24/7 CARBON-FREE ENERGY

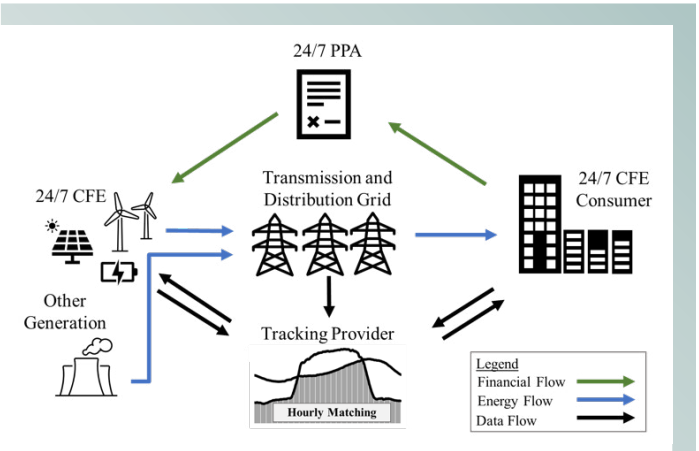
Overview

In recent years, many large companies in the U.S. and internationally have been procuring renewable energy to achieve voluntary sustainability goals—including reducing greenhouse gas (GHG) emissions—often by purchasing enough wind and solar power and/or renewable energy certificates (RECs) to equal their total electricity consumption in megawatt-hours per year. By procuring "100% Renewable Energy," corporate purchasers can report significant reductions in electricity-related emissions under existing voluntary GHG accounting practices.

However, the content of the power purchased through financial contracts by an end-use consumer typically differs from that delivered to and used by the same customer's buildings and facilities. Contracted wind or solar projects may be located in a different grid control area, and output profiles may not match the purchaser's hourly load profile. **A few corporations have begun to procure carbon-free energy (CFE) 24 hours a day, 7 days per week, to better align their electricity purchasing and use in efforts to reduce emissions** consistent both with corporate goals and societal targets for 2030 and beyond. Widespread 24/7 CFE implementation could impact grid planning and operations and influence demand for the full range of carbon-free resources, including energy storage, renewables, advanced nuclear, and fossil with carbon capture and storage or utilization.

Current Situation & Latest Developments

No generally agreed-upon global definition of 24/7 CFE exists. The small but growing list of companies focused on procuring 24/7 CFE includes Google, Microsoft, Iron Mountain, and others. Some are interested in a broader range of power generation technologies beyond variable renewables like wind and solar, which must be firmed by additional resources



Key elements of a 24/7 CFE power supply transaction.

to qualify with procurement guidelines. To date, only a handful of 24/7 power supply agreements have been executed, and three regulated, investor-owned, U.S.-based utilities (Southern, Duke, Nevada Power) have submitted requests to or been authorized by state regulators to offer 24/7 CFE to large commercial and industrial customers.

The U.S. federal government is the country's largest electricity consumer. Executive Order (EO) 14057: Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability, issued by President Biden in December 2021, is designed to advance 24/7 CFE by leveraging this buying power. The EO defines **"carbon pollution-free electricity"** as "...electrical energy produced from resources that generate no carbon emissions, including marine energy, solar, wind, hydrokinetic (including tidal wave, current, and thermal), geothermal, hydroelectric, nuclear, renewably sourced hydrogen and generated from fossil fuels that are accompanied by carbon capture and storage." It also defines **"24/7 carbon pollution-free electricity"** as that "...procured

to match actual electricity consumption on an hourly basis and produced within the same regional grid where the energy is consumed." Under the EO, all federal agencies are required to purchase 100% CFE on a net annual basis by 2030, including at least 50% 24/7 CFE.

Internationally, the United Nations and collaborating organizations launched the 24/7 Carbon-Free Energy Compact in 2021. More than 80 signatories—corporations, governments, institutions, and more—have pledged to implement 24/7 CFE. In addition, Eurelectric and other organizations have partnered to create the European 24/7 Hub to explore and raise awareness about 24/7 energy matching.

Challenges

Broad deployment of 24/7 CFE purchasing faces some significant challenges beyond the availability of sufficient carbon-free energy resources for hourly load matching and emission reduction. Notably, the mismatch between contracted power supplies and physical delivery of electricity raises GHG accounting and possible regulatory issues; transmission and distribution system infrastructure imposes limitations; and the potential exists for inaccurate accounting (and double-counting) of emission reductions. Power suppliers interested in offering 24/7 CFE products need to identify suitable resources and projects, address asymmetric financial and operational risks, and avoid the potential for overbuilding, as well as develop new pricing strategies, supply agreements, and regulated tariffs where applicable.

There is virtually no market infrastructure today to match customer load to unit-specific CFE generation on an hourly basis, but the needed infrastructure is emerging and evolving rapidly in the U.S. and internationally. Questions exist regarding the potential impacts of 24/7 CFE on wholesale and retail pricing, renewables balancing, resource adequacy, transmission and distribution infrastructure, and decarbonization. Data acquisition and management needs include real-time access to end-use customer load data and real-time power generation and transmission data, verification systems for carbon-free generation, interoperability across jurisdictions and entities, and methodologies for quality assurance.

Opportunities

EPRI has world-clase energy-economy modeling and resource planning capabilities and is providing thought leadership on 24/7 CFE procurement and implementation. Areas of expertise and research focus include the following:

- **Power markets:** utility and corporate procurement, project development, supply contracting, market design, and regulation
- **Technology assessment and planning**: cost-performance assessment and integrated resource planning
- **Grid benefits and impacts:** load forecasting, operational modeling, and reliability/adequacy assessment
- **Decarbonization analysis:** energy-economy modeling, scenario analysis, GHG emissions accounting, and offsets

Why It Matters

24/7 CFE represents a potentially significant evolution in power purchasing that better matches corporate procurement with both real-time hourly customer load and stewardship goals. Widespread implementation could have important decarbonization and reliability implications. While the number of 24/7 CFE transactions executed to date is small, corporate buyers, independent power producers, and utilities are all showing growing interest, and the U.S. government's commitment to 24/7 CFE purchasing may make broader implementation likely.

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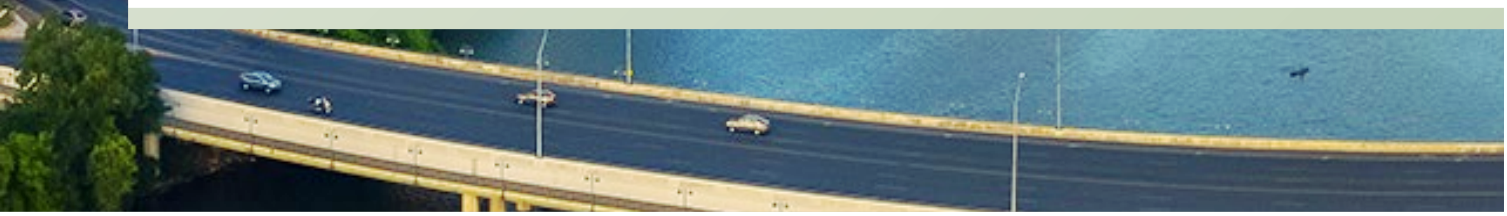

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