installed capacity. Therefore, the values presented here are often aggregated at the sub-sector level as a mean value over many data points; as such, these data should not be used to gauge specific payments for a renewable electricity project, or as basis for a cost-benefit analysis of a particular renewable electricity investment. Rather, these data can be interpreted in the context of a country-level levelised cost of electricity (LCOE) exercise, or as a broad indicator of government support for renewable electricity use.

This note provides definitions and methodological details of the data collection and aggregation process. For further details on the methodology and applications of previous versions of this dataset, please consult the following references:

Röttgers, D. and B. Anderson (2018), "Power struggle: Decarbonising the electricity sector", OECD Environment Working Papers, No. 139, OECD Publishing, Paris, https://doi.org/10.1787/900f4c72-en.

Prag, A., D. Röttgers and I. Scherrer (2018). “State-owned enterprises and the low-carbon transition”, OECD Environment Working Papers, No. 129, OECD Publishing, Paris. http://dx.doi.org/10.1787/06ff826b-en

Ang, G., D. Röttgers and P. Burli (2017), “The empirics of enabling investment and innovation in renewable energy”, OECD Environment Working Papers, No. 123, OECD Publishing, Paris. http://dx.doi.org/10.1787/67d221b8-en

Haščič, I., M. Cárdenas Rodríguez, R. Jachnik, I. Silva and N. Johnstone (2015), Public Interventions and Private Climate Finance Flows: Empirical Evidence from

Renewable Energy Financing, OECD Environment Working Papers, No. 80, OECD Publishing, Paris. http://dx.doi.org/10.1787/5js6b1r9lfd4-en.

Cárdenas Rodríguez, M. I. Haščič, N. Johnstone, J. Silva and A. Ferey. (2014), Inducing Private Finance for Renewable Energy Projects: Evidence from Micro-Data, OECD Environment Working Papers, No. 67, OECD Publishing, Paris. http://dx.doi.org/10.1787/5jxvg0k6thr1-en.

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2. Definitions

Feed-in tariff values

These values reflect the payments mandated in laws and regulations and defined further in power purchase agreements (PPAs). Typically, values reported in this category are averages for a year and country over different categories within one technology sub-sector. Different values for sub-sectors are always separated. Payments recorded are always the value for a new installation in a given year, i.e. do not include current values of contracts from previous years. In this dataset, the few relevant feed-in *premiums* (FIPs) are recorded as if they were feed-in *tariffs*. FITs are presented in current USD/kWh.

Some countries offer tender-based support schemes, which are excluded from this FIT dataset when the corresponding tariff is determined through a bid. However, some schemes labelled as tenders do not require developers to go through a bidding process and are therefore considered here (e.g. the FIP support policy in Hungary active in 2019).

Length of the PPA awarded under a feed-in tariff policy

These values measure the length of the corresponding PPA in years. The PPAs limit the payment of FITs over time and are included in virtually all feed-in tariff programs. While the FIT data does not account for built-in degression of payments, a degression to zero is recorded as an end of the contract.

FIT data are reported for seven selected categories of renewable energy:

- Biomass: See section “technology types”.
- Geothermal: This includes all FITs for geothermal electricity plants.
- Marine: This includes all FITs for marine and tidal electricity plants, but excludes any hydro plant.
- Small-scale hydropower: This includes FITs for electricity plants relying on hydrology up to and including 50 MW plant capacity.
- Solar: This category includes FITs for solar photovoltaic, but excludes all other forms of solar such as Concentrated Solar Power (CSP).
- Wind: This includes both offshore and onshore wind. The averaging strategy described below applies to these categories as well.
- Waste: See section “technology types”.

3. Measurability

The calculation of a mean country-year-sector value of FITs is often based on multiple dimensions. For the purpose of aggregation, a straightforward solution is preferred, i.e. often a re-categorisation or using mid-points/averages of the different dimensions. Here is a list of the most important methodological choices made for the construction of this dataset:

- *Technology types:* Most FITs apply to technologies such as wind, solar and hydro separately. However, FITs are not always set for some specific technology types. For example some FITs include certain forms of waste, like gases and trash burning, and few include geothermal and marine energy specifically. In the case of waste, if no other waste types are present, landfill gas is chosen representatively for all waste feed-in tariffs. If FITs for many waste types are present, the midpoint between all categories is chosen. Waste categories include but are not limited to anaerobic gases, sewage gases, biomass waste (as opposed to "biomass" or "renewed biomass" which are included in the biomass category) and municipal waste-fired plants. In cases where certain technologies (e.g. geothermal or marine) are not explicitly distinguished in the coverage of the policy, these values are assumed to be zero.
- *Capacity and scale:* If a policy distinguishes between different capacity brackets, FITs for projects with a capacity below 1MW are excluded, except for onshore wind power plants where all tariffs are included for the calculation of the mean FIT. Note that the scale of the projects is not always expressed in capacity bracket (in kW), but also by use, e.g. household vs. industrial or small-scale vs. large-scale. In that case, only the values for the large scale or for industrial, commercial or utility-scale projects were included. Similarly, countries' micro-FiT policies have been excluded. Micro-FiT policies are specifically targeted at private households, and are likely (and sometimes legally) relevant only for small-scale capacity ranges. This avoids capturing tariffs targeted at the small-scale or home-owners; for example ground-mounted solar tariffs were prioritised over rooftop solar if otherwise no distinction was made in terms of capacity. Given the difference in size and number of roof-mounted and ground-mounted solar PV, a simple average would likely have distorted the tariff.
- *Tariffs vs. premiums:* Some countries, for example Finland and the Netherlands, do not have a fixed-price tariff, but rather pay a premium-price on top of the market price, also known as Feed-In-Premium. In line with the literature (NREL and US Department of State, 2010), this is considered to be equivalent to a FIT. For countries with a cap on the premium-price FIT, recorded tariff is midpoint between guaranteed price and maximum subsidy. For countries with a cap-less premium-price FIT, the premium is added to the average market price when the regulator reports the market price (often when forecast market prices are used in FIP calculation). When neither cap nor market price is reported, the tariff recorded is the guaranteed price. Specifically, the premium is added to a given year's average electricity market price for industrial (i.e. non-household) consumers. End-consumers' prices are disregarded since they include the VAT, which accrue to the state, not to the electricity producer, and thus are not an investment incentive.

- *Sub-national levels:* For India, the United States and Canada, sub-national differences play an important role. In such cases, feed-in tariff values are averages of relevant tariffs of states or provinces that had a FIT in at least one year since 2000, weighted by the energy generation (in MWh) in the respective states or provinces to account for the size and therefore impact on the overall country's investment attractiveness. In the case of US, all states listed as ever having had a FIT are included in the average, even if it was not for large-scale. Note that this is the only instance of weighting in the dataset.
- *Timing of provision:* FIT values that vary according to peak hour, off-peak and valley demand are aggregated using mid-points.
- *Degression types and periods:* FITs are sometimes designed to have a decreasing tariff over time (a.k.a. degression). The majority of tariffs do not degress over the years by default, but some have a yearly decay rate, and in few cases monthly and quarterly degression exists. If policies include a degression within the PPAs of tariffs over the lifetime of a plant, only the starting value for the first year of the lifetime of a plant is recorded.
- *Modes of connection to the grid or technical details*: If modes or technical details not already mentioned put payments in different brackets, small modes (e.g. special tariffs for islands) are ignored, and otherwise values are midpoints.