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Achieving Western States Green House Gas (GHG) Reduction Objectives: Effective, Least-Cost Compliance in a Constantly Evolving Policy Environment

Washington CETA Markets Work Group | August 28, 2020

Joseph Cavicchi
Todd Schatzki

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Overview

- What are the principles for designing effective and least-cost GHG compliance accounting mechanisms within the electricity sector, focusing on Washington's Clean Energy Transformation Act (CETA)?
  - **Key consideration** is interactions with Western wholesale electricity markets
  - **Key design issue** is unit of accounting: flow-based versus resource-based
- Our key findings are as follows:
  - Zero-carbon compliance frameworks should aim to achieve environmental objectives, while supporting cost-effective achievement of policy goals and complementing existing (and evolving) regional centralized and bilateral markets
  - Compliance frameworks that accommodate efficient, functional wholesale electricity markets support achievement of zero-carbon policy through improving integration of variable renewable resources
  - A resource-based system better accommodates efficient, functional wholesale electricity markets through support for system transactions, which improve bi-lateral market efficiency and are essential to centralized market operation
  - A resource-based system can account for all relevant characteristics of resource supply needed to determine compliance with an non-emitting standard – resource type, timing, location (to approximate deliverability), etc.
  - Flow-based systems face many challenges - as current markets do not track all electricity flows from resource to load, "contract path" scheduled flows can (and do) differ from actual flows, and source-to-load tracking of *all* flows is impractical (if not infeasible)
  - Resource-based compliance can draw on experience in other US regions which rely on resource-based systems, including the Generation Attribute Tracking Systems (GATS)

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Efficient, Functional Wholesale Markets Support Zero-Emission Climate Policies

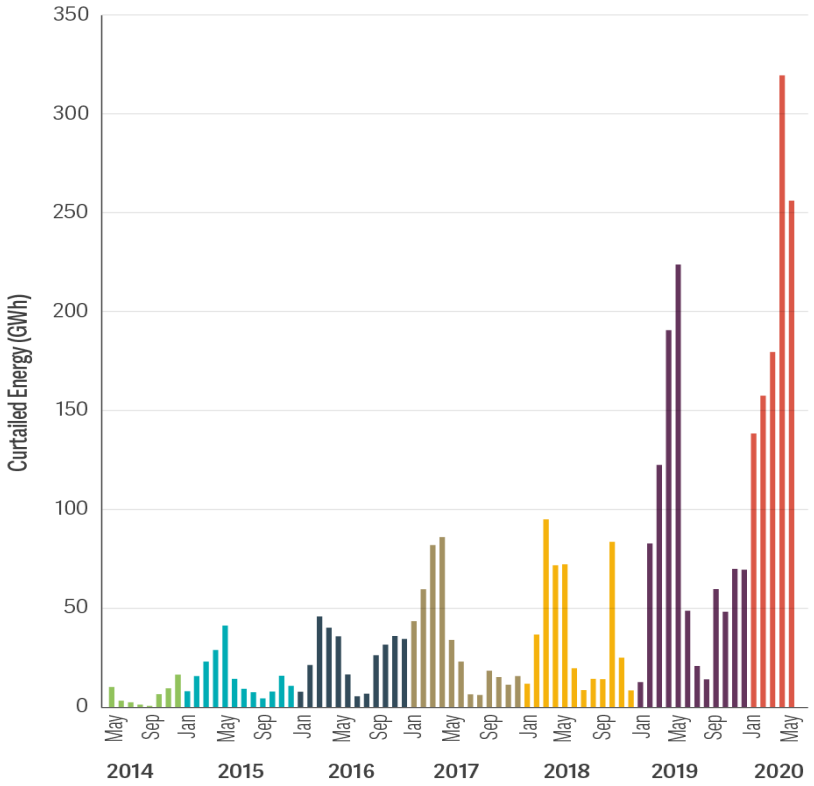
Non-emitting Climate Policies ⟷ **Efficient, Functional Wholesale Markets**

- Well-designed climate policies can support market efficiency and function:
  - Accommodating all types of market transactions while imposing environmental requirements
  - Minimizing administrative cost of compliance (and avoiding costly monitoring systems)

- Well designed markets can support environmental and consumer policy goals:
  - For consumers/LSEs, cost-effectively procure energy supply, hedge financial risks, efficiently use resources, cost-effectively balance supply and demand, reduce renewable curtailments
  - For environmental goals, lower renewable resource integration costs by more efficiently using available resources and transmission, and accessing geographic and resource diversity, thereby increasing supply from renewable resources and reducing curtailment

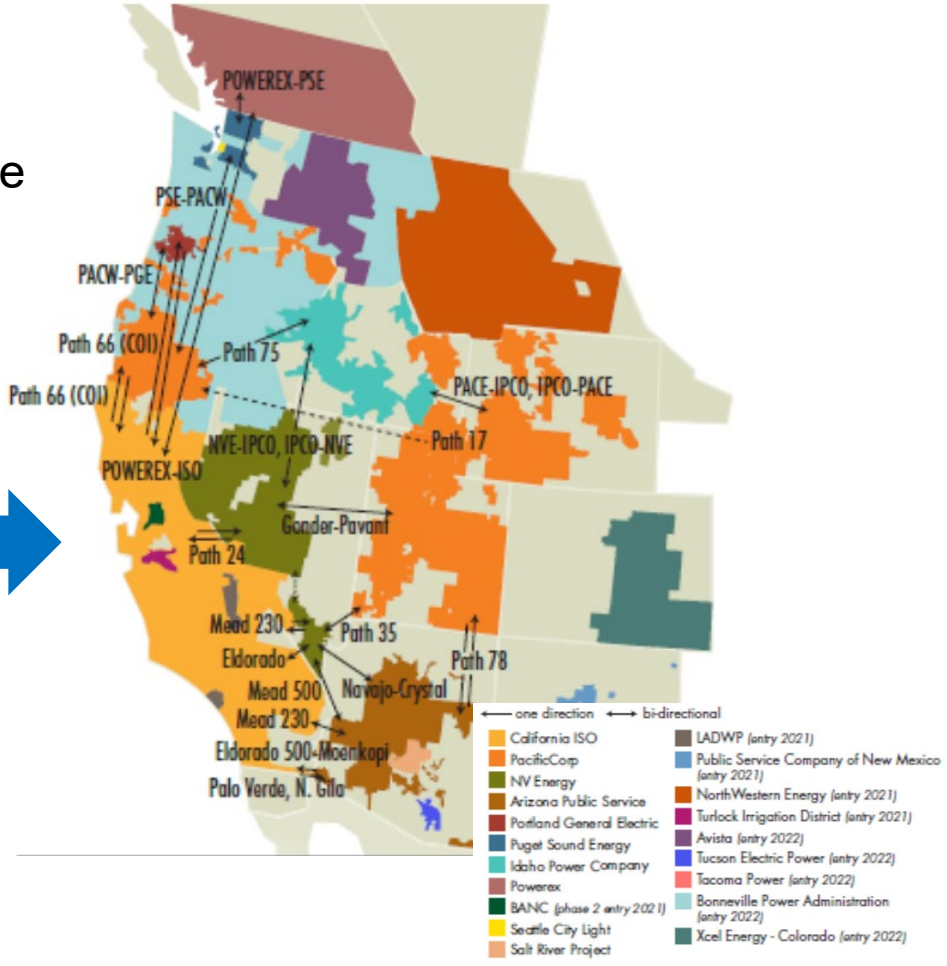
Centralized Markets Support Use of Clean Energy Investment

Growing Renewable Energy Curtailments Can be Reduced



- Centralized markets can help balance and integrate variable renewables needed to meet no-emission policy goals

Western EIM Balancing Authority Areas Participation is Expanding



Source: "Wind and Solar Curtailment by Month," CAISO, accessed at: http://www.caiso.com/informed/Pages/ManagingOversupply.aspx.

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Careful Design of Compliance Systems Can Accommodate Efficient and Functional Wholesale Market Operations

- Current bi-lateral markets accommodate resource-specific supplies
- But, centralized markets and efficient bi-lateral markets depend on system ("unspecified") transactions
  - System resources offer substantial flexibility in bi-lateral transactions and are essential to centralized transactions
- Flow-based system would be *inconsistent* with system transactions

Illustrative LSE Electricity Supply Portfolios and Resource Production Tracking

Supply Source	Procurement Time Horizon	Resource Production Tracking[1]
Owned Generation Capacity	Long-Term	Production measured at resource generator and energy delivered into BAA without specifically tracking disposition.
Bilaterally Contracted Generation Capacity	Medium/Long-Term	Same as above.
Bilaterally Contracted Specified Energy	Short/Medium/Long-Term	Production can be system or resource specific energy supply delivered within or to a BAA.
Bilaterally Contracted Unspecified Energy	Short/Medium/Long-Term	Production is system energy supply delivered within or to a BAA.
Bilateral Spot Market Energy	Hourly, On- and Off-Peak	Production can be system or resource specific energy supply delivered within or to a BAA.
Centralized Spot Market Energy	Hourly & Intra-Hourly	Production measured at generator and energy delivered into BAA without specifically tracking disposition.

Note:
[1] Delivered energy may be sourced on an E-Tag for scheduling purposes and to facilitate reliable BAA system operations when associated with inter-BAA transfers. However, the vast majority of delivered energy is simply injected into the BAA where the generator is physically located and its flow is not tracked.

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Alternative Approaches to Zero-Carbon Compliance

- **Resource-based compliance framework**
  - Supplier accounts capture the "stock" of electricity generated and its attributes within the Western markets
  - Supplier accounts are matched – on an aggregate basis - with electricity used by customers
  - Compliance is determined by demonstrating sufficient attributes that meet the rules determined by state regulators to account for factors such as resource type, deliverability, and time-period
  - Resource-based compliance frameworks form the basis for compliance with most existing Renewable Portfolio Standards (RPS) and Clean Energy Standard (CES)

- **Flow-based compliance**
  - Compliance would be determined by demonstrating each "flow" of electricity from a specified source to the customer that meets the rules determined by the state to account for factors such as resource type, deliverability and time period
  - Flow-based accounting does not form the basis for any RPS/CES compliance, although an approximation of flows is used in state accounting for imports and exports in certain emission trading (cap-and-trade) systems

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Comparison of Resource- and Flow-Based Tracking

Flow-based compliance would be challenging and costly compared to a resource-based approach

Category	Resource-Based	Flow-Based
Accurate Measurement	Actual production Deliverability based on predetermined locations (approximation) Timing granularity flexible	Actual and scheduled production Deliverability determined for each flow (contract paths, approximate and actual) Timing constrained (e.g., within the hour)
Administrative Feasibility	Low/moderate complexity, high transparency – standardized systems of WECC-wide accounts would improve reliability	**High complexity, low transparency**
Cost-effectiveness	Supports any type of out-of-state resources **Temporal flexibility can lower costs** **Supports market structures with ability to integrate renewables**	**May limit supply from certain out-of-state resources** **Lack of temporal flexibility may raise costs** M**ay constrain market ability to integrate renewables**
Transactions and Administrative Costs	**Low/moderate – standardized systems of WECC-wide accounts may lower costs, after initial development**	**High – flow-based accounting (e.g., resource hourly scheduling and E-Tag tracking) more complex; currently no system capturing all flows; developing proxies for system flows would be time-consuming and subject to error**
Support Well-Functioning Markets	Yes. Accommodate all transactions and market structures.	No. May not accommodate system supply and centralized markets.
Out-of-State Activities	Can accommodate provisions aimed at accounting for out-of-state activities	Can accommodate provisions aimed at accounting for out-of-state activities

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Comparison of Resource and Flow Based Tracking

Resource-based tracking has several desirable characteristics:

- Ensure zero-carbon resources meet technical criteria
- Ensure power is deliverable based on usual, feasible patterns of power flows in Western markets
- Compliance production accounting reflects actual generation resource output
- Existing compliance frameworks for low/zero-carbon policies confirm effectiveness (GATS, NEPOOL GIS and PJM EIS)
- More compatible with centralized markets and would not impair the efficiency of markets
- Flexibility in the timing of compliance with zero-carbon requirements
- Less administrative burden and can build upon existing Western attribute tracking (WREGIS)

Flow-based tracking presents various challenges:

- Compliance production accounting will reflect scheduled generation resource output for many transactions
- System power cannot be specifically tracked to individual resources
- Centralized market transactions cannot match specific resources to loads
- Electric systems operators currently capture only a subset of flows (developing necessary infrastructure would be costly and administratively more burdensome)
- Introduces inefficiencies that impact participation in existing and future bilateral and centralized markets

Resource-based Accounting Can Meet Environmental Objectives

- A resource-based methodology accounts for all relevant characteristics needed to determine compliance with an non-emitting standard – resource type, timing, location (to approximate deliverability), etc.
  - Actual standards would reflect reasonable, pre-determined criteria
  - Provides greater flexibility regarding timing to more cost-effectively meet zero-carbon goals
  - Allows generalized deliverability requirements that avoid problems with determining deliverability moment-to-moment
  - Lower administrative costs for LSEs, balancing authority operators, generators, regulators
  - Can build off experience with other RPS/CES systems

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Further Information

Joseph Cavicchi and Todd Schatzki, *Achieving Western State Green House Gas (GHG) Reduction Objectives: Least-Cost Compliance in a Constantly Evolving Policy Environment*, August 2020.

Link: https://www.publicgeneratingpool.com/studies-reports

Contact information:

Joseph Cavicchi, Vice President
Joe.Cavicchi@analysisgroup.com
617-425-8233

Todd Schatzki, Principal
Todd.Schatzki@analysisgroup.com
617-425-8250