Contracting Principles for Moving Towards Location and Hourly Clean Energy Matching

There is growing interest among corporate buyers in moving toward granular clean energy procurement, including location and hourly matching of purchased clean energy to electricity consumption. Leading academic research (Princeton University, TU Berlin, International Energy Agency) finds that location and hourly matched procurement can accelerate the decarbonization of electricity systems. It can also enable more efficient hedging for clean energy buyers, providing more predictable electricity costs. Google, Microsoft, Iron Mountain, the U.S. Federal Government, and a number of U.S. and European cities have set goals to move towards consuming around-the-clock clean energy produced on the grids where they operate. The United Nations 24/7 Carbon-free Energy (CFE) Compact now has over 120 signatories that are committed to advancing this approach to accelerating electricity system decarbonization. Other companies are piloting the approach and learning about how they can make this transition through organizations like 24/7 CFE Hub, coordinated by Eurelectric.

Regulation is also enabling more energy consumers to advance toward location and hourly matching. The European Commission's Delegated Act for renewable hydrogen will require that grid-connected electrolyzers match their electricity consumption with renewable energy produced on the same grid and in the same hour, starting in 2030.[1] The updated Renewable Energy Directive (RED III) also enables for the first time the issuance of time-stamped Granular Guarantees of Origin (GOs), which can be used to substantiate location- and hourly-matched clean energy purchases.

Hourly matched procurement is already happening today, and as more clean energy buyers consider moving toward more granular clean energy matching, it is important to understand how today's clean energy contracts can be tailored to accommodate this shift. Many provisions within hourly matching PPA contracts are similar to or the same as those in traditional PPAs that are well known to many clean energy buyers. However, there are a number concepts that may be new to both buyers and suppliers.

Some utilities, energy retailers and aggregators have also sought to assess how to improve hourly matching of their supply and load portfolios (i.e., Peninsula Clean Energy initiative in California), and not only the individual PPA contract approach from specific buyers.

This document lays out a number of principles and considerations, informed by some of today's leading buyers advancing time-matched clean energy procurement.

[1] Member States can choose to pull the hourly matching requirement forward to 2027.

Key Commercial Principles

1. **More granular data tracking and reporting.** As corporate buyers move toward granular clean energy procurement, we need to adjust the systems and processes that enable energy consumers, system operators, and generators to know exactly what kind of energy is being produced and consumed on an hourly basis across each electricity grid. A transparent and tamper-proof record of clean and renewable energy generation and consumption ensures that consumers are actually receiving the renewable energy that they are paying.

   There are three core types of data needed:

   a. **Consumption data:**

      - Hourly data shall be available from the Revenue Meter or other acceptable measurement point. The Balancing Responsible Party ("BRP") or Retailer will play a critical role to ensure settlement quality over time and make it available to the Buyer via a web Application Programming Interface ("API") or other accepted data transfer protocol at low latency (data should be retrieved immediately after the financial settlement and no longer than 24 hours after the data is available)
      - Standard practices involve the grid operator (i.e., TSO, DSO) independently verifying meter compliance and metered energy info.
      - Regulations should work towards enhancing energy consumption data quality and accessibility.
      - Granular electricity consumption data may be already available and open in some European countries, as exemplified by the increasing number of Data Hubs such as that in Denmark.
      - Other open initiatives enable calculation of granular emissions factors, such as the Data Portal and the Residual Mix Methodology by Electricity Maps.

   b. **CFE Generation data:**

      - Producers and energy suppliers/retailers shall make available to the corporate buyer or a service provider hourly meter data through a data transfer protocol (preferred API) near real-time. Centralised data providers are another route to receiving the same data. An example of this are the datahubs being established across Europe.
      - Standard practices involve the grid operator (i.e., TSO, DSO) independently verifying meter compliance and metered energy info, and data reconciliation being aligned with the applicable domain protocol of the official issuing body in each market.

- In some markets, consumers can buy and sell energy directly to each other.
- For PPAs with multiple offtakers, the contract terms should clearly specify how MWhs shall be apportioned on an hourly basis and provide clarity on apportionment by meter(s) in order to be able to link the hourly production to the GOs. Having a complete audit trail of all transactions would make it easy for auditors to keep track and identify any irregularities.

c. Reporting with specified hourly data and tracking granular EACs

- **Producers and energy suppliers/retailers** shall ensure that clean energy production is tracked with the greatest precision feasible:
  - Retailers can offer reporting with hourly data.
  - The BRP/Retailer that is sleeving a PPA should also offer reporting on matching at an hourly or sub-hourly granularity between generation and consumption, using hourly EACs if available, or metering data if not.
  - To the extent that the registry or applicable law establishes a program for time-based tracking of clean energy, Developers and energy suppliers/retailers should use these granular Energy Attribute Certificates ("EACs") to track electricity production with the greatest precision feasible (e.g., hourly) in accordance with good utility practice.
- The EnergyTag Standard outlines ways in which granular EACs can be issued: either by a participating EAC issuing body or by a SaaS provider that tracks granular data and EAC issuance.

2. **Defining Products to Enable Hourly Matching:** It is important to define the products that will be delivered under the 24/7 contract. As these types of agreements are not industry standard at this point in time, it's crucial that there is upfront alignment on what the seller is delivering to the buyer.

   In standard PPAs, products can include energy and environmental attributes as well as data reporting requirements, however these will be required on a more granular basis for 24/7 arrangements. The matching methodologies may vary depending on the buyers' needs. For example, generation could be matched to forecasted load, predetermined load blocks, or actual hourly consumption, which can be done by tracking the origins and consumption of clean and renewable energy. Energy suppliers can use or develop a software to match hourly production and consumption. Wherever possible, granular EACs should be redeemed after hourly matching.

   Agreement structures include:

a. 24/7 Attribute Purchase Agreement: This is an agreement under which the seller provides the buyer with granular (hourly) EACs that are unbundled from the corresponding generation. The granular EACs could be provided to match a pre-agreed consumption profile, or the seller could provide the buyer with time-stamped EACs from a single project as they are generated.

b. 24/7 Power Purchase Agreements (PPAs): Under this agreement, the seller provides the buyer with both clean energy and granular EACs to match a pre-agreed consumption profile. Typically the seller will use a portfolio of generation assets in order to provide this service, as combining different clean energy technologies together helps increase the percentage of hourly matching achieved under the agreement.

c. 24/7 Energy Supply Agreements: This is an arrangement that provides hourly EACs on top of a retail supply agreement between buyer and seller. The retail energy provider typically provides electricity to one specific consumption site (or group of sites). They will track the buyers' hourly consumption at these sites and provide the buyer with hourly EACs to match their load. The hourly EACs could be sourced from projects that are part of the retail energy providers own generation asset portfolio, or be sourced from other projects that are on the same electricity grid.

There are additional considerations in agreements that buyers and sellers can discuss, including the selling of excess CFE and EACs (i.e., when and under what conditions), the inclusion of demand-side resources (e.g., load shaping and load shifting), and the incorporation of energy storage technologies to better match periods of CFE production. Products are still in their early stages and should evolve in line with supportive regulations to ensure improvements in the percentage of hourly CFE matching.

3. **Hourly CFE guarantees**: Hourly CFE guarantees are a way to ensure that the buyer is receiving the hourly carbon-free deliveries it has contracted for. This type of guarantee is similar in concept to a performance guarantee, which aims to ensure the level of performance under the contract is commensurate with buyer expectations.

a. Pricing Mechanisms: One way to align seller incentives with delivering hourly CFE is with pricing structures. For example, if a seller hits a certain % hourly CFE threshold, there could be a bonus to the contract price, or if a seller does not hit the threshold, there could be a discount to the contract price.

b. Contractual Guarantees: Another option for ensuring hourly CFE deliveries is to require a certain minimum % CFE threshold to be met under the agreement. If the seller is not able to meet the threshold, they would be in breach of the contract, which could lead to a termination right and liquidated damages.

Some suppliers may face some dilemmas related to opportunity costs and regulatory risks such as:

- the “target function” of energy markets remaining based on cost-effective marginal merit order for load supply without any explicit carbon-free maximisation in any algorithm (with the exception of the ETS price on thermal generation marginal costs)
- some ancillary services devoted to grid stability and security needing to be “carbon agnostic”

Together, the buyer and the supplier should agree on the right allocation of risks and rewards in the transaction, ensuring that the trade-off between affordability, risk aversion and risk appetite is worthy for both parties.

The supplier and buyer can work together towards achieving greater matching by:

a. Promoting collaborative performance incentives by jointly establishing performance targets (i.e., certain minimum % CFE threshold), commending whenever these targets are achieved or exceeded. The example of Alliander’s 58.9% hourly matching score in 2022 in the Netherlands is a realistic starting point in the 24/7 journey

b. Scheduling periodic performance review meetings where suppliers and buyers discuss performance trends, challenges and opportunities for improvement, as well as best practices to enhance the reliability of hourly CFE.

c. Allowing adjustments and adaptations to accommodate changing conditions or unforeseen challenges, potentially including grace periods or temporary adjustments during transitional phases.

Commercial Contracting: How to Get Started

There are a number of practical initial steps that buyers can take to move toward hourly matching.

1. **Baseline your hourly electricity consumption:** Buyers should start by developing a detailed understanding of their hourly electricity consumption and profile over the course of the year. This will also allow them to calculate their hourly CFE scores based on the electricity grid where they operate and any existing clean energy contracts There are many service providers that can assist buyers in this task. Energy suppliers/retailers already have access to the necessary data and can provide this service. In principle, the availability of immutable transactions will help to ensure the integrity of the data and prevent fraud.
2. **Determine what hourly matching score you are aiming for.** Every increase in hourly matching increases the decarbonization of a buyer’s electricity consumption and the impact buyers have on decarbonizing the grid. Talk to your retail energy provider or other energy suppliers to understand the options in the market and how they can help improve on the baseline score. Service providers can also help buyers understand how different generation assets will likely impact the hourly matching score.

3. **Determine what kind of commercial structures work best for your specific needs.** For example, large electricity consumers may be interested in agreements that provide both electricity and hourly EACs (such as a 24/7 PPA) since increasing hourly matching reduces exposure to volatile wholesale power prices.
   Other buyers with existing retail energy supply arrangements or those unable to sign PPAs may rely on their retailer to provide them with a 24/7 supply arrangement or may decide to purchase unbundled hourly EACs to match their hourly demand on the same electricity grid.

A number of resources exist to help companies get started in this journey. Consult the 24/7 CFE Hub and its Buyer's Journey for more information.