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Learning from the Experts Webinar Series

The Commercial Sale of Offshore Wind Power Generation

July 10, 2024

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Meeting Procedures

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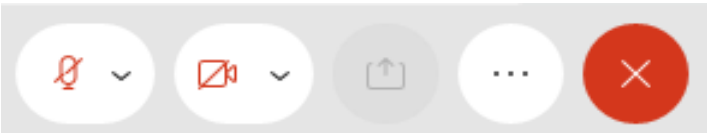
Participation for Members of the Public:

> Members of the public will be muted upon entry.



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> Questions and comments may be submitted in writing through the Q&A feature at any time during the event. Please submit to **All Panelists**.

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Learning from the Experts

This webinar series is hosted by NYSERDA's offshore wind team and features experts in offshore wind technologies, development practices, and related research.

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Commercial Sale of Offshore Wind Generation

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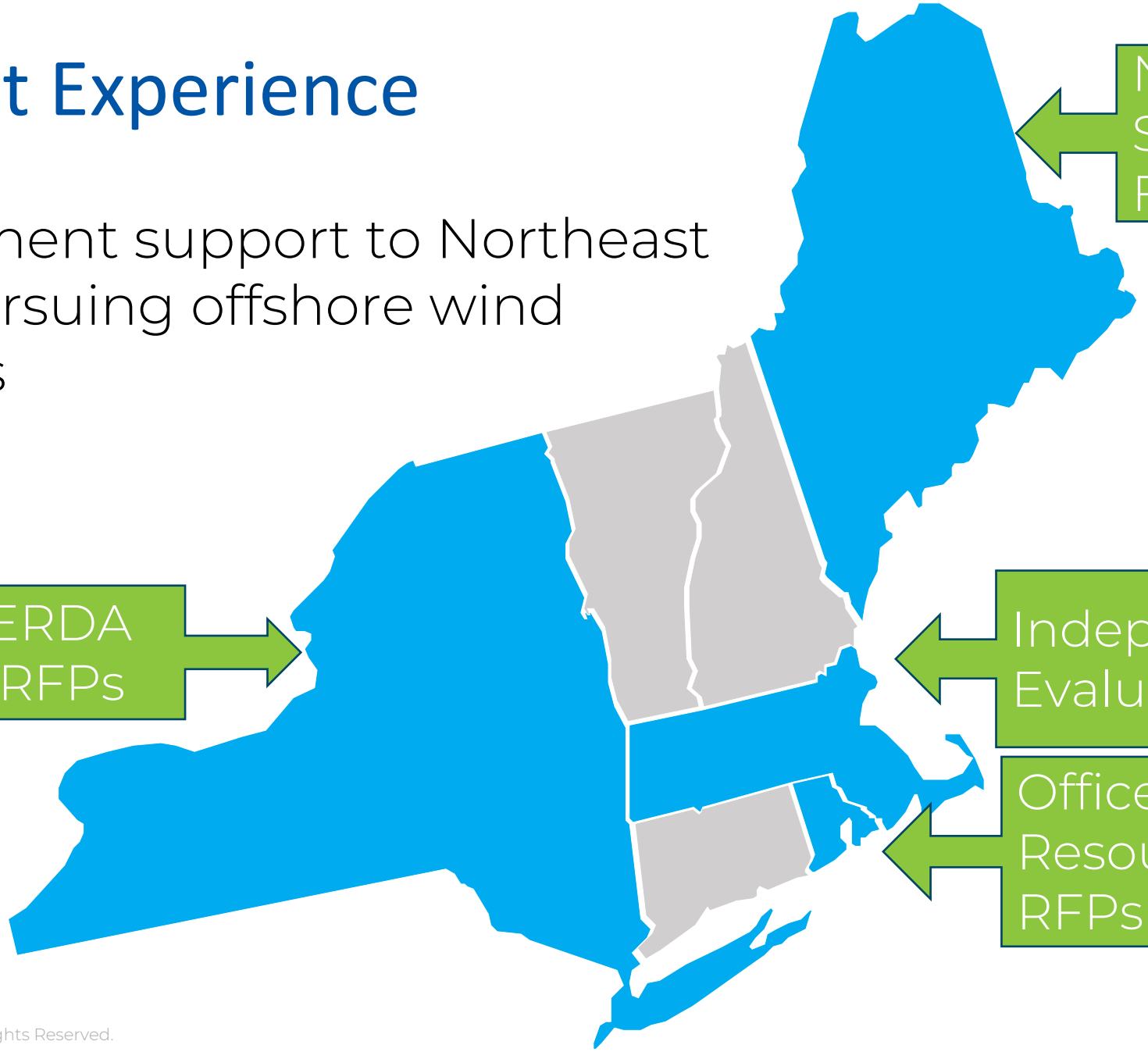
Relevant Experience

- Procurement support to Northeast states pursuing offshore wind contracts



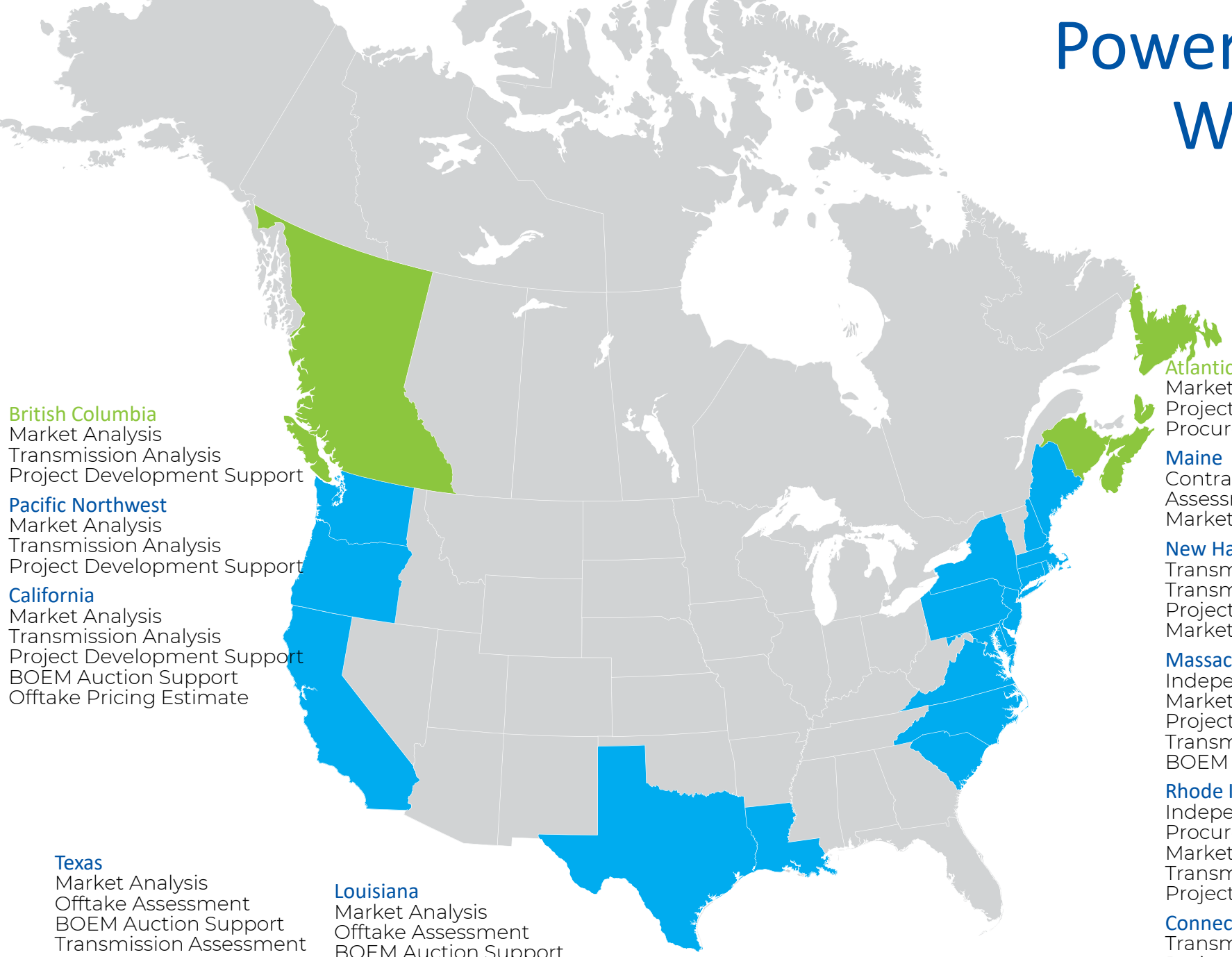
Negotiation Support for Floating OSW

4 NYSERDA OREC RFPs

Independent Evaluator

Office of Energy Resources: 2 OSW RFPs

Power Advisory Offshore Wind Experience



British Columbia
Market Analysis
Transmission Analysis
Project Development Support

Pacific Northwest
Market Analysis
Transmission Analysis
Project Development Support

California
Market Analysis
Transmission Analysis
Project Development Support
BOEM Auction Support
Offtake Pricing Estimate

Texas
Market Analysis
Offtake Assessment
BOEM Auction Support
Transmission Assessment

Louisiana
Market Analysis
Offtake Assessment
BOEM Auction Support

Atlantic/Maritimes Canada
Market Analysis
Project Development Support
Procurement Support

Maine
Contract Pricing & Risk Assessment
Market Analysis

New Hampshire
Transmission Support
Transmission Assessment
Project Development Support
Market Analysis

Massachusetts
Independent Evaluator
Market Analysis
Project Development Support
Transmission Assessment
BOEM Auction Support

Rhode Island
Independent Evaluator
Procurement Support
Market Analysis
Transmission Assessment
Project Development Support

Connecticut
Transmission Assessment
Project Development Support
Market Analysis

New York
Independent Evaluator
BOEM Auction Support
Procurement Support
Market Analysis
Project Development Support
Transmission Assessment

New Jersey
Transmission Support
Procurement Support
Project Benefit Support
Auction Support
Project Development Support
Market Analysis
Transmission Assessment

Pennsylvania
Market Analysis

Maryland & Delaware
Market Analysis
Transmission Assessment

Virginia
Market Analysis
Offtake Assessment
Transmission Assessment

North Carolina
Market Analysis
Offtake Assessment
BOEM Auction Support

South Carolina
Market Analysis
Offtake Assessment

Purpose: Review

(1) how offshore wind projects are paid; and

(2) how these costs are recovered for customers

Objective: participants will understand structure of offshore wind contracts and how these costs are allocated to customers

New York State Electricity Market

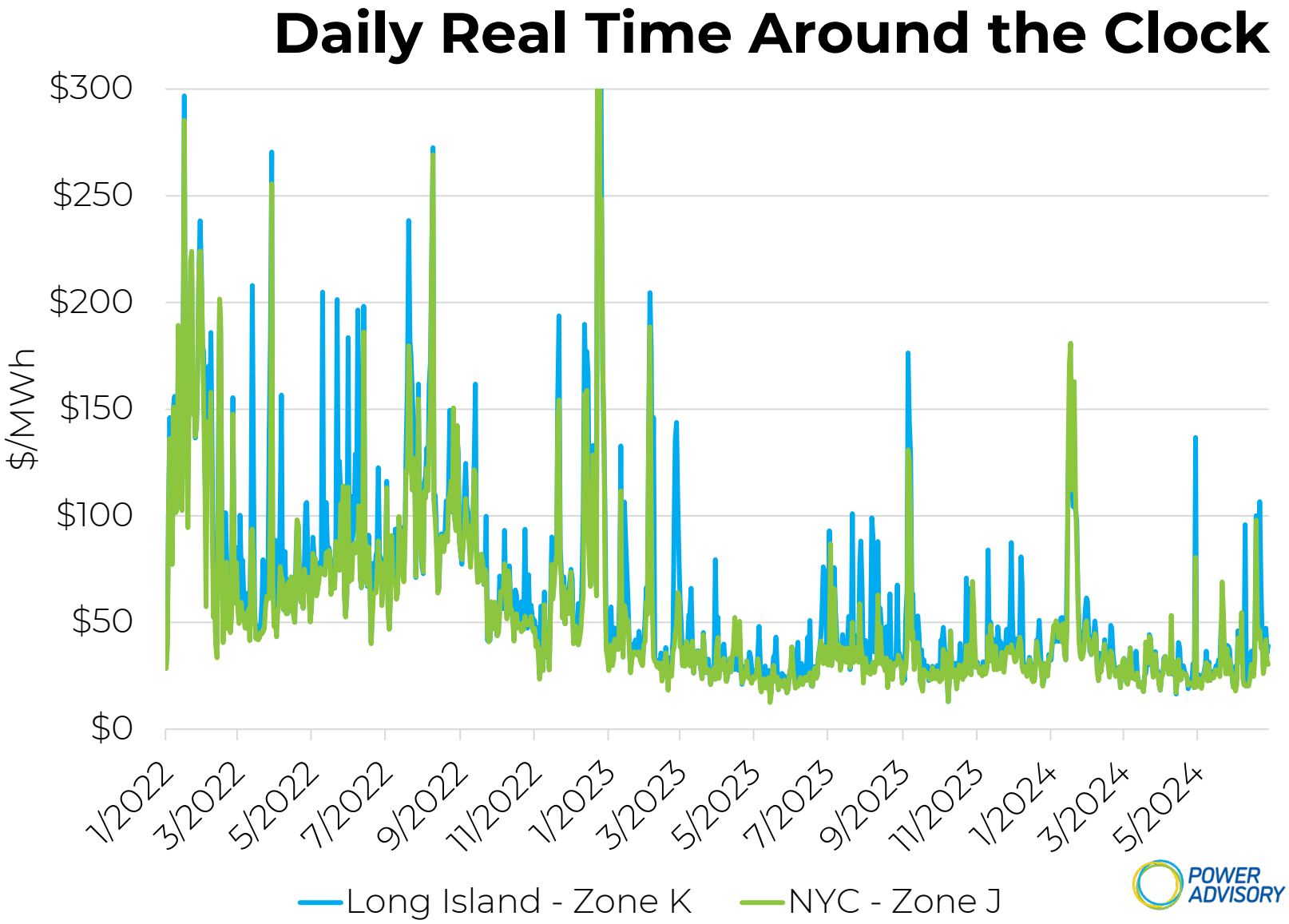
- New York's electricity market (NYISO market) organized to provide competitive markets for various wholesale electricity products
  - Energy: organized into day-ahead (DA) and real-time(RT) markets
  - DA energy market: clears on hourly basis day-ahead provides suppliers with price certainty to support efficient dispatch decisions
  - RT energy market: clears in real time based on difference between actual demand and committed day-ahead supply

NYISO Capacity Market: Supports Reliability

- Suppliers paid for being available to provide energy
- Variable output resources' capacity value based on output during peak period windows
- Capacity prices based on capacity levels relative to peak loads and required reserve margins
- Capacity revenues for offshore wind projects modest

NYISO Energy Market: Significant Volatility

- Volatility makes it virtually impossible to finance generation projects based on energy market revenues

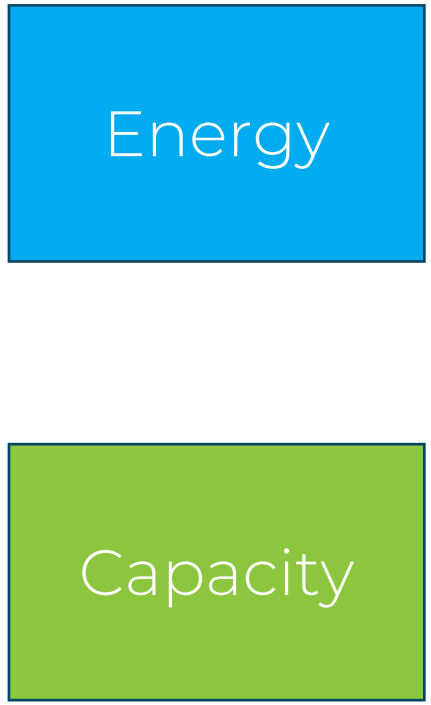


Long-term contracts provide revenue certainty

- This yields lower costs to customers by enabling lower cost financing
- Seller manages development, construction & operating risks
- What energy products covered?

Contract structure supports

- Energy payments ($/MWh) incent project owner to ensure project is available and operating
- Capacity payments incent project operation during peak periods given underlying variability of wind resource

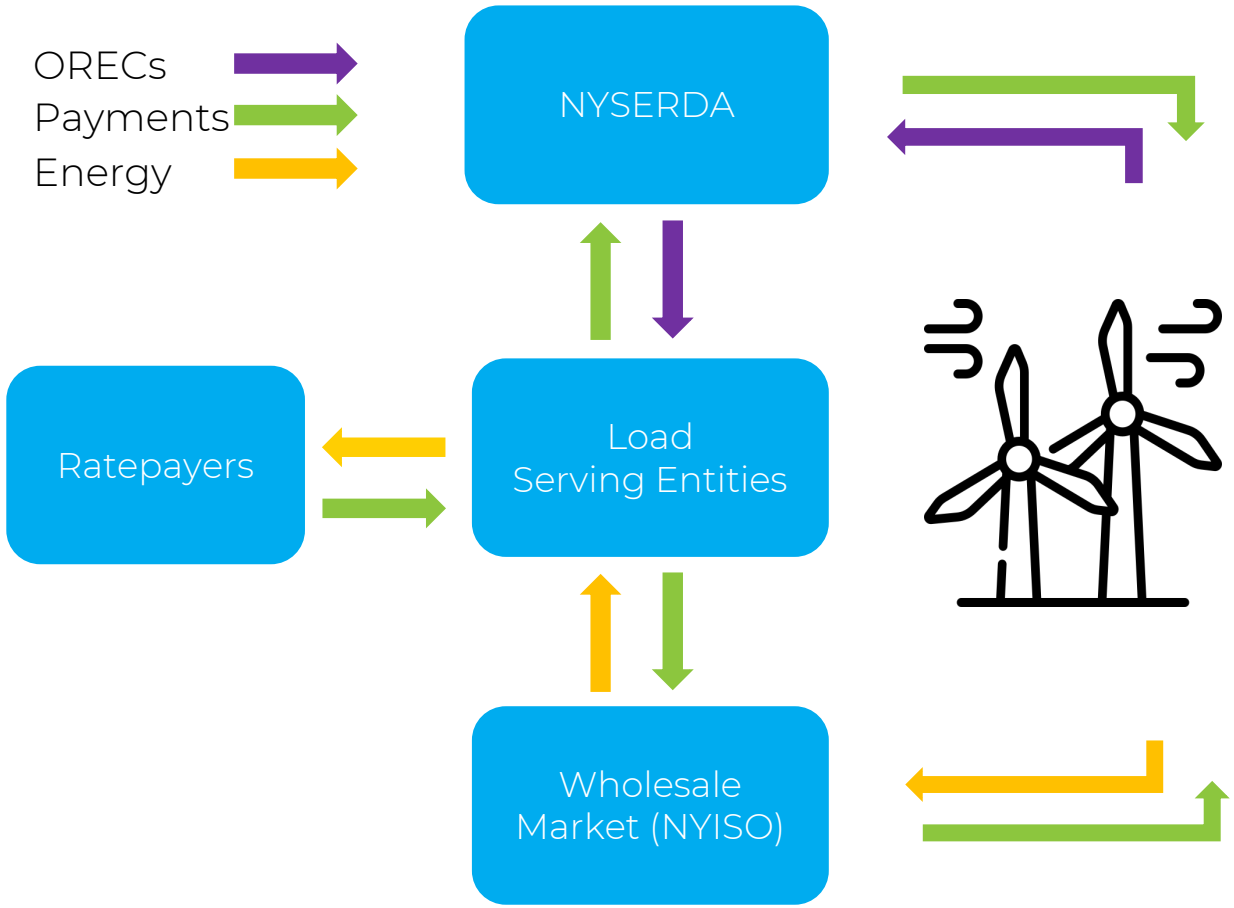


Renewable projects generate RECs

- Renewable energy certificates (RECs) minted for qualifying renewable generation
  - Environmental attributes from one MWh generated from renewable resource
- RECs recognize incremental value of renewable resources
- Offshore Wind Renewable Energy Certificates, or ORECs, represent environmental attributes from offshore wind resources

NYSERDA OREC Contract Structure

- OREC RFP bidders can bid a Fixed or Index OREC
- Consistent price through the contract term with level nominal price options required (i.e., no escalation)
- Contract terms of 20 or 25 years

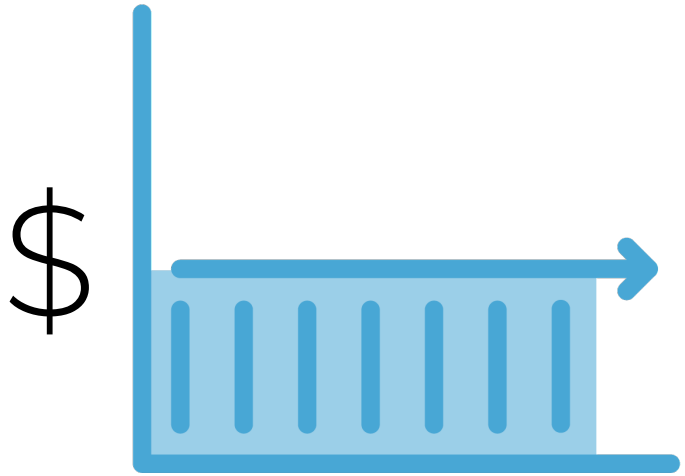


Fixed OREC

- Fixed OREC: fixed price for each MWh generated and delivered

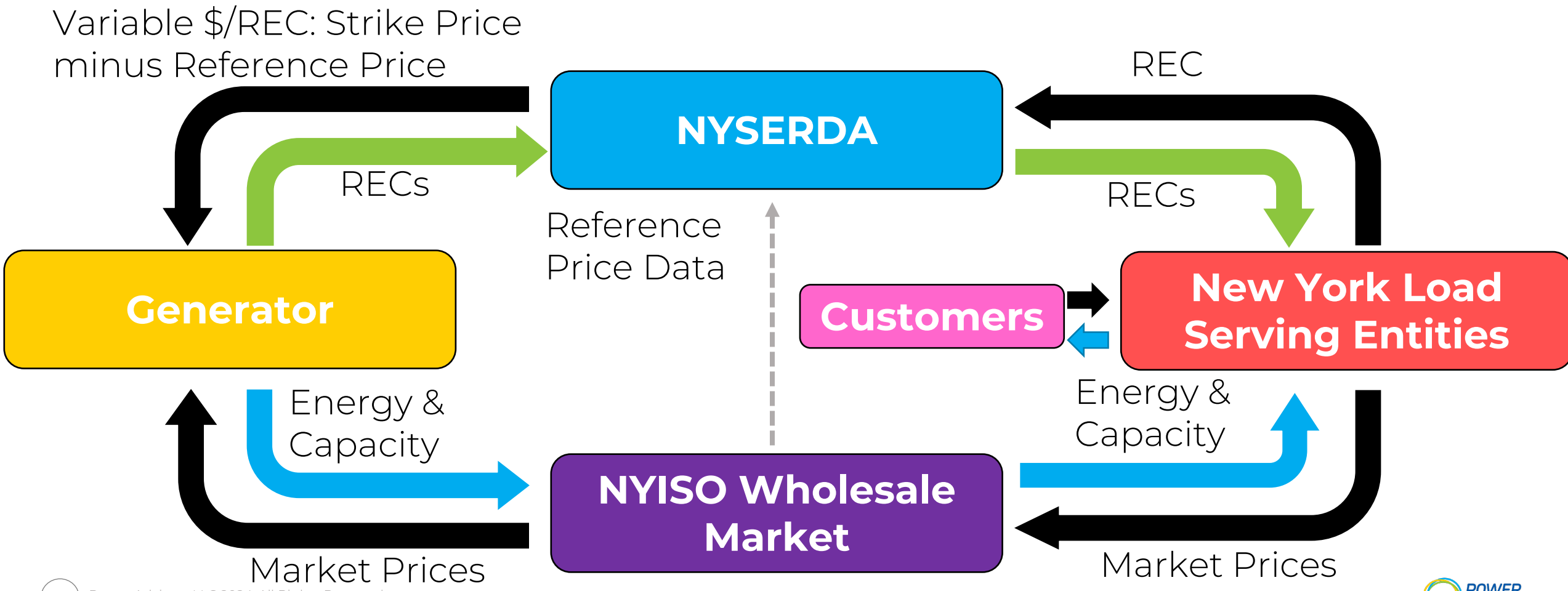
$$\boldsymbol{Monthly\ OREC\ Price = Fixed\ OREC\ Price\ (\$/MWh)}$$

- Seller manages volatility of energy and capacity prices



NYSERDA purchases bundled RECs/ORECs

- Index REC contract structure



Source: NYSERDA/NYISO, Adapted by Power Advisory

Index OREC

- Index OREC: variable monthly price

$$\boldsymbol{Monthly\ OREC\ Price} = \boldsymbol{Index\ OREC\ Strike\ Price}\ (\$/\boldsymbol{MWh}) - \boldsymbol{Reference\ Energy\ Price}\ (\$/\boldsymbol{MWh}) - [\boldsymbol{Reference\ Capacity\ Price}\ (\$/\boldsymbol{MWh})\ \boldsymbol{x}\ \boldsymbol{Mitigation\ Factor}\ (\%)]$$

  - Index OREC Strike Price developer's $/MWh revenue requirement and associated risk compensation

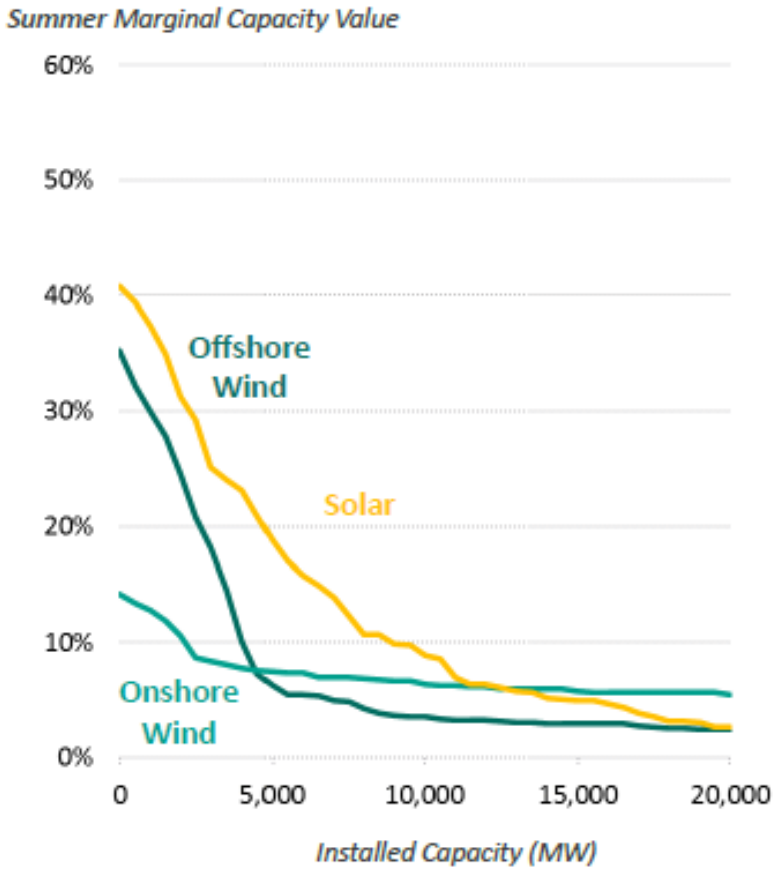
Reference Capacity Price

$$RCP = \frac{RUP\ x\ IC\ x\ 1,000\ x\ CAF}{Total\ ORECs}$$

- RUP = Reference UCAP Price ($/kW-Month)
- IC = Installed capacity (ICAP) of the generator (MW)
  - Offer Capacity for evaluation and Operational Installed Capacity for settlement purposes.
- CAF = Capacity Accreditation Factor for the resource's Capacity Accreditation Resource Class

NYISO Capacity Accreditation Factor

- Marginal reliability contribution of representative unit
- Current capacity accreditation factor for offshore wind 31.56%



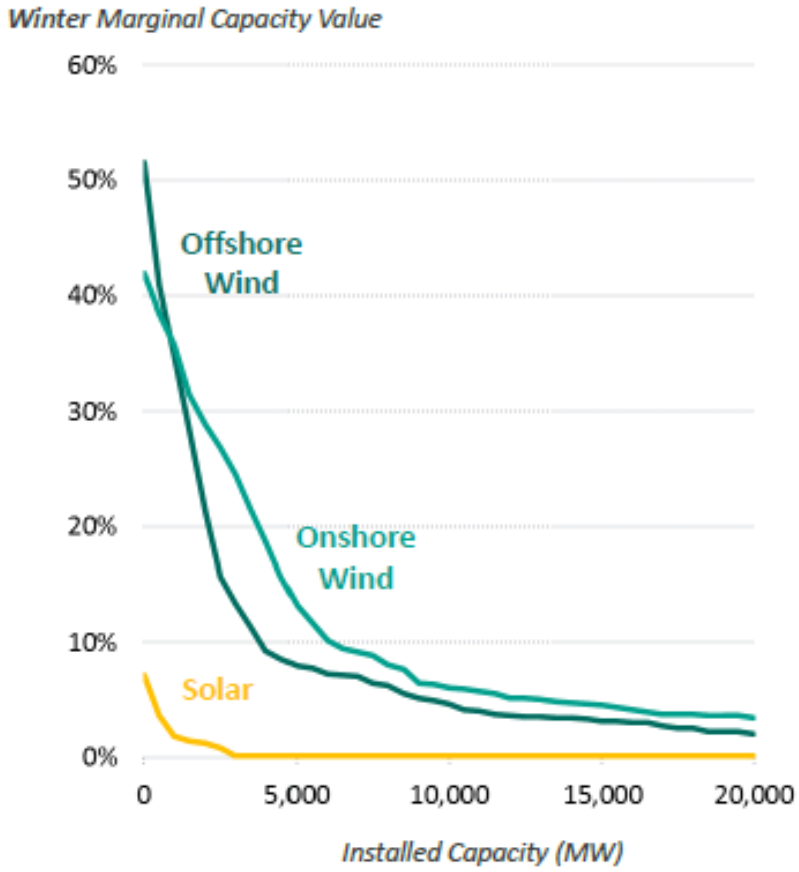


Image Source: Brattle

Levelized Net OREC Cost (LNOC)

- LNOC used to evaluate bid prices
  - Using forecast reference energy and capacity prices
- Index OREC Strike price - Zonal energy & capacity price forecasts = LNOC
  - Projected cost to customers of contract

Index OREC Strike Price - (Zonal Energy Price + Capacity Price) = LNOC

Image Source: Ørsted

Determining OREC Price

- Proposers estimate: DEVEX to permit and design project
  - CAPEX to build project
  - OPEX to operate
- Estimates input to DCF model to arrive at OREC price that provides target return
  - Also considers equity/debt mix & various project risks

Allocation of costs to Customers

- Load serving entities (LSEs) required to purchase Tier 1 RECs for a portion of electricity supply or pay ACP
  - Tier 1 RECs include ORECs
- NYSERDA one possible source of Tier 1 RECs
- NYSERDA establishes net cost of Tier 1 RECs including ORECs and recovers these costs through quarterly sale to LSEs

Index OREC Strike Price - (Zonal Energy Price + Capacity Price)

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