



Perspectives on Clean Energy Procurement

PJM Clean Attribute Procurement
Senior Task Force

September 9, 2022

Constellation



Carbon-Free Generation Fleet:

- #1 provider of carbon-free 24/7 energy in the United States
- Lowest carbon emissions and carbon intensity generator in the United States
- 32,400 MW of total generating capacity
- ~78 million metric tonnes of carbon avoided through our fleet
- 94.3% capacity factor at nuclear plants
- Ability to extend fleet to 80 years – providing 24/7 carbon-free power through 2050 and beyond



Industry Leading Customer Business:

- #1 in market share for C&I customers
- #2 retail electricity provider
- #3 in market share for mass market customers
- Top 10 natural gas provider in the U.S
- Serve $\frac{3}{4}$ of the Fortune 100
- 2 million total customers
- 215 TWh of load served
- Operate in 48 states and the District of Columbia



Supporting our Communities:

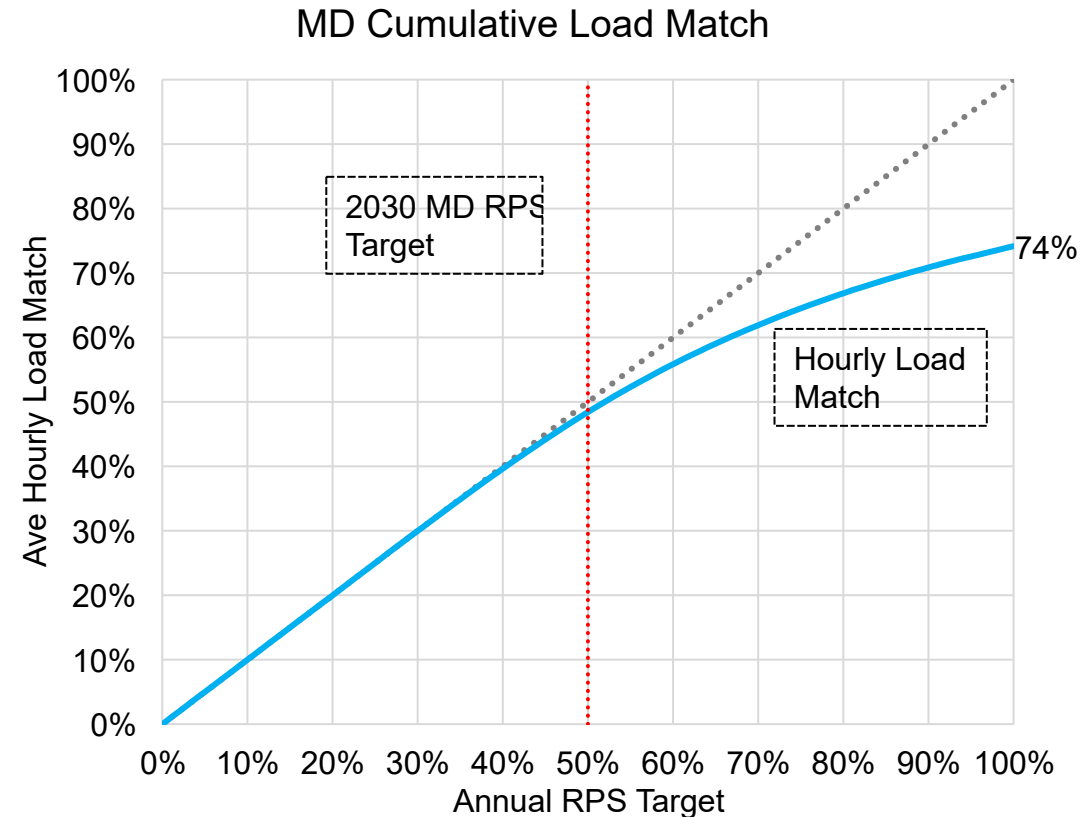
- Fortune 200 company, based on \$17.6 billion in operating revenues in 2020
- Approximately 13,000 employees nationwide
- Investing in local communities through \$207 million in local property taxes and \$87 million in state payroll taxes
- Employees volunteered nearly 53,000 hours in 2020
- Increasingly diverse workforce, with strong diverse hiring and promotion rates and community workforce development partnerships

Customers Want Clean Energy Delivered When They Need It

- Customers are looking beyond annual procurement of clean energy and unbundled clean energy attributes towards supply options that match generation with hourly consumption
- A centralized, voluntary, clean energy attribute product would enable 24/7 procurement for compliance and voluntary buyers
 - Voluntary hourly attribute procurement would provide a meaningful benefit beyond the status quo of de facto compliance regional clean energy attribute markets
- Matching clean generation and load at the time of energy consumption can bolster system reliability and facilitate integration of new carbon free resources

Annual RPS is Unlikely to Eliminate Carbon Emissions from Electricity Consumption

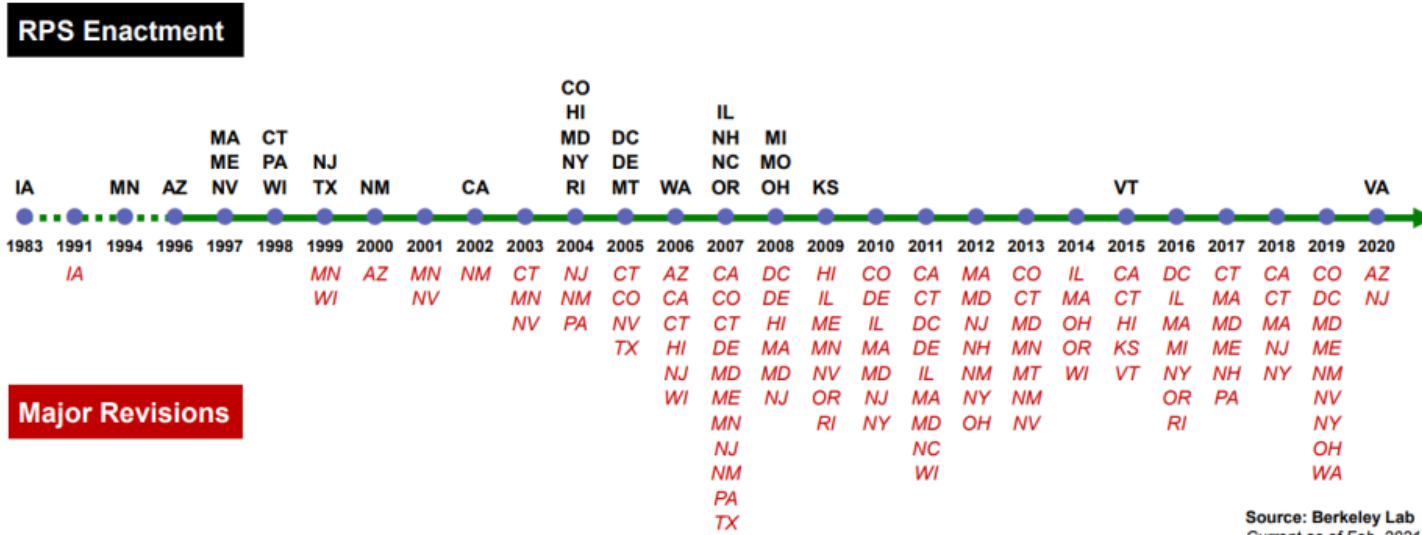
- For example, a Maryland RPS load match with renewable generation equal to 100% of load on annual basis will only match about 74% of hourly load.
- The hourly time-match of renewable generation begins to deviate from the annual total at a roughly 50% annual RPS target
- The declining load match of each increment of renewables above 50% demonstrates the diminishing effectiveness of a renewable-only program



Annual clean energy procurement targets offering diminishing returns

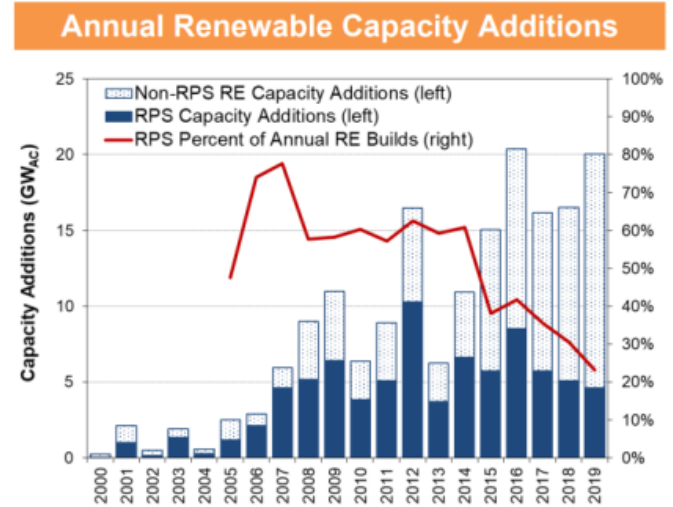
Clean Energy Procurement Is Evolving

Evolution in compliance procurement...



Source: Berkeley Lab
Current as of Feb. 2021

...And voluntary procurement



Notes: RPS Capacity Additions consist of RE capacity contracted to entities with active RPS obligations or certified for RPS eligibility within the REC tracking systems used by MISO, PJM, ISO-NE, or NYISO.

Source: LBNL

- Compliance clean energy procurement on an annual basis is rooted in nearly three decades of policy history, but relatively frequent revisions suggest that states are willing to adapt as circumstances change
- Voluntary procurement have eclipsed compliance purchases for several years
- Voluntary buyers have a variety of objectives, but leading corporates are increasingly interested in matching resource output to hourly load profiles and understanding the grid emissions impacts of their purchases

Any PJM clean energy attribute product should support the evolution in customer preferences for 24/7 clean energy service

Resource Neutral Hourly Procurement Aligns with PJM's Long-Term Needs Assessment

Findings

The results of the second phase of this “living study” suggest five key focus areas for the PJM stakeholder community and delineate the subsequent phases of the study:

- 1 | Electrification shifts the seasonal resource adequacy risk to winter.
- 2 | Retail rate design and energy storage become increasingly important with electrification.
- 3 | Market reforms are needed to incentivize flexibility and mitigate uncertainty.
- 4 | The integration of renewable resources increases the need for balancing resources to meet forecasted ramping requirements.
- 5 | Energy storage (four hours) enhances operational flexibility, but seasonal capacity and energy constraints require transmission expansion, long-term storage and other emerging technology.

- PJM's assessment highlights critical issues for grid transformation, but the path to meeting emerging needs is uncertain
- Price signals during periods of high-load and/or low clean energy output are a means of encouraging the retention of existing and development of new clean energy resources
- To be efficient and effective, hourly attribute procurement must be open to all carbon-free resources

Energy Transition in PJM:

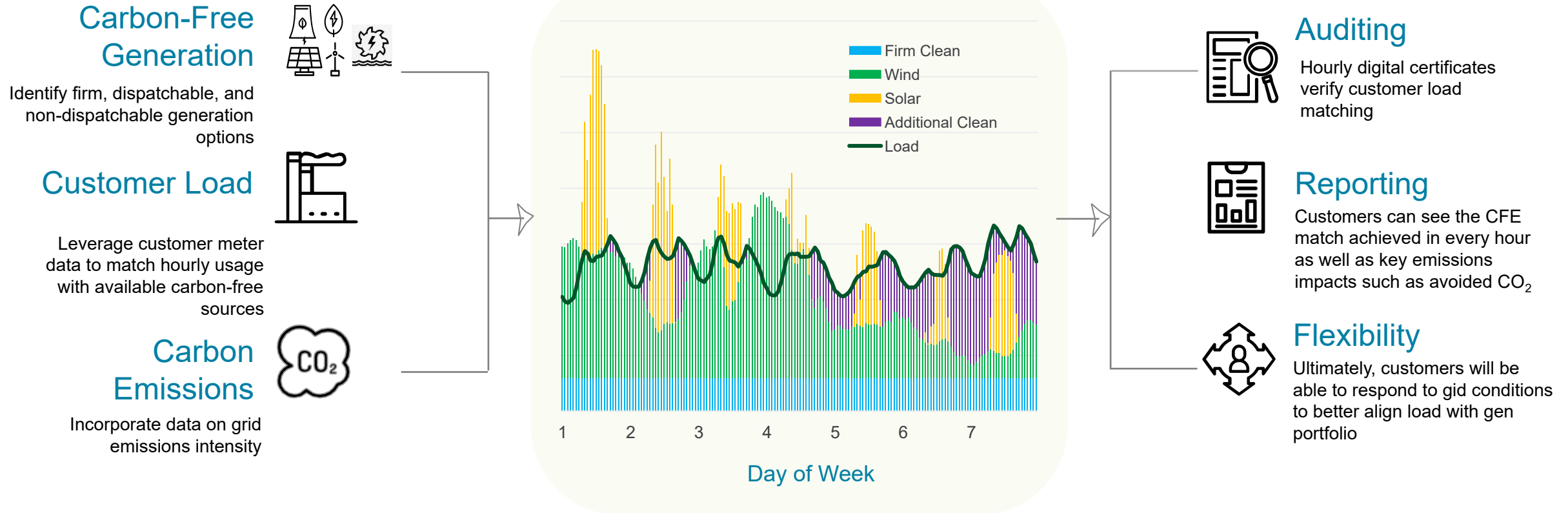
Emerging Characteristics of a Decarbonizing Grid

May 17, 2022

A fungible, regional clean energy product should be sourced from all available clean energy resources – including nuclear – to assure affordable and reliable clean energy supply

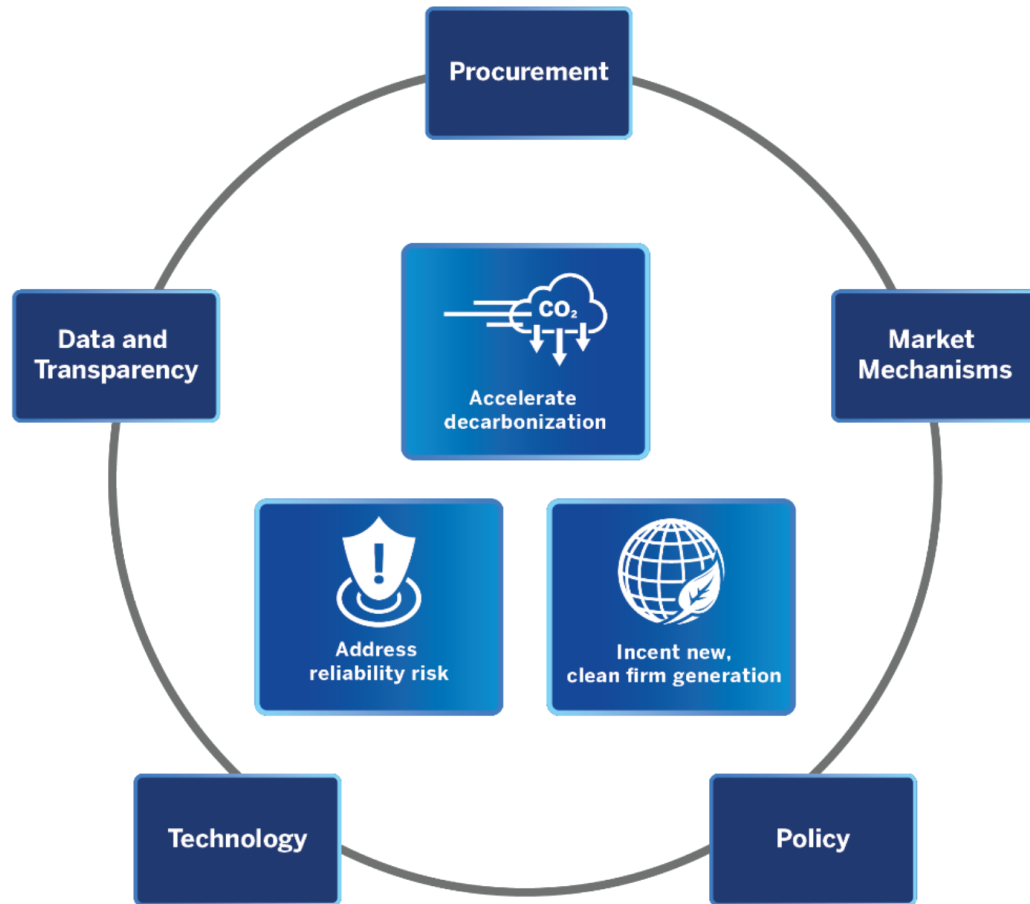
Hourly CFE Scores Provide Customers with Critical Insights

24/7 Hourly CFE Match



Customers will have the insights and tools needed to achieve meaningful, affordable, and sustainable decarbonization

Hourly Carbon-Free Energy (CFE) Can Drive Affordable Decarbonization



- 24/7 Hourly CFE brings focus to the technologies, policies and market mechanisms to balance carbon-free generation and load to reliably and affordably decarbonize the U.S. electric grid
- Hourly attributes unlock opportunities beyond matching generation with load
- As granular data on emissions across the grid become more available, buyers can target clean energy procurement to periods in which emissions are highest

We need a holistic approach to supporting the development of 24/7 clean energy procurement

Thank you

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