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By 2030 Taiwanese companies can meet their electricity demand with 80% clean sources on average during each hour of the year, while lowering system costs, reducing emissions and driving investment in renewables

- If 5% of Taiwanese demand chose to match 80% of their load with carbon-free electricity (CFE) on an hourly (24/7) basis, this could annually save Taiwan NT$25 billion* in fuel costs and avoid around 5 $MtCO_2e$, all at a unit cost lower than the average electricity tariffs over the past 6 years.
- To realise the 80% CFE scenario at the lowest cost, corporates can avoid costly offshore wind and batteries, but they do need to fully tap into cheaper onshore wind, solar, and geothermal .
- Novel dispatchable technologies, like gas equipped with carbon capture and liquid air energy storage, could achieve 100% hourly matching at barely any additional cost, maintaining required capital expenditures near the level required for matching at 80% of load.

London, 21 October, 2025:

A new study by climate analytics nonprofit TransitionZero finds that 24/7 CFE procurement could not only help commercial and industrial consumers meet their climate targets cost-effectively, but also save the Taiwanese power system NT$25 billion annually by 2030.

As Asia's ninth-largest economy and a global semiconductor powerhouse, Taiwan's energy choices carry outsized influence over the ability of world technology leaders to transition to cleaner business models. Global companies using Taiwan's high-value exports are increasingly demanding that their suppliers use 24/7 carbon-free electricity (24/7 CFE). This places pressure on Taiwan to decarbonise its grid while maintaining reliability. Meeting this expectation hinges on the island's capacity to generate 24/7 CFE at scale—raising critical questions about cost, emissions, and the feasibility of sustaining competitiveness.

Unlike most international markets that match electricity consumption with renewable generation on an aggregate yearly basis, Taiwan stands out with its monthly accounting rule under the Taiwan Renewable Energy Certificate (T-REC) system, enabled by its 15-minute interval matching mechanism.The analysis shows that moving to a fully time-stamped hourly accounting regime for carbon-free electricity can bring significant environmental benefits at an affordable cost. If corporations representing 5% of Taiwan's electricity decided to cover on average 80% of their consumption through an hourly matching regime, the corresponding renewable build-out would save NT$25 billion in fossil fuel consumption annually and avoid nearly 5 MtCO2e emissions to the Taiwanese power system per year, while also eliminating 75% of offtakers' emissions from electricity consumption.

According to the modelling, adopting 80% hourly matching makes economic sense as well. Unit costs for securing PPAs is around NT$2.7/kWh. This is still 7% cheaper in real terms than the lowest observed average annual electricity tariff of NT$2.9/kWh recorded from 2019 to 2024.

Given limitations apparent in the government's projections for renewable energy potential, our analysis shows that realising the 80% CFE scenario at the lowest cost—despite not needing expensive offshore wind and batteries—requires corporates to fully exploit all available onshore wind and solar potential, while also robustly leveraging the round-the-clock potential of geothermal generation. If 5% of Taiwanese demand participated, 6.2 GW of additional renewable capacity would need to be built between 2025 and 2030 beyond the projected business-as-usual expansion. This would consist of 4.2 GW solar PV, 1.2 GW of onshore wind, and 0.7 GW of geothermal. Given current government ambition, this implies accelerating solar deployment by five years relative to government targets for 2035, fully exploiting all remaining onshore wind sites by installing an estimated 300 new 4.2-MW turbines***, and achieving geothermal development targets in full by 2032.

The analysis confirms that a final push from 80% to 100% CFE through renewables and batteries alone would be materially more expensive. That step would require annualised system-wide capital expenditures to rise from NT$38 billion to NT$137 billion, driven by a near tripling of asset capacity from 6.2 GW to 16.2 GW. The difference in capacity consists nearly entirely of an expansion of offshore wind and conventional batteries. However, this expansion can be considerably reduced if dispatchable technologies like gas with carbon capture and storage (CCS) and liquid air energy storage are included – lowering costs by more than NT$76 billion and capacity by more than 8 GW.

The analysis shows that CCS can contribute to lowering costs, but only if as much as 70% of combustion CO_2 is sequestered in Taiwan. Lower performance or moving storage abroad reduces the attractiveness of CCS, lowering its buildout and increasing that of liquid air energy storage instead.

Matt Gray, Co-founder and CEO at TransitionZero, said:
"Our analysis for Taiwan shows that if 80% of hourly electricity consumption is matched with carbon-free electricity through PPAs, corporates could eliminate nearly 75% of their emissions intensity, while still paying cheaper unit costs for their PPA electricity than average annual electricity tariffs going as far back as the pre-COVID year of 2019. If corporates amounting to 5% of Taiwanese electricity demand adopted 80% hourly CFE, Taiwan as a whole could save up to NT$25 billion annually in fuel costs and reduce emissions by up to 5 $MtCO_2e$."

Alex Luta, Lead East Asia Analyst at TransitionZero, explained:
"Our findings show that for commercial and industrial (C&I) players in Taiwan to hourly match 80% of their power consumption with carbon-free electricity, expensive offshore wind and batteries are not required if cheaper onshore wind and solar potential are fully utilised and geothermal potential is comprehensively tapped. However, these costly technologies become unavoidable when advancing from 80% to 100% hourly matching, driving up annualised system-wide capital expenditure from NT$38 billion to NT$137 billion and nearly tripling asset

buildout from 6.2 GW to 16.2 GW. This escalation can be largely avoided by diversifying into novel dispatchable technologies such as gas turbines with carbon capture and liquid air energy storage, making even hourly matching at 100% of load an achievable target."

TransitionZero modelled Taiwan's electricity system on an hourly level, as a single node assuming electricity generated at any location can be transmitted seamlessly to any demand centre. Its model is calibrated to account for observed plant behaviour and incorporates historical trends in capacity additions to obtain a realistic composition of the 2030 capacity mix.

Ends

Download the full report here

About TransitionZero
TransitionZero is a climate analytics nonprofit established in 2021. We provide system modelling data, software, and analysis to support energy transition planning. Our tools are used by governments, developers, investors, and think tanks across the globe.

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Analysis Methodology

TransitionZero's study on the system-level impacts of 24/7 CFE in Taiwan uses a sophisticated modelling approach to understand how different clean energy procurement strategies affect the grid and procurement costs. It involves running three main scenarios for 2030: a "brownfield" reference scenario (assuming no CFE or annual matching), a 100% CFE annual matching scenario, and various hourly matching scenarios (from 70% to 100% CFE hourly matching). It considers factors like demand growth, technology costs, fuel costs, and national policies to determine the optimal capacity expansion and operation of power plants, storage, and transmission, aiming for a system-wide cost-optimal solution. The study specifically looks at 5% of the national demand shifting to hourly matching. The model explores how different technology mixes (solar, onshore wind, offshore wind, geothermal, batteries, long-duration energy storage, and innovative thermal**) affect the system's ability to meet CFE targets, costs, and emissions.

* All monetary valuesare expressed as real 2023 NT$.

** Includes gas power plants equipped with carbon capture and storage (70% final sequestration rate), and gas-hydrogen co-firing (10% co-firing ratio).

*** Assumes the latest version of 4.2-MW wind turbines (informed by desk research) will be used for new-build.