



Global  
Renewables  
Alliance

# 24/7 carbon-free energy (CFE)

Beyond capacity additions  
towards system resilience



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# In summary

As geopolitical tensions continue to reshape global energy markets and expose the vulnerabilities of import-dependent economies, the way we source and account for renewable power is undergoing a fundamental shift. Global power demand is growing, and renewable capacity additions are breaking records year-on-year. The next frontier is matching that demand with renewable power on an hourly or sub-hourly basis. High-impact corporate sourcing through 24/7 carbon-free energy (24/7 CFE) aligns private investment with grid, storage, and flexibility needs, enhancing energy security and accelerating system-wide decarbonisation.

At times of global energy crises, electrifying end-use sectors and covering that demand with long-term renewable energy procurement tools such as power purchase agreements (PPAs) is one of the most effective ways to reduce exposure to fossil fuel volatility and ensure price certainty. For industry, pairing electrification with long-term renewable power sourcing also lowers carbon costs and reduces exposure to a rapidly tightening regulatory landscape that designates granular renewable energy sourcing a direct driver of competitiveness.

Hourly matching is not a new concept; it is the way power markets have been operating for decades. However, the years 2026-2027 represent the decisive pivot point. 24/7 CFE is shifting from a voluntary leadership initiative of a few to a mandatory regulatory and financial requirement for many. The convergence of updated standards, new international regulations, surging private sector demand, and recent energy crises have created a decisive moment to reconsider how we account for renewable power. Energy security must now be built from within.



# Foreword

The global power system is undergoing a fundamental shift, driven as much by geopolitical necessity as by climate ambition. On the one hand, as growing tensions disrupt oil and gas markets and expose the fragility of import-dependent economies, energy security has moved from the margins to the centre of the transition debate. On the other hand, renewable deployment is accelerating and electrification is driving new demand. As a result, system reliability is increasingly determined by the ability to integrate variable renewable energy with dispatchable, storage-backed, and hybrid solutions. The focus is no longer on simply building more generation, but on ensuring that renewable power can be delivered when and where it is needed. For nations still vulnerable to external fuel shocks, this transition marks a structural evolution toward more flexible and resilient electricity markets.

Within this changing landscape, high-impact corporate renewable energy sourcing has emerged not only as a decarbonisation tool, but as a form of economic defence. Long-term procurement instruments such as auctions and corporate power purchase agreements (CPPAs) have proven critical in shielding businesses and consumers against volatile fossil fuel prices in the aftermath of reoccurring energy crises. In a world where geopolitical shocks can materialise quickly and unpredictably, the ability to lock in stable, domestically sourced renewable power is a pillar of industrial resilience and national competitiveness.

Looking ahead, the next frontier is the transition toward 24/7 carbon-free energy (24/7 CFE), moving beyond annual matching to increasingly align electricity consumption with renewable generation on an hourly basis. 24/7 CFE makes the energy security lens salient: by incentivising storage, demand-side response, clean firm power, and grid modernisation, it reduces structural dependence on fossil fuel markets and builds domestic energy resilience that no import contract can provide. As the report outlines, 24/7 CFE is uniquely positioned to accelerate the next phase of the energy transition, transforming private sector demand into a powerful signal for system-wide change and for a future where energy security is built from within.



Trigya Singh  
Head of Corporate Sourcing & Senior  
Manager, Global Renewables Alliance

Trigya Singh brings 15 years of international diplomatic expertise in renewable energy policy and sustainable development. She leads multilateral efforts to achieve 24/7 carbon-free energy, fostering systems change through hourly and location-based matching to triple renewables by 2030. Her strategic counsel shapes energy security, policy, and coordinated solutions across APAC, LATAM, and Africa.

# Recent market developments in corporate renewable energy sourcing

Global renewable energy deployment is accelerating at an unprecedented pace: 2025 saw a record 692 GW installed renewable power capacity addition (IRENA, 2026), with generation forecasted to further rise at an annual rate of 8% through 2030 (IEA, 2026). In 2025, for the first time since global tracking began, renewable energy surpassed coal in electricity generation (Ember, 2025), with wind and solar having generated more power than fossil fuels in the European Union (EU) (Ember, 2026) (Figure 1).

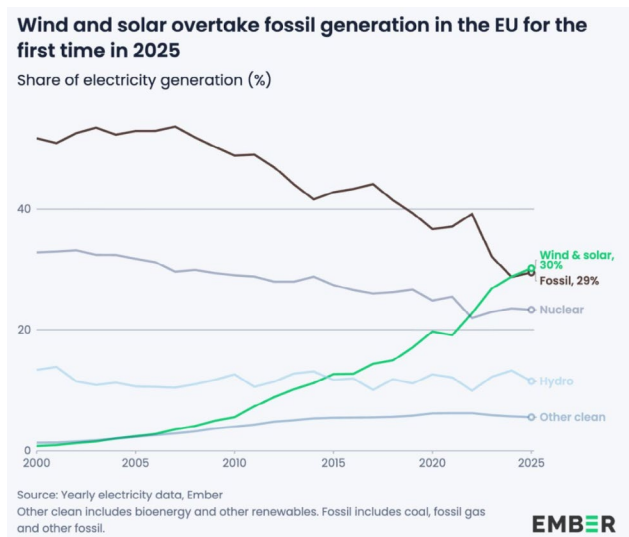


Figure 1: Renewables overtake fossil fuels in the EU’s electricity generation (Ember, 2026)

The record 692 GW of renewable capacity additions in 2025 is a direct response to a surge in global power demand, which is expected to rise by 3.6% annually through 2030 (IEA, 2026). 49% of the additional global power demand in the next 5 years will be driven by the residential and commercial buildings sector (almost half of which comes from space cooling, data centres, and heat

pumps), followed by industry and transport (Figure 2).

Global electricity demand growth by sector and end-use, 2015-2030

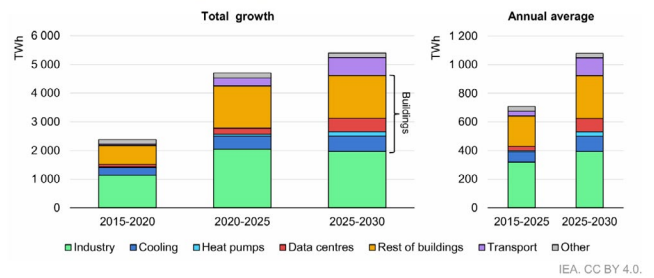


Figure 2: Global power demand drivers, 2015-2030 (IEA, 2026)

Demand-led electrification – powering homes, industry, and transport with efficient electric technologies – provides a compelling opportunity to leverage abundant renewable resources, improve efficiency and enhance energy security. Electrified end-use sectors are already projected to account for over 27% of global final energy demand in 2030 (IEA, 2023), while Ember research shows that 75% of the global energy system can already be electrified using existing technologies (Ember, 2025).

Yet, for electrification to deliver climate, security, and economic benefits, the power demand needs to be credibly met by renewable sources, otherwise it risks reinforcing fossil generation and grid stress. The Global Renewables Alliance (GRA) recognises that high-impact corporate sourcing of renewable energy provides a critical delivery mechanism that transforms electrification from a demand shift into a system-wide investment signal, accelerating further renewable deployment, storage, flexibility, and grid modernisation.

Long-term power purchase agreements (PPAs) are one of the most essential market instruments to examine the private sector’s decarbonisation efforts. PPAs provide the financial certainty and risk mitigation required to unlock massive investment flows and ensure the cost-effective integration of renewable sources into our power systems. In 2025, corporates signed at least 63.3 GW of offsite corporate PPAs, which equals the highest year on record (Figure 3). This brings cumulative offsite PPA capacity to over 325 GW since 2008.

### Annual global corporate PPA volumes, by region

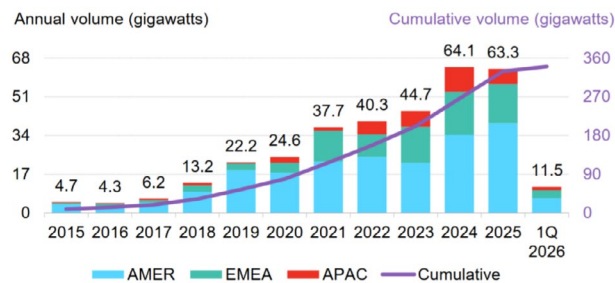


Figure 3: Global PPA market developments in 2025 (BNEF, 2026 Q1 update)

While PPA numbers continue rising, the growing volume of intermittent renewables is making traditional procurement riskier. Shifting towards more time-matched renewable energy sourcing is the logical response to an increasingly decarbonised power market defined by increasing curtailment and negative prices. The private sector is already making progress on this frontier and increasingly purchasing clean firm power from technologies offering natural baseload generation profiles that are not dependent on weather patterns, such as hydro or geothermal. Moreover, co-location of generation and storage, as well as hybrid PPAs that combine the generation profiles of multiple technologies for better hedging and more price stability, are increasingly popular,

having accounted for 6.6 GW of signed deals in 2025 (BNEF, 2026 Q1 update). Looking ahead, hybrid renewables (such as solar or wind projects combined with battery storage) are expected to reach cost parity with fossil fuel alternatives across most regions by 2035 (Figure 4), further reinforcing their role in corporate sourcing strategies.

Figure 2.19 Total cost of electricity per unit consumed for hybrid options of wind, solar PV and battery in the United States, Europe and China

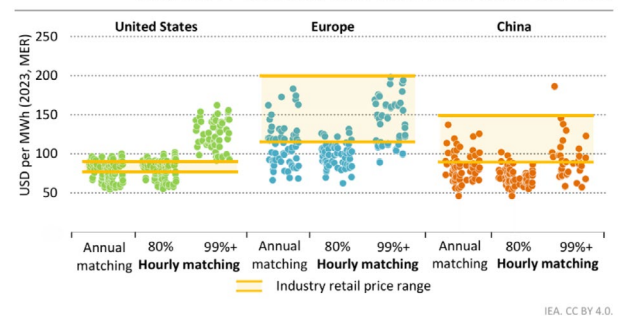
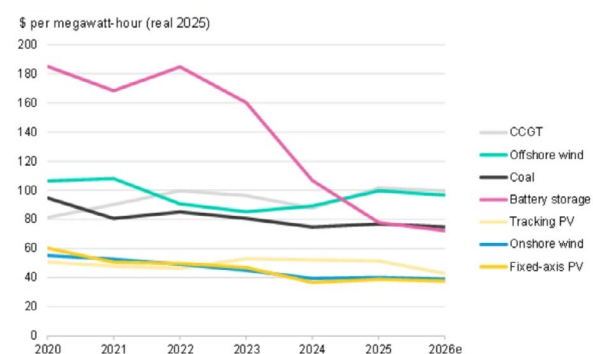


Figure 4: Cost comparison of hybrid generation options (IEA, 2025)

Falling battery costs are additionally accelerating the buildout of co-located and hybrid renewable projects. The cost of installing battery storage projects has dropped by around 40% since 2024 (IEA, 2026), while average global prices for battery energy storage systems (BESS) fell to roughly one-third of 2020 levels by 2025 (IEA, 2026). Deployment has expanded at an exceptional pace, with global storage capacity increasing more than twenty-fold over the past five years (IEA, 2026). As a result, batteries are increasingly available to meet demand during peak periods, particularly in the late afternoon and early evening, strengthening the reliability and value proposition of renewable portfolios. By 2035, BNEF forecasts a further 25% reduction in the levelised cost of electricity (LCOE) for battery storage (BNEF, 2026) (Figure 5).



Source: BloombergNEF. Note: Global benchmarks are capacity-weighted averages using the latest market estimates. Offshore wind includes offshore transmission costs. Carbon pricing is included where policies are already active. Subsidies and tax credits are excluded. Levelized cost of electricity (LCOE) shown by financing date. CCGT is combined-cycle gas turbine, PV is photovoltaic solar.


Figure 5: LCOE of BESS (BNEF, 2026)

Hybrid assets and pairing renewables with storage and flexibility strengthen resilience by reducing reliance on imported fuels, insulating economies and companies from global energy shocks, and providing more distributed, localized renewable power. Increasingly, corporate procurement strategies aim to source renewable supply that aligns with real-time consumption, incentivising further renewable buildout where and when it is most valuable to the power system – a core pillar of 24/7 carbon-free energy (24/7 CFE). Since Google first popularized it in 2018, 24/7 CFE has evolved from an aspirational concept to the frontier of corporate energy strategy, gaining critical mass through initiatives like the Climate Group’s [24/7 Carbon-Free Energy campaign](#), Eurelectric’s [Next-Level CFE Hub](#) and the UN [24/7 CFE Compact](#), which now counts 180+ global signatories. While initially spearheaded by EU and the US, the 24/7 CFE momentum is increasingly Asia-led: 44 of the 24/7 CFE Compact 184 signatories come from the Asia-Pacific region, 20 of which joined during 2024–2025. This significant regional demand for around-the-clock renewable energy coincides with a significant increase in regional clean energy

procurement. For instance, 88% of new RE100 members in 2025 originated from the region, and members significantly increased their renewable procurement from 2024 to 2025 in markets like Vietnam (30% to 58%) and India (23% to 39%).

Delivering 24/7 CFE at scale is increasingly supported by market infrastructure. More granular tools such as [Granular Certificates \(GCs\)](#), also known as time-based Energy Attribute Certificates (T-EACs), that enable renewable electricity to be tracked by time and location are becoming more widespread. In parallel, suppliers’ market offerings are scaling rapidly. For example, 46 suppliers already offer hourly matching tariffs, which represents a fourfold increase in available tariffs between November 2024 and 2025 and currently covers around 73% of global electricity demand ([Granular and Baringa, 2026](#)). Additionally, data providers such as [Electricity Maps](#) contribute to more precise tracking and verification through openly accessible hourly and sub-hourly data on electricity carbon intensity and generation mixes.

Finally, new technologies such as advanced geothermal and long-duration energy storage are beginning to scale, enabling always-on renewable power. Early adopters of 24/7 CFE are [spurring the commercialisation](#) of these nascent technologies, accelerating cost declines that benefit the entire electricity system.



# Recent regulatory changes in corporate sourcing

Much interest in 24/7 CFE comes from firms with global supply chains, who are preparing for standard revisions and future reporting needs.

- The Greenhouse Gas Protocol (GHGP) is in the process of updating its Scope 2 Guidance, a global standard used by the private sector for GHG emissions from purchased electricity. Key proposed changes to market-based claims include stronger deliverability and the introduction of temporal (hourly) matching of demand to supply, subject to thresholds and legacy exemptions (read more on the [GHGP website](#)). While the Protocol is voluntary, its inclusion in the EU's Corporate Sustainability Reporting Directive (CSRD), the International Sustainability Standards Board (ISSB), the Science Based Targets initiative's (SBTi) Corporate Net-Zero Standard and California's Climate Corporate Data Accountability Act (CCDAA) means that the final changes will significantly shape the future of corporate energy procurement and carbon reporting globally.
- The Greenhouse Gas Protocol (GHGP) has also announced its [new partnership with the International Organization for Standardization \(ISO\)](#) to harmonise carbon accounting standards.
- The EU's [Carbon Border Adjustment Mechanism \(CBAM\)](#), fully operational from 2026 onwards, ties export competitiveness

and trade access to verifiable low carbon intensity of production. This is particularly relevant for export-oriented Latin American and Asia-Pacific industries: for example, China, South Korea, India, Japan, Viet Nam together account for USD 791.8 billion of exports to the EU, roughly 33.2% of the total ([EnergyTag, 2026](#)). New rules for embedded emissions in goods covered by CBAM (cement, iron and steel, aluminium, fertilizers, hydrogen) require companies signing PPAs to demonstrate hourly matching and deliverability to reduce electricity emissions, tying export competitiveness directly to 24/7 CFE progress. Further export sectors including chemicals, electronics, and EV supply may also eventually be covered by CBAM ([EnergyTag, 2026](#)).

- Low-carbon product standards, such as green hydrogen rules under Renewable Fuels of Non-Biological Origin (RFNBO) category of the [Renewable Energy Directive \(RED\)](#) and the [UK Low Carbon Hydrogen Standard](#) further require demonstrating granular, time-aligned renewable energy sourcing for compliance.

As these requirements take hold, markets aligned with 24/7 CFE principles will be better positioned to attract private investment, sustain industrial competitiveness, and retain access to key export markets.

As countries and companies embark on their 24/7 CFE journey, it quickly becomes clear that

the transition delivers value at each stage of implementation: analysis by the [IEA](#) and modelling by [Transition Zero](#) demonstrate that 70–80% CFE levels can reduce system costs by 15–35% compared to annual matching, unlocking annual savings ranging from tens of millions to more than \$1 billion, depending on market specificities.

### **Scaling high-impact corporate sourcing in high-growth markets**

As the world is increasingly renewable-powered, 24/7 CFE becomes the strategic direction for renewable power procurement worldwide. It is rapidly expanding across sectors and geographies and is seen as the global framework for credible, high-impact decarbonisation. The economic rationale behind 24/7 CFE - price stability, risk management, and integrity - is clear, while its system-level benefits - more resilient and flexible grids, smarter system operation, and better utilisation of storage - are becoming increasingly essential as power systems integrate higher shares of renewables.

Crucially, 24/7 CFE is a phased journey that delivers value from the outset, with 100% hourly matching being a long-term north star. As granular accounting frameworks become the new norm, countries must ensure their markets remain attractive to large corporates with global supply chains reporting under internationally recognized systems. Forward-looking policy that aligns national climate ambitions with emerging corporate practices enables leveraging this corporate demand for climate and economic benefit, thereby safeguarding competitiveness, facilitating a [just energy transition](#), and unlocking private investment.

Emerging economies including those in Asia-Pacific and Latin America hold strong growth opportunities for 24/7 CFE; they account for nearly 80% of projected electricity demand growth through 2030 ([IEA, 2026](#)) and have been undergoing power market liberalisation, expanding corporate procurement models, and introducing electricity market reforms. These regions have vast renewable energy potential: for example, 65% of electricity generated in Latin America and the Caribbean in 2024 came from clean sources, much higher than the global average of 41% ([Ember, 2025](#)). 24/7 CFE supports job creation, enables affordable electricity, greater energy access and security, but wider system transformation is needed for successful national implementation.

### **High-impact corporate sourcing readiness in Latin American and Asia-Pacific economies**

While interest in high-integrity corporate renewable energy procurement is growing across both Latin America and Asia-Pacific, countries are entering the 24/7 CFE transition from fundamentally different starting points. These differences pertain to institutional design, regulatory capacity, grid readiness, stakeholder understanding, market maturity, and data availability. Therefore, progress toward 24/7 CFE requires differentiated policy responses, despite global pressures from corporate demand, supply chain decarbonisation and granular reporting standards. Below, we characterize the energy outlook and opportunities for 24/7 CFE progress in 5 countries across Asia-Pacific and Latin America.

# High-impact corporate sourcing readiness

## Latin American and Asia-Pacific economies



# India

### Positive Energy Outlook:

- The draft National Electricity Policy of 2026 shifts the focus to firm clean power, electrification, industrial competitiveness, and system optimization ([Ember, 2026](#)).
- Round-the-clock (RTC) and Firm and Dispatchable Renewable Energy (FDRE) tenders strengthen demand for clean firm power ([EnergyTag, 2026](#)).
- National 15-minute settlement intervals in place ([EnergyTag, 2026](#)).

### Key bottlenecks hindering 24/7 CFE:

- While the central government sets Renewable Purchase Obligation (RPO) and Energy Storage Obligation (ESO) trajectories, states control land allocation, transmission access, banking rules, and distribution companies (DISCOMs).
- Further institutional power fragmentation between Ministry of New and Renewable Energy (MNRE) and the Ministry of Power (MoP), as well as across states impedes deployment.

### Recommended actions:

- Create further price signals for the deployment of firm clean power (geothermal and hydropower) and long-duration energy storage.
- Reduce regulatory fragmentation: improve coordination between central and state authorities and harmonise state-level open access and transmission rules.

# Japan



## Positive Energy Outlook:

- Record 1.1 GW corporate PPAs in 2025, ~400 MW clean firm power ([BNEF, 2026](#)), while solar remains the mainstream option ([REI, 2026](#)).
- 87.4% energy import dependence in 2024 ([Climate Bonds Initiative, 2026](#)), which makes domestic renewables pivotal for energy security and price stability.

## Key bottlenecks hindering 24/7 CFE:

- Rigid grid regulation, occasional curtailment due to congestion or oversupply and a dual-grid system (50Hz east / 60Hz west), which limits transfer ([REI, 2026](#)).
- Renewable-rich regions are distant from load centres, which hinders deliverability of renewable power ([IEEFA, 2025](#)).

## Recommended actions:

- Reform grid regulation to improve interregional transfer and reduce curtailment.
- Strengthen carbon pricing mechanisms under the [GX Promotion Act](#) (under revision in 2026) to incentivise fossil fuel phase-out and further renewable and dispatchable carbon-free resource growth.

# Philippines



## Positive Energy Outlook:

- Vast clean firm power potential: alongside 1,200 GW solar/wind, 13.1 GW hydro and 4.1 GW geothermal ([IMF, 2025](#)).
- Retail Competition and Open Access (RCOA) and Green Energy Option Program (GEOP) allow direct renewable procurement ([First Gen](#)).

## Key bottlenecks hindering 24/7 CFE:

- GEOP PPA prices remain higher than retail tariffs, dampening demand ([BNEF, 2026](#)).
- The quality and strength of the grid and transmission network show regional variation, leading to inefficiencies and losses.
- Permitting delays due to lengthy regulatory processes and high capital costs for renewable projects (almost double of that seen in advanced economies ([IEA, 2025](#)) for solar) hinder wider deployment ([IMF, 2025](#)).

## Recommended actions:

- Improve grid modernisation and storage deployment.
- Leverage The Association of Southeast Asian Nations (ASEAN) Chairmanship in 2026 to advance regional ambition for high-impact renewable energy sourcing.

# Brazil



## Positive Energy Outlook:

- Cleanest power mix among G20 countries ([BNEF, 2025](#)): 90% low-carbon electricity in 2024 ([Ember, 2025](#)).
- 163 data centres, concentrated in the São Paulo hub ([Secretary of Industrial Development, Innovation, Commerce and Services, 2026](#)). Tech sector accounts for 6.5% GDP, representing 30% of Latin America's technology market ([Brasscom, 2025](#)).
- Procurement standards for data centres, such as the [REDATA](#) (Regime Especial de Tributação para Serviços de Datacenter) are evolving to incentivize long-term renewable procurement.

## Key bottlenecks hindering 24/7 CFE:

- Long transmission distances.
- Grid congestion outside established hubs like São Paulo.

## Recommended actions:

- Expand grid infrastructure beyond core hubs.
- Introduce granular certification.
- Support storage and flexibility deployment.

# Colombia



## Positive Energy Outlook:

- Strong hydro baseline: around 60% hydropower installed capacity ([IEA, 2024](#)).
- Growing behind-the-meter solar.

## Key bottlenecks hindering 24/7 CFE:

- Minimal wind deployment despite large potential.
- Behind-the-meter solar not integrated into planning.
- Permitting delays and transmission constraints.
- Voluntary, underdeveloped Renewable Energy Certificate (REC) market.

## Recommended actions:

- Enable demand aggregation.
- Strengthen REC transparency and market design.
- Streamline and accelerate permitting processes to improve project delivery timelines.
- Strengthen community consultations and benefit-sharing mechanisms to ensure local engagement.

# Further country insights



## Energy Outlook

- Electricity demand projected to grow 6.3% annually between 2025 and 2027, driven by data centres, railways, and energy-intensive manufacturing ([IEA, 2025](#)).
- By 2035, the freshly updated Nationally Determined Contribution (NDC) targets 47% emissions intensity reduction of the GDP and 60% cumulative non-fossil power capacity ([Press Information Bureau, 2026](#)).
- 2.8 GW corporate PPAs announced in 2025 ([BNEF, 2026](#)).
- Heavy industry dominates corporate PPA market; the EU's CBAM is expected to strengthen demand for long-term renewable procurement tools ([BNEF, 2026](#)).

## Key bottlenecks hindering 24/7 CFE

- Limited data transparency and lack of verification systems such as [EnergyTag standards](#).
- While the National Electricity Plan (2023) sets a requirement of [208 GWh of BESS](#) by 2030 to integrate intermittent and variable renewables, there is no clear pathway for long-duration storage.

## Recommended course of action

- Build upon existing round-the-clock (RTC) and hybrid tender progress and develop an overarching 24/7 CFE framework to reduce system balancing costs by \$1 billion annually by 2030 ([TransitionZero, 2025](#)).

- Create further price signals for the deployment of firm clean power (geothermal and hydropower) and long-duration energy storage, and integrate these solutions with variable renewables such as wind and solar for always-on renewables. Reaching 70% 24/7 CFE clean electricity in India by 2030 is 35% cheaper than 100% annual matching ([TransitionZero, 2025](#)).



## Energy Outlook

- Net zero by 2050 commitment ([Government of Japan, 2024](#)).
- 7th Strategic Energy Plan (revised in 2025) positions renewables as pivotal for decarbonisation.
- Electricity demand rising sharply; \$28bn hyperscaler investment, 60% of demand growth from data centres ([Wood Mackenzie, 2025](#)).
- Largest RE100 market for membership growth in 2025 ([BNEF, 2026](#)).

## Key bottlenecks hindering 24/7 CFE

- Current Non-Fossil Certificate (NFC) system is underutilised and lacks the granularity required for real-time tracking ([JERA, 2025](#)).
- High storage and hydrogen costs.
- Renewable curtailment concerns are rising ([TransitionZero, 2026](#)).

## Recommended course of action

- Introduce granular, time-based certification, aligned with international standards.
- Accelerate storage cost reductions and grid flexibility.



## Philippines

### Energy Outlook

- Target of 35% renewables by 2030, 50% by 2040 ([Power Technology, 2025](#)).
- Investment into renewables grew 163% annually between 2022 and 2024 and wholesale prices declined from PHP 5.58 to 4.14 per kWh in 2024 ([IMF, 2025](#)).
- In 2026, the minimum eligibility threshold for Green Energy Option Program ([GEOP](#)) has been lowered from 100 kW to 50 kW of average monthly peak demand, allowing more electricity consumers to source power directly from suppliers under the framework.
- 82 MW corporate PPAs in 2025, out of which 65% onsite ([BNEF, 2026](#)).
- 65 renewable energy projects (17.84 GW) unlocked through 100% foreign ownership reform ([UNCTAD, 2022](#)).

### Key bottlenecks hindering 24/7 CFE

- Composed of 7,107 islands in three main groups (Luzon, Visayas, and Mindanao), archipelagic grid limits interconnection and integration of renewable sources ([IRENA, 2017](#)).
- Ember shows 41,000 MWh of electricity lost during outages in 2020 ([Ember, 2025](#)).
- Need for more than PHP 10 trillion additional renewable investment beyond 2028 ([IMF, 2025](#)).

### Recommended course of action

- Enable market instruments for (granular) corporate sourcing.



## Brazil

### Energy Outlook

- The region's largest corporate PPA market: 1.3 GW corporate PPAs in 2025 ([BNEF, 2026](#)).
- \$6 trillion net-zero opportunity (6.6% GDP through 2050) ([BNEF, 2025](#)).

### Key bottlenecks hindering 24/7 CFE

- Centralized planning.

### Recommended course of action

- Continue aligning regulation with 24/7 renewable procurement standards, building on [REDATA](#), by incentivizing long-term renewable energy procurement.



## Colombia

### Energy Outlook

- First wind corporate PPA in 2025 for 245 MW ([BNEF, 2026](#)).

### Recommended course of action

- Expand self-generation limits. Integrate distributed solar into system planning.
- Improve transmission expansion.

In summary, these country experiences point to a common structural gap. Corporate demand for high-quality, time-matched renewable electricity is increasing faster than national policy frameworks are adapting. The barriers differ, but they all lead to uncertainty for corporate buyers and missed opportunities for renewable energy investment. The policy recommendations that follow aim to address shortcomings in the regulatory, technical, and investment conditions required to enable progress for 24/7 CFE.

# Actions for wider 24/7 carbon-free energy (24/7 CFE) deployment

## Technology

**Progress:** Emerging technologies for 24/7 CFE are attracting capital

**Action needed:** Deploy targeted policy to de-risk and scale emerging 24/7 CFE technologies

## Electricity data

**Progress:** Electricity data transparency and access is expanding in certain markets

**Action needed:** Expand global disclosure of hourly grid data to enable transparent 24/7 CFE tracking

## Grids

**Progress:** Grid reforms have been underway

**Action needed:** Scale grid investment to match renewable growth and unlock firm 24/7 integration

## Certificates

**Progress:** Hourly renewable energy certificates (RECs) are entering the market

**Action needed:** Accelerate hourly REC markets to support credible 24/7 CFE claims and compliance



## Market design

**Progress:** Auction designs have been evolving towards hybrid, peak-power, and round-the-clock solutions

**Action needed:** Shift auction designs to hybrid, peak-power and round-the-clock models

## Procurement

**Progress:** High-impact, cost-effective Carbon-Free Energy procurement options are growing worldwide

**Action needed:** Remove barriers to PPAs, green tariffs and cross-border clean power contracts

# Fundamental recommendations for 24/7 CFE



**Electricity data transparency and access is expanding, with digital power sector infrastructure, hourly tracking platforms and time-resolved grid data becoming more available in advanced markets. Disclosure needs to advance in all countries to enable informed 24/7 CFE planning.**

- Recent developments under the [India Energy Stack framework](#), including pilots for interstate peer-to-peer electricity trading and data exchange architectures signal a movement toward a digital infrastructure that could enable future granular renewable energy products ([EnergyTag, 2025](#)).
- Chile's leading electric power generation company, Enel Generacion, has also been [piloting a 24/7 CFE platform](#) for hourly tracking. The initial five customers achieved 100% hourly traceability from various renewable sources.
- In Thailand, the public generator and transmission operator recently launched a [green tariff](#) that provides cost transparency and additionality to corporate buyers. Corporate uptake reached 600 GWh/year as of January 2025, with several companies, including data centres, already expressing strong interest in the programme ([Bangkok Post, 2025](#)).
- In the UK, Matched's [Clean Power Index](#) shows how much renewable electricity is actually delivered in real-time, providing transparent hourly renewable power data to inform procurement and policy.

- Service providers offering monitoring and evaluation of 24/7 CFE such as [LevelTen](#), [Renewabl](#) or [Granular](#) remain concentrated in advanced markets. Their number and reach need to grow to cover more countries.



**Hourly renewable energy certificates (RECs) are entering the market, with several suppliers already offering hourly matched tariffs. The list needs to grow, and REC registries and trading infrastructure need to prepare for regulatory compliance with hourly matching criteria.**

- Many Asia-Pacific markets already have the building blocks: China's [first hourly matching pilot](#) was completed in 2024-25, alongside recent reforms to the Green Electricity Certificates (GEC) system to align it with international standards ([RE100, 2025](#)).
- Singapore's cross-border [Renewable Energy Certificate \(REC\) framework](#) explicitly considers hourly/sub-hourly matching.
- [EnergyTag's 2025 APAC Factbook](#) shows that several APAC grids (India, Japan, Singapore, Taiwan, Vietnam) already operate with 5–30-minute settlement intervals, enabling practical hourly REC adoption.

- The UK government’s decision to maintain 30-minute matching requirements for low-carbon hydrogen aligns renewable energy claims with actual renewable generation for system-wide decarbonisation.
- A pilot by Google and Flexidao demonstrated that hourly renewable energy certification is feasible at scale, converting 10.5 TWh across more than 100 sites in 7 countries into validated hourly certificates using EnergyTag standards.



**High-impact, cost-effective CFE procurement options such as offsite PPAs and green tariffs are growing worldwide, but further progress depends on removing systemic barriers such as unfavourable wheeling charges and lack of buyer aggregation mechanisms.**

- Vietnam’s direct power purchase agreement (DPPA) decree, first introduced in 2024, enables renewable energy generators to sell electricity directly to large consumers, fostering a more competitive energy market. The country’s move to a 30-minute wholesale pricing mechanism also demonstrates how pricing reform improves transparency, supports renewables integration, and prepares the market for future granular matching (EnergyTag, 2024).



**Auction designs have been evolving towards hybrid, peak-power, and round-the-clock solutions and need to mature further for cost-effective renewable integration.**

- India’s tenders for round-the-clock energy are effectively early 24/7 CFE-aligned

auctions, requiring high minimum supply guarantees (monthly/annual) backed by hybrid portfolios and storage.

- South Korea has continued operating its real-time auction market pilot project on Jeju Island throughout 2025, leading to reduced renewable curtailment and improved grid stability. The real-time bidding market is planned to expand nationwide, with a semi-centralized dispatch system being introduced as a first step in 2026 (SFOC, 2025).
- China launched a nationwide unified electricity trading market in 2025 that integrates spot and medium-term trading contracts into a digital marketplace to liberalize electricity pricing (EnergyTag, 2025).



**Grid reforms such as pricing reforms, storage deployment, demand-side solutions have been underway, but grid investment needs to catch up for the cost-effective integration of renewable supply. As grid investments have lagged behind investment in generation capacity, more than 2500 GW of renewables and storage remain stuck in grid connection queues worldwide (IEA, 2026).**

- Brazil, a country that has been facing significant rates of curtailment, aims to resolve the issue by enhancing pricing mechanisms for end users and adding new on-site demand to absorb surplus generation, as well as by stepping up the adoption of storage solutions.
- Regional interconnections, such as the ASEAN Power Grid initiative, are also essential for unlocking greater system efficiency and flexibility.

- Meeting forecasted electricity demand through 2030 would require annual grid investment to increase by roughly 50% by 2030 from today's USD 400 billion, alongside a significant scaling up of grid-related supply chains ([IEA, 2026](#)).

- To help close the financing gap, the Green Grids Initiative released the [Climate Finance Principles](#), also endorsed by the [COP30 Presidency](#) and the [governments of the UK and Germany](#).

- At COP30, Utilities for Net Zero Alliance (UNEZA) members [announced](#) upgraded investment plans for grids. Overall energy transition spending rose to USD 148 billion annually (up from previously stated ambitions of USD 117 billion), including USD 82 billion dedicated to grids and storage.

- China has already announced [\\$800 billion](#) over six years for grids, and published an [action plan](#) to integrate over 200 GW of new wind and solar capacity each year between 2025-2027.

- India plans to invest [\\$107 billion](#) in grids up to 2032, while the EU is also strongly mobilizing investment for grid upgrades as part of its [Grids Package](#).

- Private companies, such as [Google](#), are increasingly de-risking and co-financing transmission upgrades, complementing public investment, which closes grid funding gaps and accelerates deployment timelines.



**Emerging technologies for 24/7 CFE are attracting capital, but supportive policy frameworks play a critical role in the wider deployment of mature renewable and energy storage solutions.**

- Google, the largest offtaker in 2025 by PPAs signed, has focused on accelerating advanced [clean firm power technologies](#), [long-duration energy storage](#) and [demand-side flexibility](#).
- Policy frameworks increasingly link the digital and the energy transition, embedding requirements for renewable energy sourcing in programmes such as [Ireland's renewable requirements for data centers](#) or [Australia's National AI Plan](#). Streamlining land and grid access for projects that bring additional renewable capacity onto the grid should be a priority.

# Peer-reviewers & Contributors:



[globalrenewablesalliance.org](http://globalrenewablesalliance.org)



[energytag.org](http://energytag.org)



[latamcleanenergycoalition.com](http://latamcleanenergycoalition.com)



[seforall.org](http://seforall.org)



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[there100.org](http://there100.org)



[electricitymaps.com](http://electricitymaps.com)



[bnef.com](http://bnef.com)

If you are interested in GRA's flagship corporate sourcing workstream and 24/7 CFE campaign, please contact Trigya Singh [trigya@globalrenewablesalliance.org](mailto:trigya@globalrenewablesalliance.org) and Blanka Tarsoly [blanka@globalrenewablesalliance.org](mailto:blanka@globalrenewablesalliance.org)



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