2022 Taiwan CPPA market report

PwC Taiwan New Energy Business Services

pwc

Executive summary

Transitioning to renewable energy (RE) has become crucial for companies in order to achieve net zero targets.

In Taiwan, RE procurement became possible after certain recent regulatory changes. First, the Electricity Act was amended in 2017 to allow RE producers to sell energy to end users through direct supply or wheeling. Then, the Renewable Energy Development Act (REDA) was amended in 2019 to establish the regulatory framework for the corporate sourcing of RE,

The amended REDA designated public utility Taiwan Power Company (TPC) as a backstop to purchase excess renewable energy, at a set feed-in-tariff (or bid price if applicable), when supply outstrips the demands of corporate customers. However, if take-or-pay is included in a Corporate Power Purchase Agreement (CPPA), the corporate buyer may need to compensate for the difference between the procurement price and TPC's offtake price for any surplus power that remains unused.

Total RE wheeling in Taiwan exceeded 1.1TWh in 2022, with onshore wind power and solar representing 80% and 17% respectively. Currently, around 40 RE retailers facilitate renewable energy trading and their numbers are increasing.

Under Taiwan's current wheeling scheme, both suppliers and end users need to consider their power generation and usage patterns to minimise the proportion of surplus power in order to be economically viable. Until a spot market is established, collective electricity procurement may help mitigate surplus power and enhance user credits.

Lastly, companies are encouraged to use PwC's RE Procurement Dashboard to help establish their RE procurement plans, review the time-of-use public utility plan adopted. and estimate their total energy costs.

Taiwan demand for renewable energy from off-takers and suppliers has grown rapidly

RE demand has increased rapidly

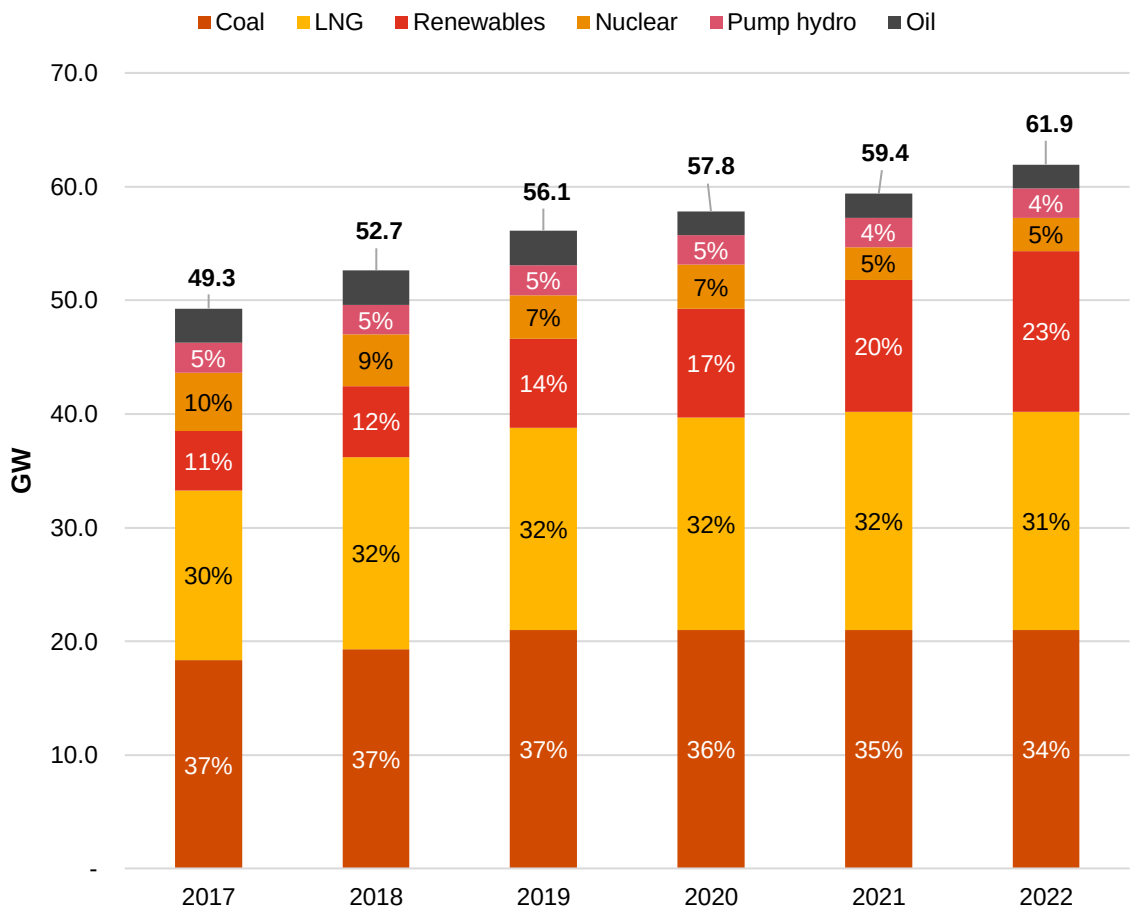
- RE100 commitments
- EIA commitments
- ESG ratings
- Heavy electricity user rules
- Supply chain requirements
- Carbon border adjustment mechanism (CBAM)

RE supply has grown steadily

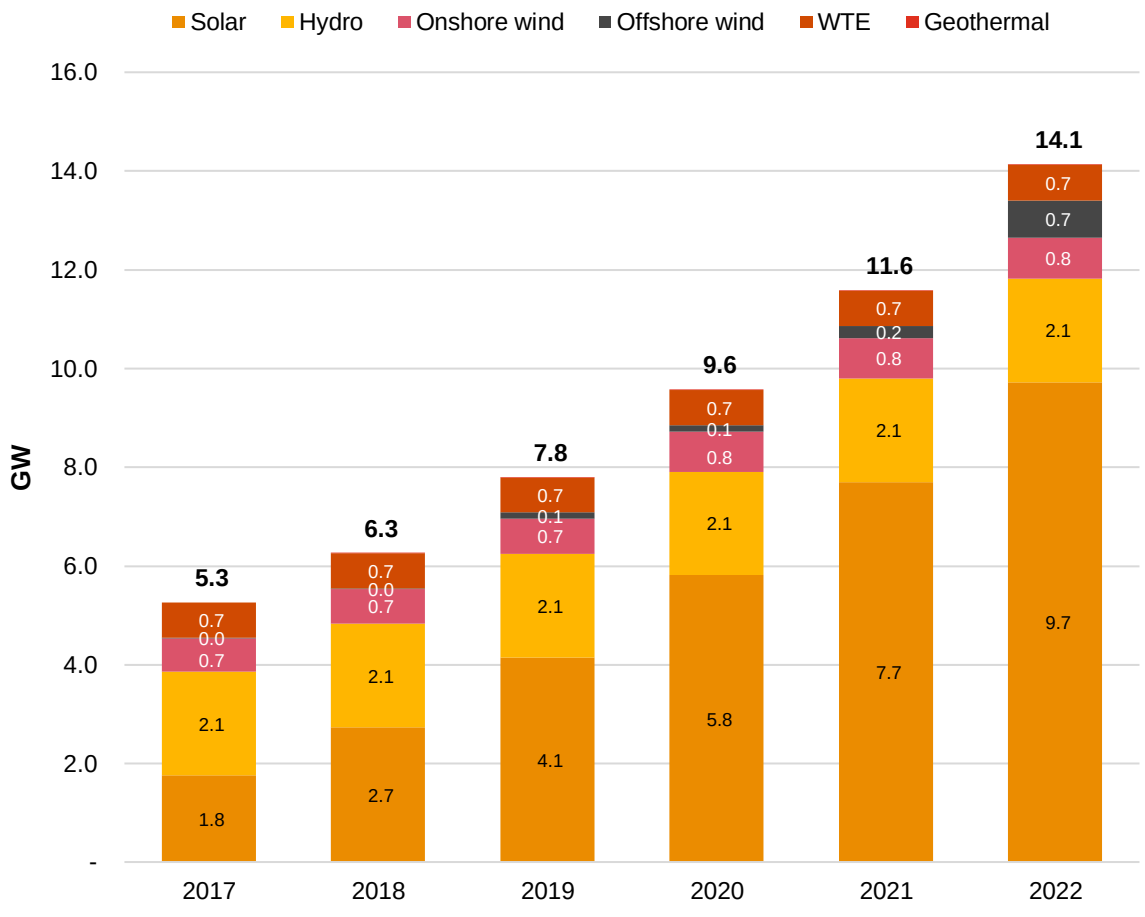
- Generators and retailers
- Phase 3 of offshore wind development

Total power capacity reached 62 GW in 2022, with renewables accounting for 23%

Total power capacity in Taiwan



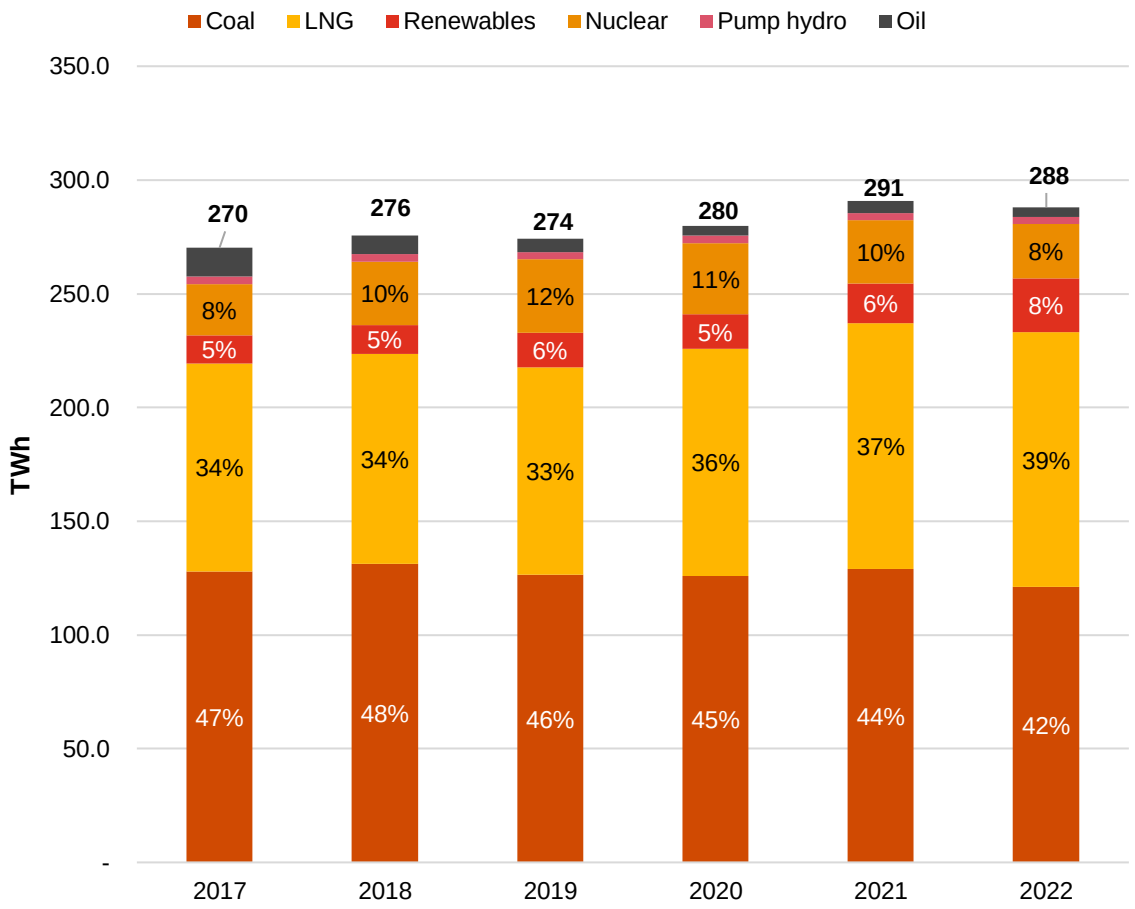
Renewable energy capacity



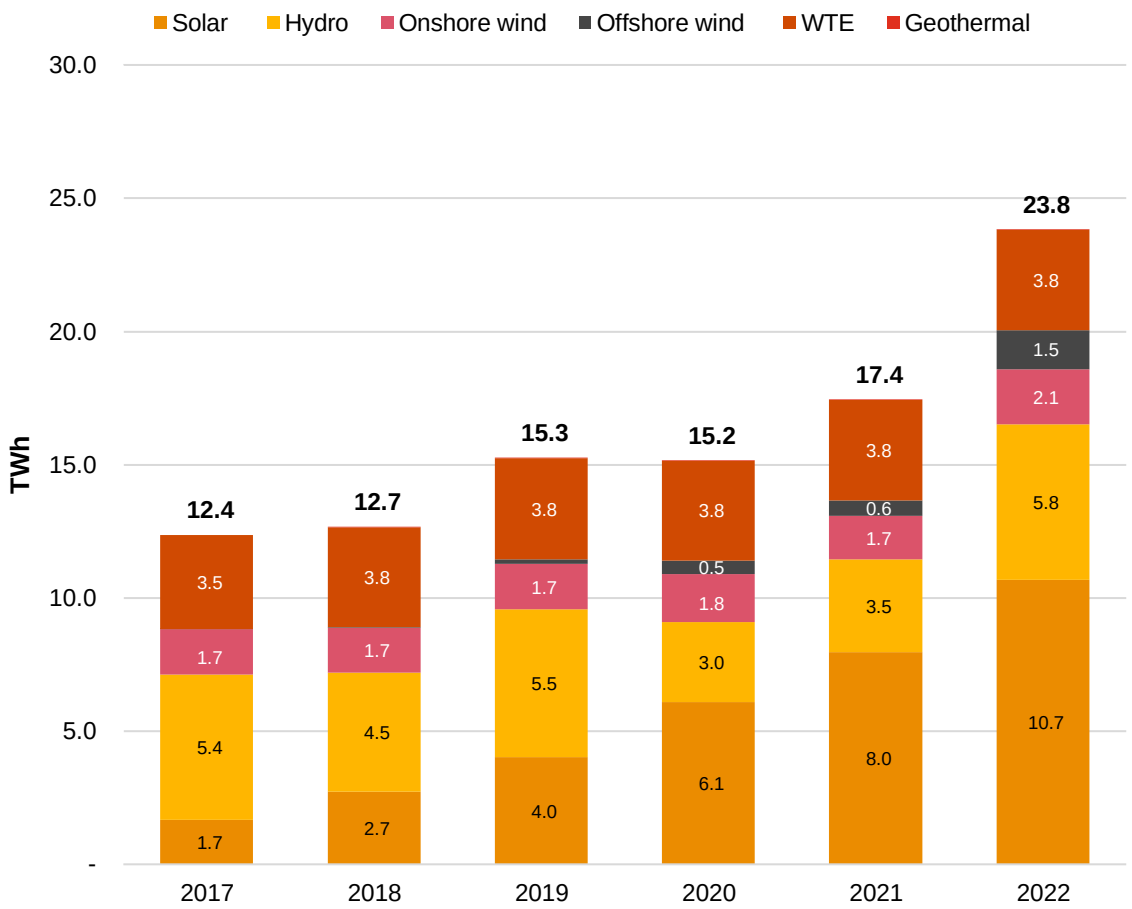
Source: BOE, PwC analysis

Total power generation reached 288 TWh in 2022, with renewables accounting for 8%

Total power generation



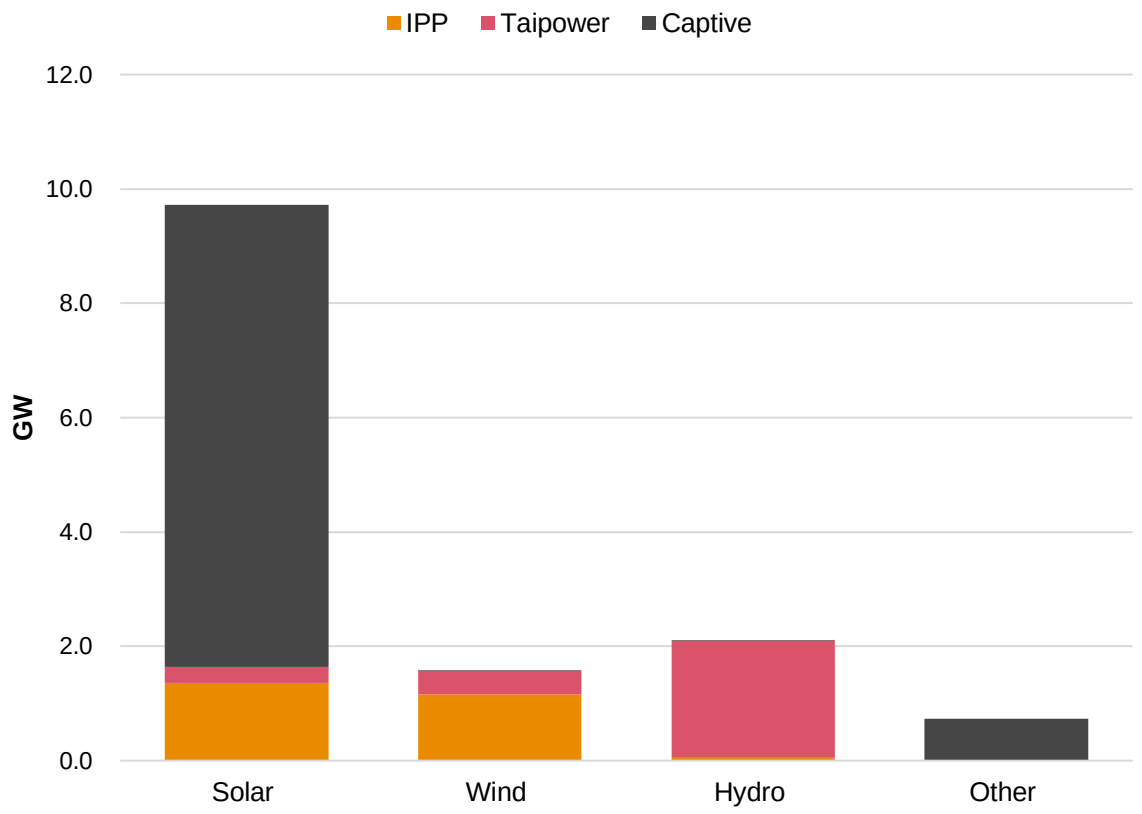
Renewable energy generation



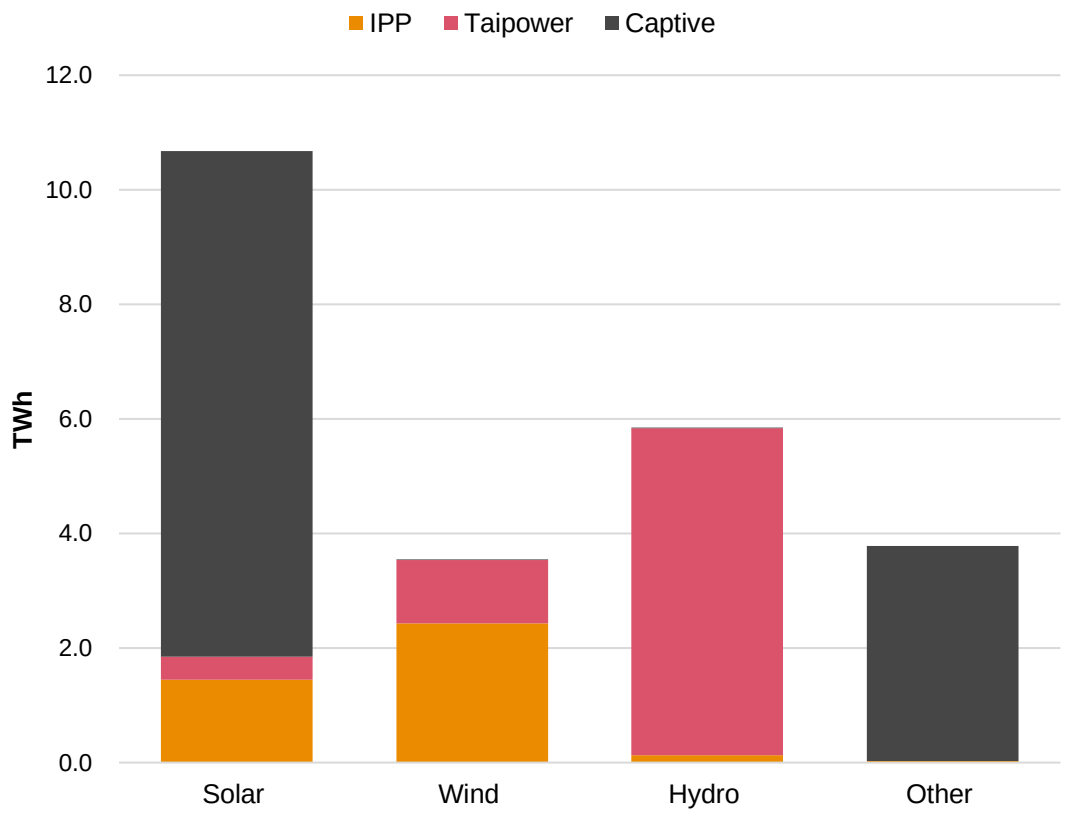
Source: BOE, PwC analysis

The primary RE source is solar energy; captive generators account for 80% of solar power

2022 Renewable energy capacity



2022 Renewable energy generation

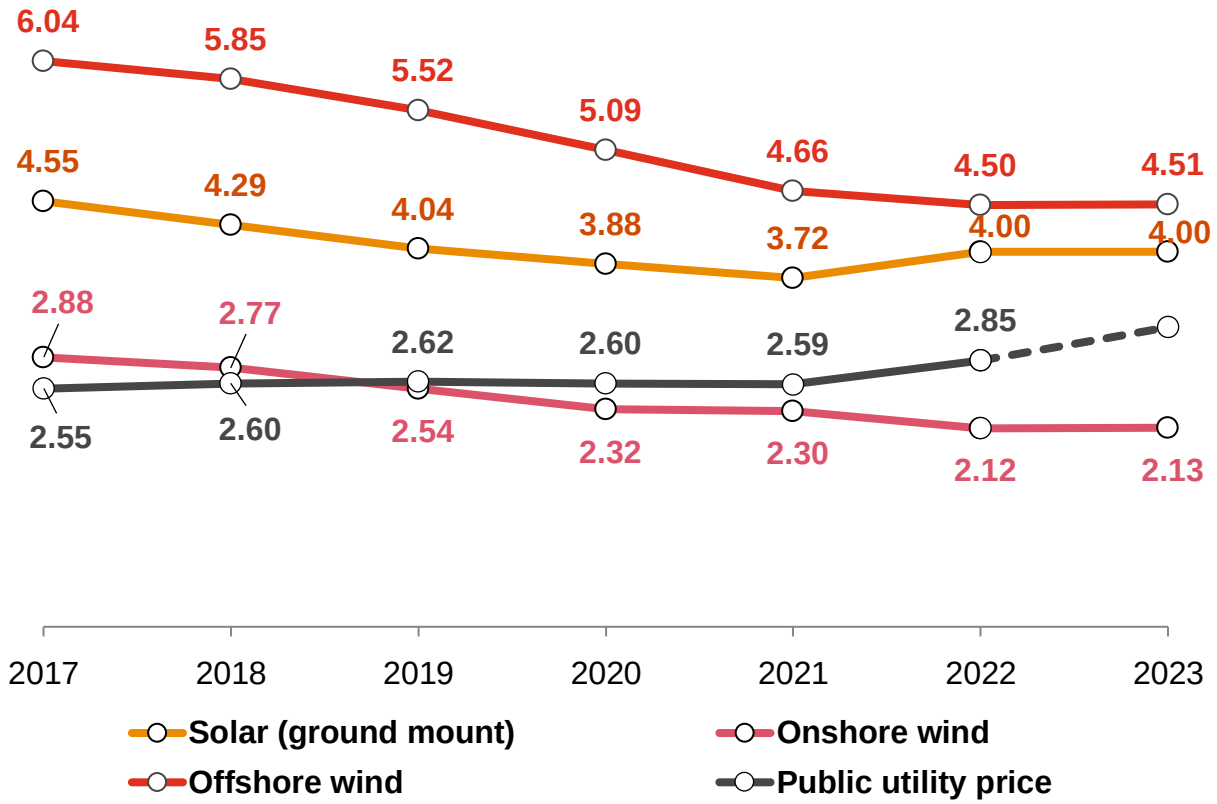


Source: BOE, PwC analysis

Feed-in tariff and public utility price trends

- Since the enactment of the REDA in 2009, FiT rates are annually reviewed by an independent panel hosted by the Bureau of Energy (BoE) of the Ministry of Economic Affairs, which are based on consideration of technology, construction, operation and maintenance costs. All qualified renewables enter a 20-year power purchase agreement at a set FiT (or bid price if applicable) with public utility TPC.
- Due to global supply chain issues during the Covid pandemic, material and construction costs have increased sharply. In order to reach its RE targets, the BOE set 2023 FiT rates at flat or higher levels.
- To promote renewable energy development, aside from FiTs, additional subsidies may be available for projects with grid enhancement costs, sub-stations, or sited on multi-use land (mainly for solar projects).
- Driven by high fuel costs and the commissioning of high FiT renewable generation assets, public utility prices may face pressure to increase further in 2023, which in turn would reduce the gap with CPPA tariffs.

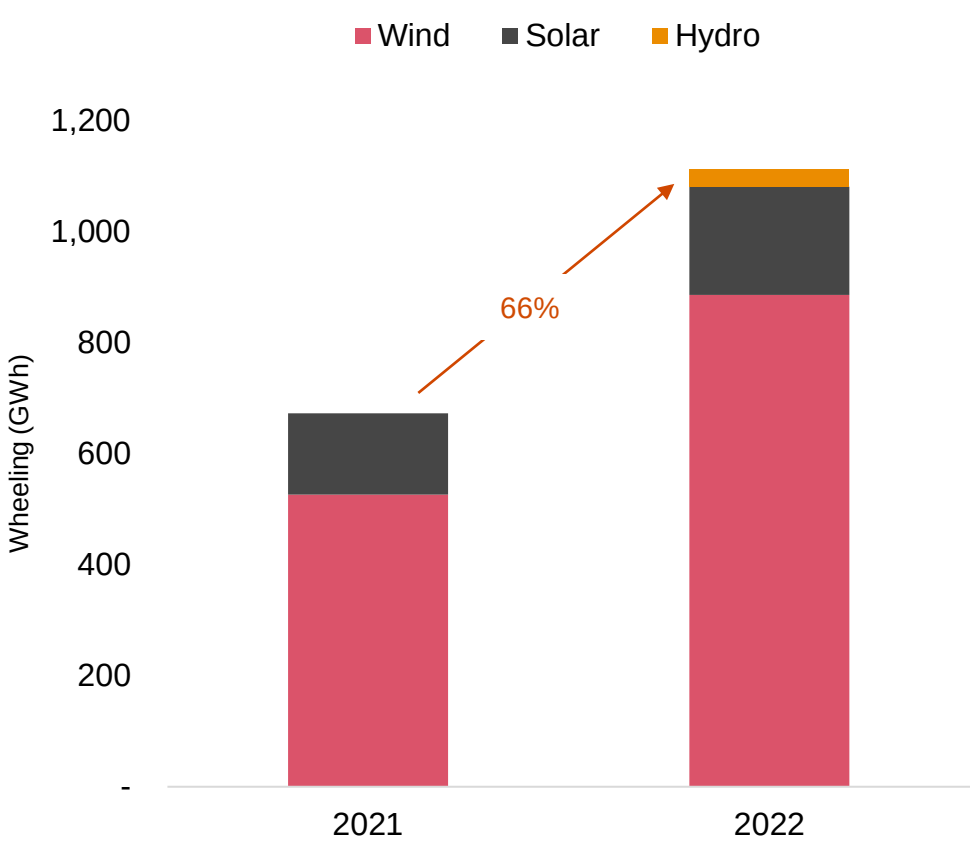
Public utility price and feed-in-tariffs (per kWh)



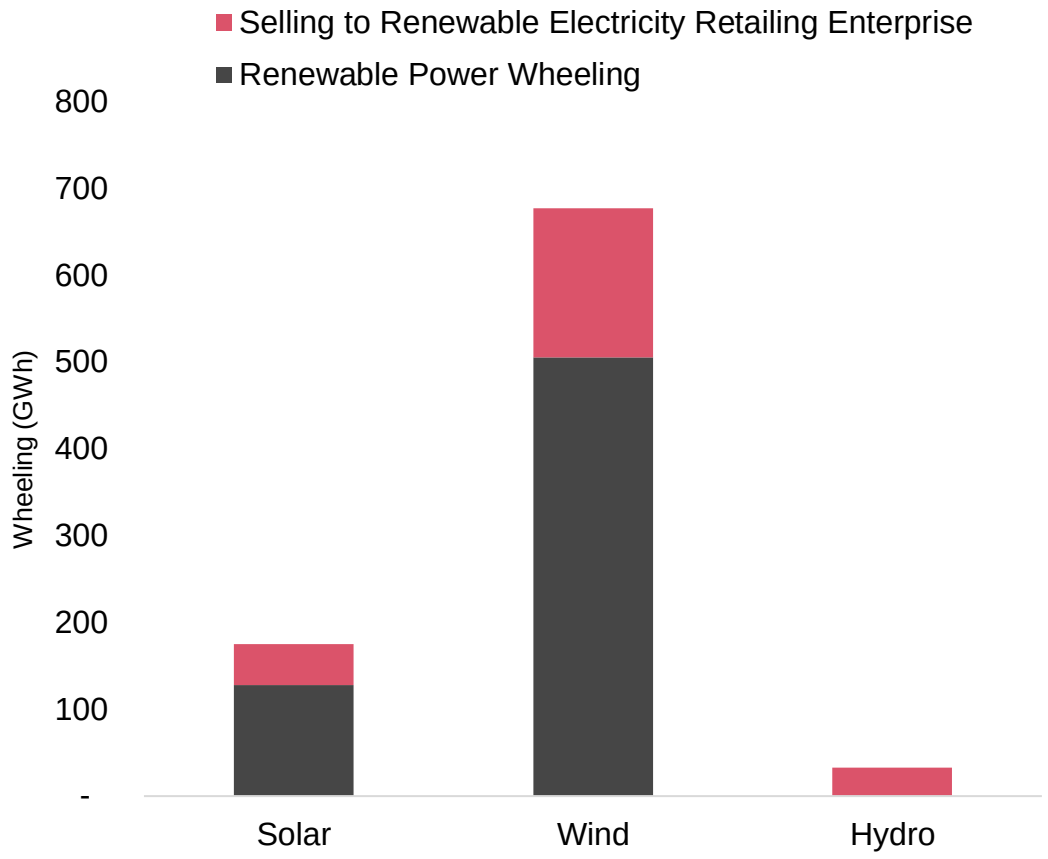
Source: TPC annual report, PwC analysis
Note1: The public utility price includes transmission and distribution costs
Note2: The feed-in tariff for renewable energy only includes energy costs

RE wheeling reached 1.1 TWh in 2022, with wind accounting for 60% of the total

Total wheeling for renewable energy



Wheeling by type of renewable energy 2022



Source: BOE, PwC analysis

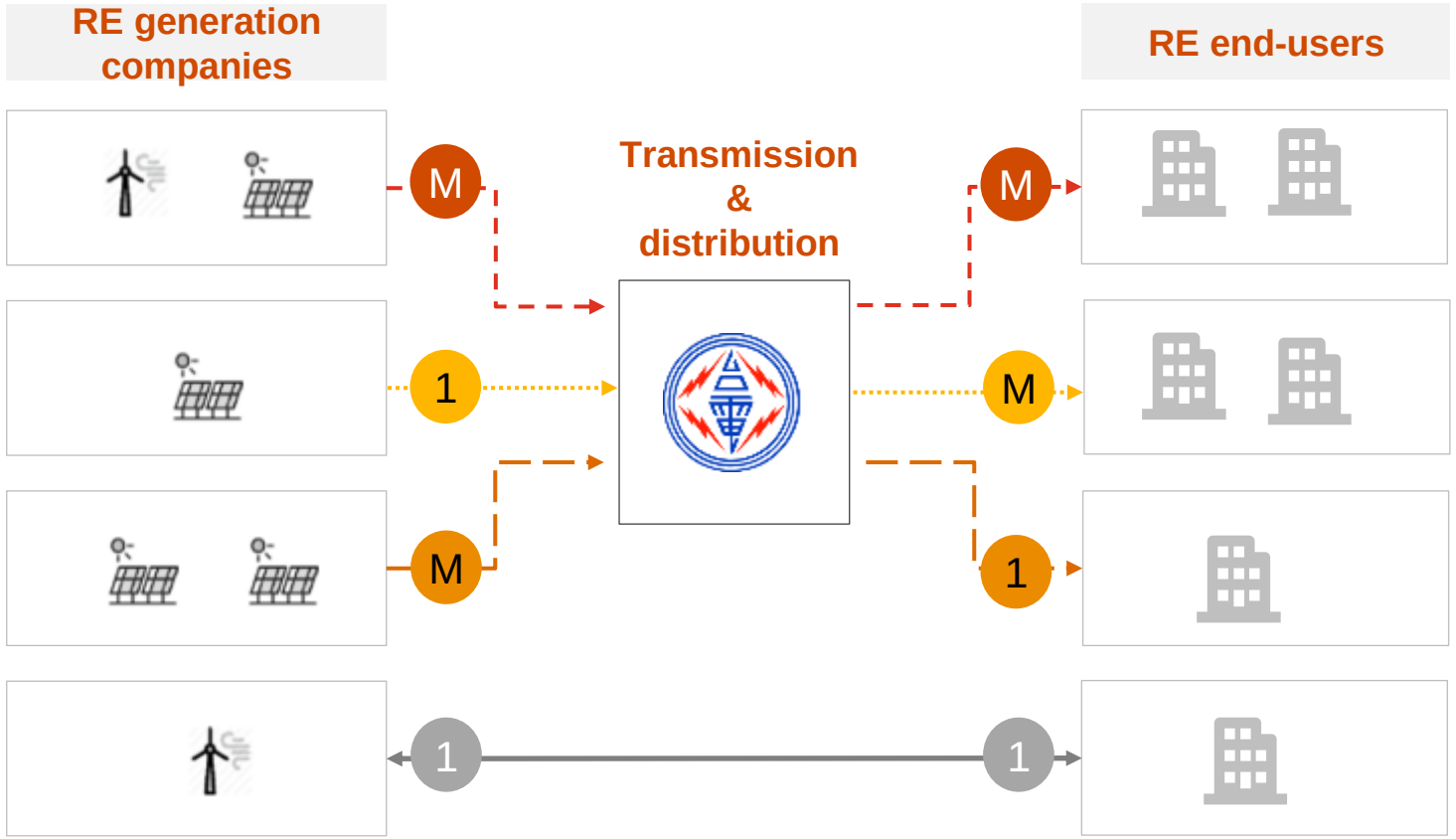
Appendix 1

RE procurement guidance

RE wheeling through TPC based on meter serial numbers

In Taiwan, physical power purchase agreements are used under the current wheeling scheme. Electricity is distributed through TPC based on meter serial numbers (MSNs). Currently, RE wheeling takes place via the following four methods:

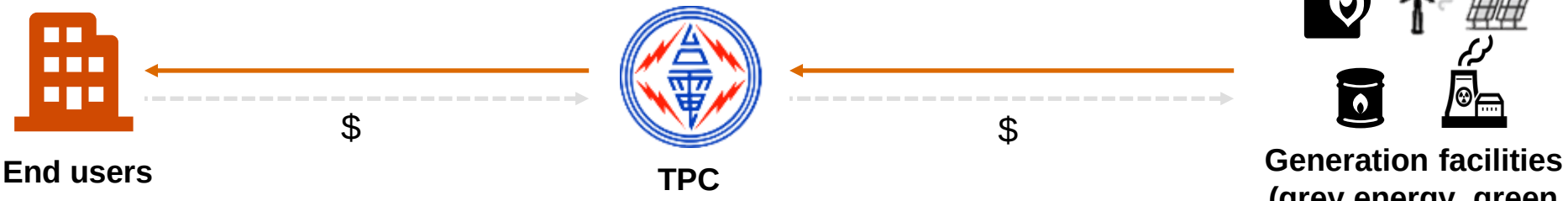
- Many-to-many (M-M): Multiple power plants wheeling based on MSNs.
- One-to-many (1-M): One power plant wheeling based on MSNs.
- Many-to-one (M-1): Multiple power plants wheeling based on a single MSN.
- One-to-one (1-1): One power plant wheeling based on a MSN.



Source: PwC analysis

Current electricity procurement flow

Traditional electricity procurement flow



TPC's CO_2 emission of around 0.509 kg per kWh in 2021

In Taiwan, before the RE trading market was liberalised, all electricity generated was sold to TPC and distributed by it to end-users based on public utility prices.

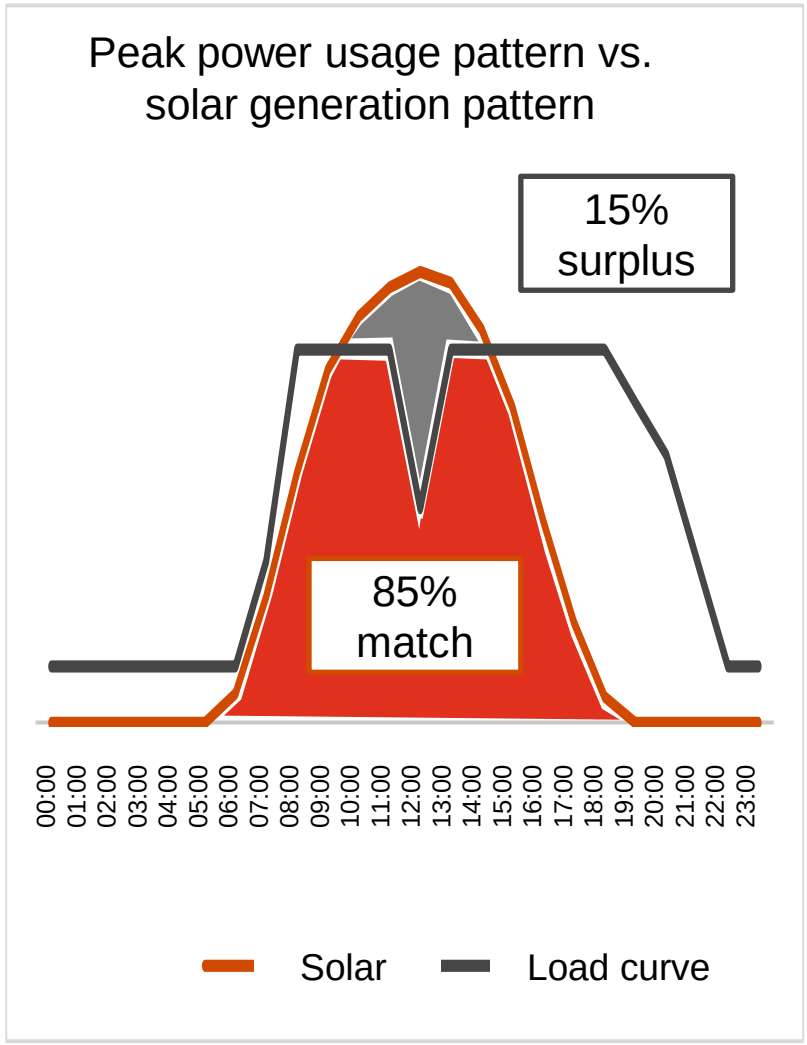
RE procurement flow

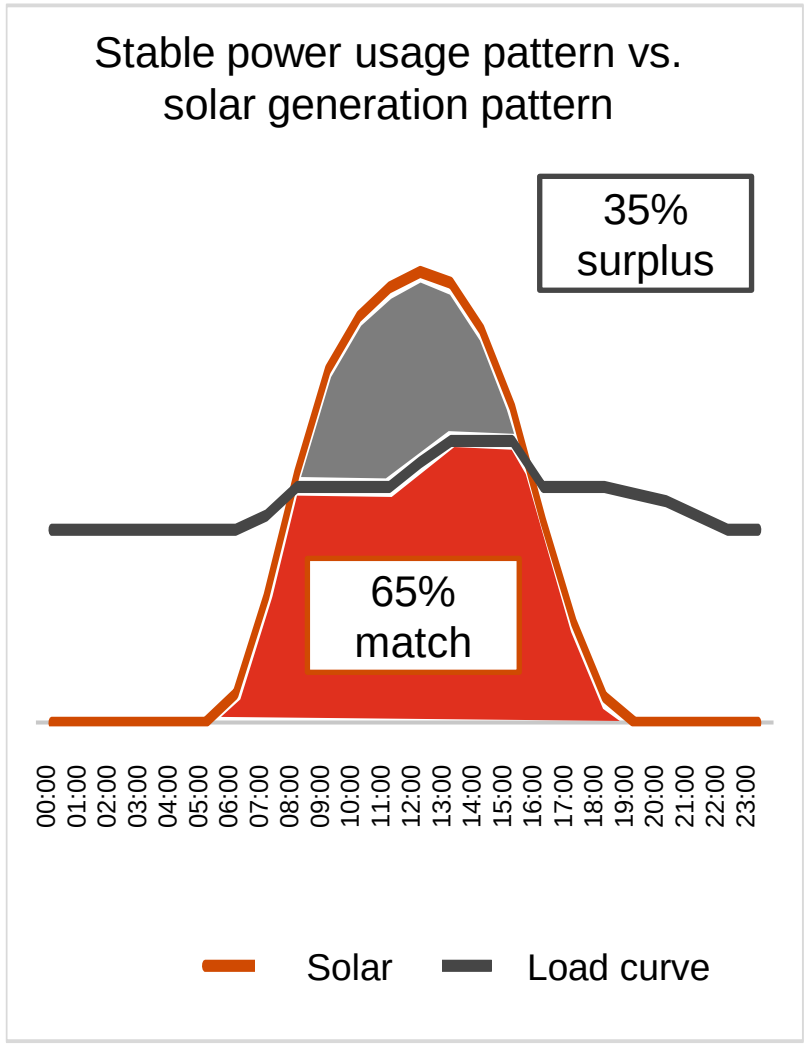
Source: PwC analysis

Generated RE can be directly sold to end-users or retailers at a mutually agreed price through wheeling. Surplus power can only be sold to TPC at a FiT rate (or bid price if applicable). TPC, as the public utility, will supplement the unfulfilled electricity demand of users.

Electricity — Negotiated price — Regulated tariff

Off-takers should evaluate their own power usage information to increase their renewable energy utilisation ratio and at the same time reduce surplus power





Surplus power issue:

- Under the current wheeling scheme, if RE generation is higher than demand, the surplus power will be sold to TPC at the applicable FiT rate or tender price.
- If take-or-pay is included in a CPPA, the buyer may need to compensate for the difference between the procurement price and TPC's offtake price for any surplus power that remains unused.

Before an RE wholesale market is established in Taiwan, as most liberalised power markets already have done, end-users may adopt group electricity procurement to mitigate the issue of surplus power.

Source: PwC analytics

Advice on RE procurement

1 Collect current power information

- Meter serial number (MSN): MSN amount, MSN representative, capacity signed with TPC
- Power usage pattern: Charging scheme, voltage,
- Power usage at peak, half-peak, off-peak
- Power bill charging formula and cost: Time of use, meter rate, flat rate

2 Confirm RE procurement plan

- Fulfill supply chain carbon emission reduction needs, ESG agreement, high power user regulations, environmental agreement, reduction in carbon border tax reduction, requirements to be included in RE100
- Reach RE ratio targets by 2025, 2030 and 2050

3 Understand different RE types

- Price
- Generation pattern
- Comparability with own power usage pattern

4 Establish RE procurement team

- Understand current RE market and future power demand by corporate sector
- Evaluate commercial and financial impact on long-term procurement in one contract, procurement with different stages and procurement delays
- Engage with operations, finance, legal, marketing tams and board of directors, etc.
- Consult third-party experts

5 Negotiate RE procurement on commercial terms

- Customise RE procurement price and contract, settlement on procurement time frame, guaranteed procurement capacity, credit support, charging schedule, certificate application, risk of delays, surplus generation, etc.

6 Implement RE trading and wheeling

- Monitor plants' development progress, power certificate application progress, and progress of later application for TPC wheeling

Appendix 2

RE procurement dashboard

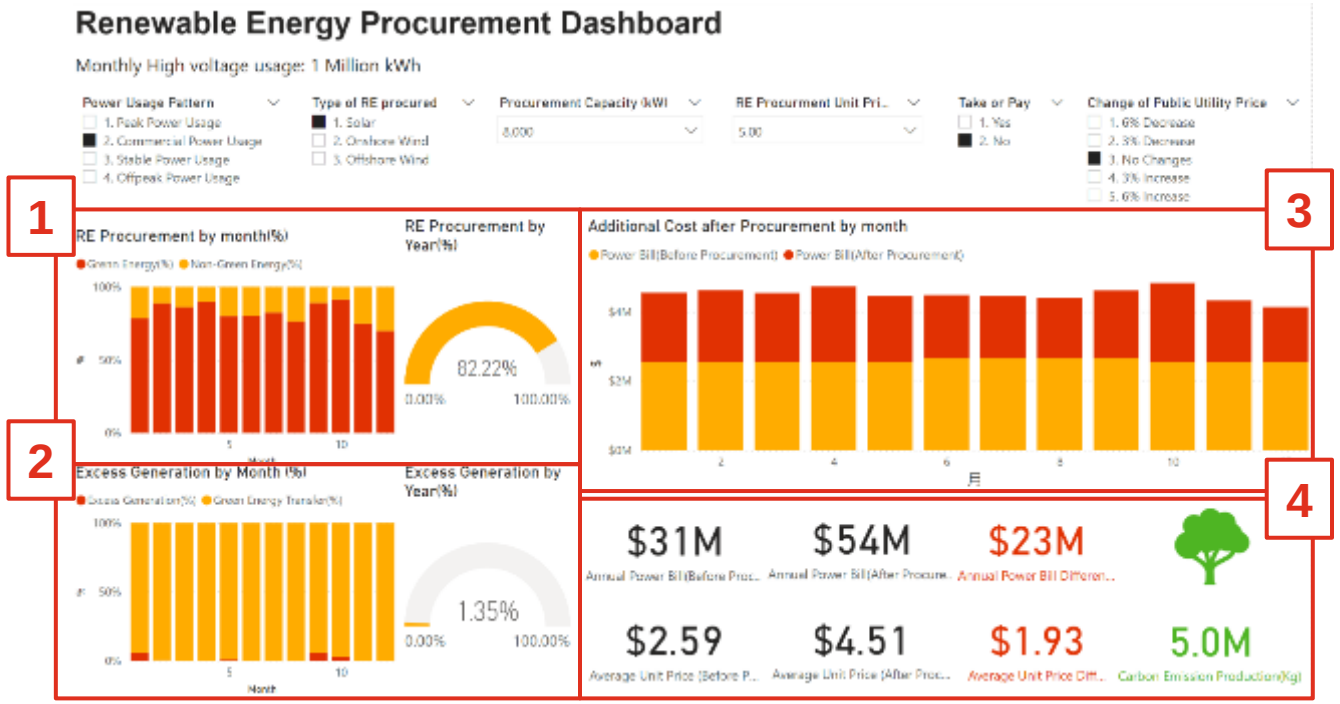
PwC's RE Procurement Dashboard

PwC's RE Procurement Dashboard is designed to assist companies to establish RE targets and related procurement plans. Assuming a high-voltage meter of one million kWh per month, users can select their power usage pattern, the RE type to be procured, the capacity to be procured, and energy prices. Using the dashboard, corporate users and suppliers can measure their RE proportion ratio, surplus power ratio, procurement cost, and carbon emissions after procurement.

Steps:

Select power usage pattern → **Select RE type** → **Select procurement capacity (kW)** → **Select suitable RE price** → **Select expected public utility price change**

Dashboard results:



1. **RE procurement proportion**
   Measures both monthly and annual RE proportions according to the capacity procured.
2. **Surplus generation proportion caused by power usage pattern and RE generation mismatch**
   Surplus power may reduce the economics for suppliers or create additional cost for users.
3. **Financial Impact**
   In the bar chart, the orange part represents the cost without procuring green energy, and the red part represents the impact after RE procurement.
4. **This section shows the comparison between the average price per kWh before and post- RE procurement as well as the reduction in Scope 2 carbon emissions.**

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