#### **ABOUT NARUC**

- The National Association of Regulatory Utility Commissioners (NARUC) is a non-profit organization founded in 1889.
- Our Members are the state utility regulatory Commissioners in all 50 states & the territories. FERC & FCC Commissioners are also members. NARUC has Associate Members in over 20 other countries.
- NARUC member agencies regulate electricity, natural gas, telecommunications, and water utilities.





#### **ABOUT NARUC'S CENTER FOR PARTNERSHIPS &** INNOVATION

- Grant-funded team dedicated to providing technical assistance to members.
- CPI identifies emerging challenges and connects state commissions with expertise and strategies to inform their decision making.
- CPI builds relationships, develops resources, and delivers trainings.



Regularly updated CPI fact sheet with recent publications & upcoming events under Quick Links at:

https://www.naruc.org/cpi-1/

#### NARUC Center for Partnerships & Innovation

#### **Current Activities**

#### **Recently Released Publications**

- Public Utility Commission Stakeholder Engagen Decision-Making Framework (Jan. 2021) Private, State, and Federal Funding and Financing Options to
- Enable Resilient, Affordable, and Clean Microgrids (Jan. 2021) User Objectives and Design Options for Microgrids to Deliver
- Reliability and Resilience, Clean Energy, Energy Savings, and Other Priorities (Jan. 2021)
- Understanding Cybersecurity for the Smart Grid: Questions for Utilities (Dec. 2020)
- Artificial Intelligence for Natural Gas Utilities: A Primer (Oct. 2020
- <u>Cybersecurity Tabletop Exercise Guide</u> (Oct. 2020) Recent Events

for State Action and related resources A Guide for Public Utility Commissions: Recruiting and Retaining a Cybersecurity Workforce Cybersecurity Partnerships and Information

Comprehensive Electricity Planning Blueprint

Grid-Interactive Efficient Buildings, Contact Danielle

Forthcoming Resources NARUC-NASEO Task Force on

- Commissions
  - Metering Infrastructure
- Integrated Distribution Systems Planning: NARUC partnered with DOE national laboratories to deliver a virtual training in Oct. 2020 on forecasting, control and automation, metrics, resilience, PUC practices, and more. The next session will be held for Western state officials beginning Feb. 26, 2021. Contact Dominic
- NARUC-NASEO Task Force on Comprehensive Electricity Planning, Resources developed by the Task Force will be shared in a virtual workshop on Feb. 11, 2021. Read the Task Force fact sheet. Contact Danielle
- National Council on Electricity Policy (NCEP). <u>Presentations</u> from NCEP's December 2020 Annual Meeting are available as well as an updated Transmission and Distribution Resource Catalog, Contact Kerry
- · Carbon Capture, Utilization and Storage Workshop Webinar Series. Recordings are available from a Western Interstate Energy Board- and NARUC-hosted six-part webinar series in Sept. and Oct. 2020. Contact Kiera

#### Available Virtual Learning Opportunities

- Cybersecurity Training for State Regulatory Commissions: NARUC is hosting a virtual cybersecurity training on Feb 23-25 2021 Contact Ashton
- · National Council on Electricity Policy (NCEP). Register for a special session on Exploring Optimization through Benefit-Cost Analysis on Feb. 25, 2021, Learn More about NCEP, Contact Kerry
- Emergency Preparedness, Recovery and Resilience Task Force: The EPRR Task Force will meet Feb. 5, 2021 to discuss BRIC funding with FEMA. Contact Will
- Commission Staff Surge Calls, NARUC hosts guarterly calls on which commission staff discuss how different states approach emerging issues in electricity policy. The next call will be held in early Mar., 2021, Summaries from past calls are available. Contact Kiera
- Innovation Webinar Series. NARUC hosts monthly webinars for members and the public. Mar. 11: Data for the Public Interest; Empowering Energy Equity. Apr. 15: Initiative on Cybersecurity in Solar Projects, May. 13: Staffing the Evolving PUC Workforce. Register and find recordings of past events. Contact Dominic
  - Join us! NARUC hosts four working groups for members:
- Performance-Based Regulation. Contact Kerry Microgrids, Contact Kiera
- Electric Vehicles, Contact Jasmine

www.naruc.org/cpi

Sharing Approaches to Economic Development in Decision-Making for Public Utility Regulators' Financial Toolbox on Advanced



## MODERATOR

COMMISSIONER ANN RENDAHL, WASHINGTON UTILITIES AND TRANSPORTATION COMMISSION



BETH GARZA, SENIOR FELLOW, R STREET

ANNA MCKENNA, VICE PRESIDENT, MARKET DESIGN AND ANALYSIS, CAISO

STEVEN OTTO, PHD, ECONOMIST, ISO NEW ENGLAND

## NARUC

### CPI Innovation Webinar Evolving Resource Adequacy March 16, 2023



### Free markets. Real solutions.

R Street Institute is a nonprofit, nonpartisan, public policy research organization. Our mission is to engage in policy research and outreach to promote free markets and limited, effective government.

# ERCOT (PUCT) Update

- Multiple objectives:
  - Uri failures
  - New dispatchable resources
- Lots of market changes discussed
  - Some implemented
- Discussion ongoing / Legislation filed



# PUCT's Market Design Dockets

- Project No. <u>52373</u> Review of Wholesale Electric Market Design
  - <u>Blueprint</u> December 6, 2021
- Project No. <u>53298</u> Wholesale Electric Market Design Implementation
  - Firm Fuel Supply Service details
- Project No. <u>54335</u> Review of Market Reform Assessment Produced by Energy and Environmental Economics, Inc. (E3)



## What market changes have we seen?

### > Operating reserve demand Curve (ORDC): Completed Jan 1, 2022,

- Increase MCL from 2000MW to 3000MW
- Decrease SWOC / HCAP from \$9000 to \$5000
- Decouple SWOC and VOLL
- Produce Bi-Annual <u>report</u> (October 31, 2022)
- > Emergency Response Service (ERS): announced Nov 2021, codified soon after
  - Deploy before EEA
  - Budget increased from \$50M to \$75M
- Firm Fuel Supply Service (FFSS): First round procured Sep 2022
  - Paid \$53M for existing capabilities
  - Second Round details being finalized adding firm natural gas
- Fast Frequency Response(FFR): implemented Oct 2022
- Load participation in Non-Spin: May 2022



# What market changes are we waiting on?

### Demand Response

- LMPs for Load Resources
- Customer Aggregation <u>ADER pilot project</u>
- Higher Performance Standards for energy efficiency programs
- > New Ancillary Service products
  - ERCOT Contingency Reserve Service (ECRS) coming in 2023
    - 10 minute notice / 2 hour duration
  - Voltage Support only a concept



## Market Design Options to Increase Installed Capacity



- LSE-RO Load Serving Entity Reliability Obligation
- DECs Dispatchable Energy Credits
- BRS Backstop Reserve Service
- PCM Performance Credit Mechanism

6

Jan 10
Governor
VS

"excellent progress made to implement the significant grid reliability reforms,"

"continue your work to ensure the long-term reliability of the Texas grid by adopting a reliability standard and a new reliability design for the ERCOT market."

Give "strong consideration" to the Performance Credit Mechanism (PCM) Jan 11

Senator Schwertner

"given the clear absence of consensus among energy experts, advocates, and industry, unilaterally moving forward with the market design change such as a **Performance Credit** Mechanism option without consultation and collaboration with both the Texas House and Texas Senate is imprudent."



# January 19 Order Issued

- PCM is the way forward no further consideration of DEC, LSERO, FRM
- PUCT to establish reliability standard (#<u>54584</u>) Directed ERCOT to do the <u>work</u>
- > PCM "principles" and "implementation plan" categories
- ERCOT to evaluate "bridging options" (April 27 OM)

"The Commission directs PUCT staff and ERCOT to delay implementation of the PCM until such time as the 88th Legislature has had an opportunity to render judgment on the merits of the PCM and/or establish an alternate solution. "



## Senator Schwertner <u>memo</u> response

"To be clear: SB 3 did not direct the PUC to replace the state's energy-only market with an unnecessarily complex, capacitystyle design that puts the competitive market at risk without guaranteeing the delivery of new dispatchable generation."





## ERCOT's Bridging Options

- Implement a Basic settlement component of PCM manually
- Procure Additional Ancillary Services
- Enhance the Operating Reserve Demand Curve (ORDC)
- Backstop Reserve Service (BRS)
- Contracts for Capacity (RMR without saying RMR)
- Publish Indicative PCM Values



## Thank you!

Beth Garza bgarza@rstreet.org

www.rstreet.org



# **Background Slides**







## **ERCOT** Market will need to adapt

### Continual trend of annual growth in the ERCOT region

500

Volume of electricity produced from natural gas has not decreased

Increased energy from wind has been offset by a decrease in coal generation

Solar's share is just starting to emerge

### Annual Energy by Fuel



2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022

Share of ERCOT electricity produced from natural gas has remained very consistent

Increased share of electricity from wind has been offset by a decrease in coal generation

Solar's share is just starting to emerge





#### Components of Prompt Summer Projected Reserve Margins



Expected summer peak Load > thermal generation capacity

All reserves provided by renewable capacity

"Single hour view" no longer appropriate because adequacy risks occur at other times of the year



### NARUC CPI Webinar

Recent Market Design Enhancements to Address Evolving Resource Adequacy Concerns March 16, 2023 | 3:00 - 4:00 pm (EST)

California ISO and the West's Evolution in Resource Adequacy

Anna McKenna – Vice President, Market Design & Analysis

# CAISO shares responsibility in ensuring resource adequacy in its balancing authority area

- CAISO oversees approximately 80% of California's electricity needs and a small portion of Nevada
- Hybrid regulatory landscape for CAISO BAA load serving entities
  - Some but not all are under CPUC jurisdiction
  - California Energy Commission sets peak load forecasts for all load serving entities
  - Local regulatory authorities (including CPUC)
    - Set their planning reserve margins (default is 15%)
    - Applied to monthly load forecasts to set RA requirements
  - CAISO administers LRA programs and backstop



### Two roads to resource sufficiency under the CPUC

### Integrated Resource Planning is:

- A long term planning and procurement process to ensure California has a safe, reliable, and cost-effective electricity supply
- 10 year forward process

### **Resource Adequacy is:**

- A bi-lateral procurement process to ensure that sufficient capacity is provided to the CAISO to ensure the safe and reliable operation of the electric grid
- Annual and monthly process



### CPUC IRP Program – Foundation in Reliability

• The CPUC has directed procurement of a significant amount of new resources in the past four years

- 18,800 MW of new capacity between 2021 and 2028

 In February 2023, CPUC ordered procurement of an additional 4 GW of new resources by 2028

> Table 2: Increased Mid-Term Reliability Procurement Requirements (in MW, September NQC)

Need Type	2023	2024	2025	2026	2027	2028
General D.21-06-035	2 000	6 000	1 500			
requirements <sup>6</sup>	2,000	0,000	1,500			
LLT resources, as defined						2 000
in D.21-06-035						2,000
New in this decision				2,000	2,000	
Total	2,000	6,000	1,500	2,000	2,000	2,000
Total (cumulative)	2,000	8,000	9,500	11,500	13,500	15,500

Source: CPUC, Decision (D.) 23-02-040, February 23, 2023

Identified 86 GW of new resources needed by 2035



# Four pillars of the CAISO annual and monthly resource adequacy program

Requirements setting	Procurement programs	Counting rules	Enforcement and backstop
<i>Target</i> requirements that ensure system, local and flexible operational needs are met	Annual, seasonal, monthly <i>procurement</i> requirements for to meet <i>targets</i>	Rules to qualify capacity procured to evaluate whether resources can serve to meet targets	Showings, penalties for deficiencies and allocation of back stop costs Significant event back stop procurement

- CPUC increased PRM from 15% to 16% in 2023 and 17% for 2024
- CAISO advocating for increased harmonization between IRP and RA



# CPUC adopted a Slice of Day (SOD) resource adequacy framework

- Each load-serving entity must demonstrate capacity to meet its gross load profile (plus a PRM) in all 24 hours on CAISO's highest load day each month
- LSEs must also show supply to meet storage charging needs
- Annual and monthly RA showings for all 24 hours
- LSE showings will consider resource operating capabilities across a day
- CPUC will assess LSE compliance to meet gross load plus PRM each hour
- Modifications to existing resource counting rules for solar, wind, and demand response

nia ISO 🊰

### Western Resource Adequacy Program

- Resource adequacy program established by the Western Power Pool – FERC approved February (effective 1/1/2023)
- First binding season expected between 2025 and 2028
- Two key WRAP design features -
  - Forward Showing Program: requires Participants to secure their share of the regional capacity need for the upcoming season using common planning and capacity accreditation metrics
  - WRAP Operational Program: obligates Participants with surplus to assist Participants with a deficit in the hours of highest need using bilateral trading mechanisms
- Establishes a regional reliability metric (1 event-day in 10 years LOLE)



### Comparison of WRAP and California RA

Design Element	WRAP	CPUC RA Slice of Day Program
Overview	<ul> <li>Voluntary program with a mandatory forward showing and operational design</li> </ul>	<ul> <li>Evolving to a 24 Hour "Slice of Day"</li> <li>Each LSE must show sufficient resources to meet load plus a PRM</li> </ul>
Need Determination	<ul> <li>P50 Load Plus PRM as defined by a LOLE study of at most 1 in 10.</li> <li>Requirements set monthly.</li> </ul>	<ul> <li>A single annual planning reserve margin to be applied to each hour in order to meet LOLE target.</li> <li>Includes charging for storage</li> </ul>
Resource Counting	<ul> <li>Thermal generation counting based on installed capacity adjusted based on forced- outage performance</li> <li>VERS Based on ELCC</li> </ul>	<ul> <li>Thermal generation based on installed capacity</li> <li>VERs capacity based on exceedance calculation measuring availability in the hour.</li> </ul>
Penalties	<ul> <li>Showing Penalties based on a Cost of New entry calculation (Up to 2X)</li> <li>Market based charges (up to 50x market) for non-delivery in the operations time horizon (if called on).</li> </ul>	<ul> <li>CPUC imposes penalties on LSEs for failure to meet system RA requirements:</li> <li>Summer System RA Penalty = \$8.88 kW-month, scaled up for repeated failures</li> </ul>



### Resource Sufficiency in Western Energy Markets

- Resource Sufficiency Evaluation (RSE) in Western Energy Imbalance Market (WEIM) and upcoming Extended Day-Ahead Market (EDAM)
  - Operational time-frame *universal adaptor* between various resource adequacy programs (including those not in a formal RA Program)
- WEIM RSE tests each WEIM BAA, including CAISO, has sufficient resources to meet load and flexibility requirements for the hour
- EDAM RSE will test that each EDAM area, including CAISO, has sufficient supply to meet its <u>next day</u> expected obligations prior to engaging in energy transfers.
  - Forecasted demand
  - Uncertainty component (variability in renewable resource output and load forecast)
- Financial consequences for failing the day ahead RSE through an administrative surcharge that incents sufficiency
  - Surcharge is based on a 16-hour block energy product
  - A tiered consequence structure recognizes that a *de minimis* RSE failure does not trigger financial consequences
  - Passing BAAs eligible to pass the WEIM RSE as a pool



### Resource Capacity Accreditation in ISO-NE

### NARUC Innovation Webinar

**ISO** new england

Steven Otto

ECONOMIST



### ISO New England's Mission and Vision

### Mission: What we do

Through collaboration and innovation, ISO New England plans the transmission system, administers the region's wholesale markets, and operates the power system to ensure reliable and competitively priced wholesale electricity

### Vision: Where we're going

To harness the power of competition and advanced technologies to reliably plan and operate the grid as the region transitions to clean energy





*The ISO's new Vision for the future represents our long-term intent and guides the formulation of our Strategic Goals* 

ISO-NE PUBLIC

### **ISO-NE'S FORWARD CAPACITY MARKET**

Very high level overview



### Two Market Approaches to Resource Adequacy: Energy-Only Markets and Capacity Markets

- Resource Adequacy: Ensuring there is sufficient capacity on the system to allow the system operator to balance the system without load shed exceeding one day in ten years, in expectation
- Energy-only markets make use of very high energy prices when the system is short of reserves to incent resources to enter the market
- Regions with *forward* Capacity Markets determine how much capacity is needed to meet the one-day-in-ten standard, then procure that capacity in a forward market

ISO-NE PUBLIC

• ISO-NE uses the Forward Capacity Market (FCM) as the primary mechanism to achieve resource adequacy

### ISO-NE's FCM Trades Billions of Dollars of Capacity Each Year

ISO-NE PUBLIC

Energy Market

Ancillary

**Services** 

The Day-Ahead and Real-Time Energy Markets are forward and spot markets for trading **electric energy** 

Resources provide **shortterm reliability services,** as well as services needed to support the physical operation of the system (eg., regulation, voltage support)

Forward Capacity Market Resources compete to sell **long-term reliability services** to the system in three years' time through annual Forward Capacity Auctions



Source: 2021 Report of the Consumer Liaison Group; \*2021 data is preliminary and subject to resettlement

# How Do You Value the Reliability Contributions of Each Capacity Resource?

- ISO-NE's FCM procured approximately 31,000 megawatts (MW) of capacity in the most recent auction
- How should the ISO value contributions from oil resources, natural gas resources, wind and solar resources, etc.?
- Each of these resources provide very different reliability contributions:
  - Oil and coal resources can provide energy in any hour, so long as they have sufficient fuel on site and are given enough notice to start-up
  - Gas-only resources can provide energy in any hour in which they can secure gas from the region's pipelines
  - Intermittent power resources (solar and wind) can only provide energy in hours where the sun shines or the wind blows or if it is paired with energy storage
  - Storage resources can only provide energy up to their stored energy limit
- Given these differences, a MW of one resource doesn't provide the same contribution to Resource Adequacy as a MW of another resource

ISO-NE PUBLIC

### Capacity Accreditation Determines Payment as a Function of a Resource's Reliability Contribution

- The ISO procures capacity to meet our reliability requirements
- The capacity offered by each individual resource is typically less than the nameplate capacity of that resource
- **Capacity accreditation** is the process by which ISO-NE determines how many MWs of nameplate capacity a resource will need to sell 1 MW of "capacity" in the FCM
  - E.g., to sell 100 MW of "capacity" in the FCM, a solar resource may need 500 MW of nameplate capacity, while a nuclear resource may only need 110 MW of nameplate capacity

ISO-NE PUBLIC

### RESOURCE CAPACITY ACCREDITATION (RCA) IN THE FORWARD CAPACITY MARKET (FCM) PROJECT OVERVIEW

Updating Capacity Accreditation to Aid in the Clean Energy Transition



# ISO-NE has Seen Dramatic Changes in the Energy Mix in the Last 20 Years; More Changes are Coming

Percent of Total **Electric Energy** Production by Fuel Type (2000 vs. 2022)



Source: ISO New England <u>Net Energy and Peak Load by Source</u>; data for 2022 is preliminary and subject to resettlement Renewables include landfill gas, biomass, other biomass gas, wind, grid-scale solar, municipal solid waste, and miscellaneous fuels. This data represents electric generation within New England; it does not include imports or behind-the-meter (BTM) resources, such as BTM solar.

**ISO-NE PUBLIC** 

### The ISO Generator Interconnection Queue Provides Snapshots of the Future Resource Mix

Dramatic shift in proposed resources from natural gas to battery storage and renewables



### RCA Project Will Make Four Main Changes to Resource Accreditation in FCM

The following will be incorporated into resource accreditation/compensation:

- 1) Correlated performance of intermittent resources
- 2) Differences in storage resources' maximum stored energy levels
- 3) The ability of gas-only resources to acquire fuel during very cold conditions
- 4) Differences in resources' expected outage rates

### Impact of Correlated Intermittent Resource Performance on Reliability Will Be Incorporated into Accreditation/Compensation

- Intermittent resources often have highly correlated outputs
  - E.g., when the wind is strong, all wind resources in the same geographical area will generally have higher output
- As an intermittent resource class comprises a larger share of the resource mix, the hourly output profiles of the intermittent resources will be increasingly correlated with hours that are important for Resource Adequacy
  - E.g., in a system that is predominantly wind resources, the vast majority of hours when the system is at risk will occur when the wind is not strong
- Marginal reliability impact (MRI)-based accreditation accounts for the correlated performances of these resources

ISO-NE PUBLIC

### Differences in Resources' Maximum Stored Energy Will Be Incorporated into Accreditation/Compensation

- Under existing ISO-NE rules, two storage resources that are identical but have different quantities of stored energy are compensated in the same way
  - E.g., a 100 MW storage resource that can discharge for 2 hours receives the same capacity market payments as a 100 MW storage resource that can discharge for 8 hours
- Under RCA reforms, differences in stored energy across resources will be incorporated into their accreditation values, so that resources cleared in the FCM with less stored energy are likely paid less than otherwise identical resources with more stored energy



### Impact of Gas Pipeline Constraints on Gas-only Resources Will Be Incorporated into Accreditation/Compensation

- During very cold conditions in New England, most of the gas pipeline capacity is used for residential and commercial heating
- As a result, it can be difficult for gas-only resources to secure fuel and contribute to system reliability during very cold conditions in the winter
- Under existing ISO-NE rules, a 100 MW gas-only resource and a 100 MW oil resource that has fuel onsite receive similar compensation
- With the RCA reforms, the impact of gas pipeline constraints on gas-only resources' reliability contributions will be incorporated into their accreditation values, so that resources that rely solely on pipeline gas for fuel will be compensated less than resources that have fuel onsite, or that have contracts to secure fuel during tight conditions

ISO-NE PUBLIC

14

### Differences in Expected Outage Rates Will Be Incorporated into Accreditation/Compensation

- Under existing ISO-NE rules, resources cleared in the FCM that are the same size but have different outage rates are compensated the same in the FCM
  - E.g., a reliable 100 MW resource with an expected outage rate = 2% receives the same capacity market revenue as a less reliable 100 MW resource with an expected outage rate = 30%
- With the RCA reforms, a resource's expected outage rates will be incorporated into their accreditation value
- Resources that are more likely to be on outage during hours when the system needs them will generally be paid less than otherwise identical resources that are less likely to be on outage during those hours

ISO-NE PUBLIC

### These Changes Will Better Achieve Resource Adequacy at Least Cost to Consumers

- This will result in accreditation values that better reflect the reliability contributions of resources in New England
- By paying each resource based on its contribution to reliability, ISO-NE's FCM will more cost-effectively procure capacity to meet the region's Resource Adequacy objectives

ISO-NE PUBLIC

16

# Questions

**ISO-NE PUBLIC** 





17

### **NARUC Innovation Webinar Series**



### One Thursday most months All NARUC members and stakeholders are invited

More webinar information will be added soon!

https://www.naruc.org/cpi-1/innovation-webinars/

NARUC thanks the U.S. Department of Energy for its support of this series.