Workshop: ALJ Ruling on Centralized Procurement of Specified Long Lead-Time Resources in Integrated Resource Planning

CPUC Energy Division Staff

With Support from Energy and Environmental Economics (E3)

May 7, 2024

Logistics & Scope

- *Workshop slides* are available at the AB 1373 Centralized Procurement of Specified Long Lead-time Resources (ca.gov) webpage
- The workshop will be recorded, with the recording posted to the same webpage
- The purpose of this workshop will be to help inform party comments on the April 26, 2024 ALJ Ruling Seeking Comments on Need and Process for Centralized Procurement of Specified Long Lead-Time Resources
- Comments due May 24, 2024 and reply comments due June 5, 2024.

Questions

- We invite clarifying questions by using the "Q&A" feature of this WebEx throughout the workshop
  - Write your question in the "Q-and-A" box, directed to "All Panelists"
  - All questions posted and answered in the Q&A during this workshop will be posted on the AB 1373 Centralized Procurement of Specified Long Lead-time Resources (ca.gov) website.
- If necessary, verbal clarifying questions can be raised using the following functionality:
  - All attendees have been muted. To ask questions verbally:
    - In Webex:
      - Please "raise your hand"
      - Webex host will unmute your microphone and you can proceed to ask your question
      - Please "lower your hand" afterwards
    - For those with phone access only:
      - Dial *3 to "raise your hand." Once you have raised your hand, you'll hear the prompt, "You have raised your hand to ask a question. Please wait until the host calls on you."
      - Webex host will unmute your microphone and you can proceed to ask your question

AB 1373 Ruling Workshop Agenda

Topic	Timing	Presenter
Introduction	5 minutes	Nathan Barcic
Background on IRP and central procurement	15 minutes	David Withrow
Overview of ALJ Ruling	15 minutes	David Withrow
Procurement Challenges and Market Transformation Impacts of Certain Resource Types	10 minutes	Jim Sievers
Summary of Analysis of LLT Resources	10 minutes	Jim Sievers
E3 Presentation: Background and Results of OSW Analysis	20 minutes	Sierra Spencer Aaron Burdick
Selected questions to parties from the Ruling	15 minutes	David Withrow Nathan Barcic
Wrap up	5 minutes	Nathan Barcic

Background

Central Procurement of Long Lead Time Resources through the Integrated Resource Planning proceeding

Statutory Basis of IRP: SB 350 (De León, 2015)

- The Commission shall…
  - PU Code Section 454.51
    - **Identify a diverse and balanced portfolio of resources… that provides optimal integration of renewable energy in a cost-effective manner**
- PU Code Section 454.52
  - **...adopt a process for each load-serving entity…to file an integrated resource plan…to ensure that load-serving entities do the following…**
    - Meet statewide GHG emission reduction targets
    - Comply with state RPS target
    - Ensure just and reasonable rates for customers of electrical corporations
    - Minimize impacts on ratepayer bills
    - Ensure system and local reliability
    - Strengthen the diversity, sustainability, and resilience of the bulk transmission and distribution systems, and local communities
    - Enhance distribution system and demand-side energy management
    - Minimize air pollutants with early priority on disadvantaged communities
- The CPUC's IRP process regularly conducts need assessments which lead to a "Preferred System Plan." Additional analysis can be useful for Long Lead-time resources that are difficult for LSEs to procure.

Diverse resource procurement through Integrated Resource Planning

- The objective of IRP is to reduce the cost of achieving greenhouse gas (GHG) reductions and other policy goals by looking across individual Load Serving Entity (LSE) boundaries and resource types to identify solutions to reliability, cost, or other concerns that might not otherwise be found.
- The goal of the IRP process is to ensure that the electric sector is on track to support California's economy-wide GHG reduction goals and achieve the SB 100 target of 100% renewable and carbon-free electricity by 2045.
- IRP analysis has consistently identified the need for a diverse set of resources to meet these goals.
    - Ongoing reduction of thermal generation capacity through the retirement of OTC plants, expected closure of additional gas generation plants, and the impending closure of Diablo Canyon power plant, in addition to LSEs increasing reliance on using solar generation to meet existing obligations has increased the likely need for resources that can provide more "firm" dispatchable load.
- It is unclear if all of these resource types will be procured on their own via existing procurement frameworks in IRP, RPS, or elsewhere.

Reasons to explore central procurement of diverse resources

- A key attribute of Long Lead-Time resources is that they are difficult to procure from the perspective of a single LSE.
- Specific resource types can provide the combined LSE portfolio of resources with diversity value that may not otherwise be developed due to cost, minimum contract size, or other barriers.
- Many of these Long Lead-Time resources are location-specific and their development is inherently geographically limited.
- LLT resources often include a high level of development risk, which can lead to long development timelines, and they also are often interdependent on significant new transmission.
- Utilizing a new central procurement tool would aim to ensure SB 100 and other goals can be achieved at least cost. It could be in the best interests of ratepayers to share the cost, timing, and technology risks of development of certain resources with the purpose of investment in GHG reductions in California as a whole.

Legislative justification for central procurement of diverse resources

Section 18 of AB 1373 describes the reasons central procurement is deemed necessary:

- "This act is an urgency statute necessary for the immediate preservation of the public peace, health, or safety within the meaning of Article IV of the California Constitution and shall go into immediate effect. The facts constituting the necessity are:
  - To ensure the procurement of eligible energy resources that the state needs to meet its reliability needs, which have been identified as being delayed or needing a secure development path, it is necessary to establish a central procurement entity within the Department of Water Resources and for this act to take effect immediately.
- In addition, paragraph 6 of the summary analysis from the Legislative Counsel's Digest describes:
  - "This bill would require that the portfolio of resources ensure a reliable electricity supply that also provides optimal integration of resource diversity in a cost-effective manner, as specified."

Statutory Basis of Central Procurement through IRP: AB 1373 (Garcia, 2023)

- AB 1373 (2023, Garcia et al.) enables CPUC to request DWR to conduct central procurement of "eligible energy resources" until January 1, 2035 and to "*develop and adopt procedures and requirements that govern competitive procurement by, obligations on, and recovery of costs incurred by the department*."
- Further requires the Commission (initially by September 1, 2024, and thereafter in a recurring process) to determine if there is a need for the procurement of eligible long lead time energy resources via a central procurement entity such as DWR.
  - This need determination is to be made in consultation with the CEC and CAISO.

Information Used to Inform an AB 1373 Need Determination

- Consistent with AB 1373 requirements, CPUC staff has sought to draw on multiple pieces of information to inform decision-making regarding a need determination for central procurement of eligible resource types.
- This includes consideration of individual LSE plans filed on November 1, 2022; LSE procurement actions as filed in the IRP proceeding; and the planning track of the CPUC's IRP process, particularly the most recently adopted IRP Preferred System Plan.
- The relevant information from each is summarized in the following slide, which indicates that:
  - LSEs selected a significant amount of LLT resources that were included in 2023 PSP
  - Modeling analysis supplemented LSE plans with additional LLT through 2035
  - Contracted and forecasted online LLT resources indicates slower than expected progress through 2028

2023 Integrated Resource Planning Cycle Load Serving Entity Preferences/PSP Portfolio vs. Procurement of Long Lead Time Resources

- Table 1. Amounts of Eligible Resources Included in PSP Portfolio, LSE Plans, and LSE Procurement Data Filings (MW capacity by 2035)

Resource Type	PSP Portfolio	LSE 11/1/2022 Plans	Under Contract or Expected Online by 6/1/2024	Additional Forecasted through 6/1/2028
OSW	4,500	4,500	0	0
OOS Wind	6,300	3,400	318	28
Geothermal	2,000	1,600	26	258
Generic LDES	500	500	0	0
8-Hour Batteries	2,800	2,800	0	361
Pumped Hydro Storage	500	500	0	0
Total	16,600	13,300	344	647

Progress to date and forecasted procurement of AB 1373-eligible resource categories

- AB 1373 provides statutory guidance through 454.52 (4)(A) for the Commission to review load serving entities integrated resource plans when developing a need determination for central procurement.
- Regarding related procurement for existing IRP procurement requirements:
  - Geothermal: LSEs have procured 26 MW through 8/1/2023, forecasted to be 26 MW for 6/1/24.
    - 258 MW of additional capacity is forecasted to be online by 6/1/28.
  - OOS Wind: LSEs have procured an expected 318 MW of OOS through 6/1/24.
    - Another 28MW of OOS is expected through 6/1/28.
  - Long Duration Storage: 361 MW of 8-hour LDES is forecasted to be online by 6/1/28.
    - No 8-hour LDES battery storage is expected to be procured through 6/1/24.
  - OSW: LSE IRP procurement filings do not indicate that OSW has been procured yet.

Overview of ALJ Ruling to implement AB 1373

Section 1: Background: Centralized Procurement Provisions of AB 1373

- AB 1373 authorizes the CPUC to request that DWR act as a central procurement entity (CPE) to conduct centralized procurement of certain eligible long lead-time (LLT) energy resources until January 1, 2035.
  - This statute adds an additional tool for the Commission potentially to use for procurement of LLT resources.
- AB 1373 directs that the Commission "*determine if there is a need for the procurement of eligible energy resources based on a review of the integrated resource plans submitted by load-serving entities in compliance with the requirements of this section and Section 454.53 and the progress towards meeting the portfolio of resources identified pursuant to subdivision (a) of Section 454.51*."
- AB 1373 does not modify the Commission's existing authority to require investor-owned utilities (IOUs) to undertake centralized procurement.
- By September 1, 2024, the Commission is required to make an initial need determination for procurement by DWR. If a need is found, within six months the Commission may then make a request to DWR to exercise the centralized procurement mechanism.

Section 2: Eligible energy resources

- The Ruling notes AB 1373 definition of "eligible energy resources" in Sec. 4 (h) (1) (A-E):
    a) *The resource directly supports attainment of the goals specified in Section 454.53 without increasing the state's dependence on any fossil fuel-based resources.*
    b) *The resource is determined by the commission to not be under contract at sufficient levels as shown in load-serving entities' most recent individual integrated resource plans submitted to and reviewed by the commission pursuant to this section to achieve the goals specified in Section 454.53.*
    c) *The resource has a construction and development lead time of at least five years.*
    d) *The resource does not generate electricity using fossil fuels or fuels derived from fossil fuels.*
    e) *The resource does not use combustion to generate electricity, unless that combustion use is ancillary and necessary to facilitate geothermal electricity generation.*
- In addition, the Ruling proposes the Commission consider centralized procurement for an LLT resource that: provides resource diversity, is needed to meet SB 100 goals, and has already been identified as needed in a PSP portfolio.
- The Ruling also proposes centralized procurement for an LLT resource if that also addresses procurement challenges for existing technologies and/or supports market transformation for emerging technologies.

Section 3: Need Determination

- AB 1373 requires initial need determination by September 1, 2024.
  - CPUC will likely revisit need determinations at various points in the future to ensure prudent ratepayer commitments.
- AB 1373 also requires "*a review of the integrated resource plans submitted by load-serving entities in compliance with the requirements of this section and Section 454.53 and the progress towards meeting the portfolio of resources identified pursuant to subdivision (a) of Section 454.51.*"
- Table summarizing LSE plans and procurement shows that LSEs are planning for a large amount of LLT resources, yet only a small amount has been procured thus far.
- Staff conducted supplemental analysis for OSW resources for two main reasons:
  - Due to its unique nature, scale, and uncertainty around some of its associated assumptions.
  - In addition, OSW was the only resource not identified as cost-effective in the least-cost modeling analysis conducted for the most recently adopted PSP portfolio in D.24-02-047. Thus it is useful to further evaluate the significant potential benefits and potential costs under various future scenarios.

Section 4: Relationship to LSE Procurement

- Should the Commission adopt an initial need determination for DWR centralized procurement, DWR's procurement would need to be coordinated with many existing and future procurement requirements. This includes procurement driven by:
  - IRP, RPS or other compliance requirements;
  - local resource adequacy procurement via IOU central procurement;
  - emergency reliability procurement;
  - Diablo Canyon orders;
  - Any likely future individual LSE procurement obligation resulting from the IRP's Reliable and Clean Power Procurement Program (RCPPP).
- Ruling recognizes that central procurement of geothermal or LDES resources would introduce considerable complexity into the allocation of procurement responsibility to LSEs.
  - Ruling further suggests that if DWR were to procure OSW in a centralized manner, it could make sense not to count the procurement toward any existing requirements for LSE procurement.
- Ruling proposes that LSEs not be allowed to opt-out of DWR centralized procurement.

Section 5: Allocation of Costs and Benefits

- For any central procurement of OSW, the Ruling proposes costs and benefits be allocated uniformly across all LSEs, in the same manner as the approved order (D.23-12-036) extending Diablo Canyon operations.
  - Allocation of costs to each IOU service area based on the IOU TAC area's share of a 12-month coincident peak load.
    - Allocation of costs to the LSEs within each IOU's territory that would mirror the Cost Allocation Mechanism (CAM) established in D. 06-07-029.
  - Allocation of benefits in the same manner as the costs, mirroring the CAM allocation of resource adequacy and GHG emissions reduction benefits.
- LSEs can voluntarily elect to obtain incremental resources from DWR central procurement.

Section 6: Procurement Process and Timeline

- Ruling proposes that DWR procurement be conducted by a competitive solicitation process.
  - Proposed contracts would be submitted by DWR to the Commission for approval.
  - Contract volumes and pricing data would remain confidential for three years.
  - CPUC and DWR would collaboratively develop solicitation criteria.
- Ruling proposes to provide DWR flexibility to buy less than the maximum need determination (including zero) in any single solicitation.
- Ruling proposes initial DWR solicitation between 2026 – 2028, with Commission decision between 2028 – 2029 for commercial operation by 2035.
  - Need determination for central procurement of eligible energy resources would be conducted on a recurring basis.

Proposed Timeline

- Table 2. Proposed Schedule for Possible First Tranche of Centralized Procurement by DWR

ITEM	TIMING RANGE
Commission decision making on initial need determination	No later than September 1, 2024
Commission request to DWR to exercise its central procurement function to procure needed resources, if determined necessary	March 1, 2025
DWR and Commission staff outreach to POUs and voluntarily participating LSEs; subsequent formation of procurement review group	Late 2024 - 2025
DWR development of solicitation plans and materials, in consultation with Commission staff and procurement review group	2025 - 2027
DWR pre-bid activities with bidders	2026 - 2028
Solicitation open for project proposals 2026 - 2028 Bid evaluation 2027 - 2028	2027 - 2028
Bid evaluation	2027 – 2028
DWR submits proposed contracts for Commission consideration	2027 – 2028
Commission decision addressing approved contracts and associated cost recovery	2028 – 2029 for deliveries by 2035

Procurement Challenges and Market Transformation Impacts of Certain Resource Types

Considerations for Determining Whether Centralized Procurement is Justified

- What conditions demonstrate a significant procurement challenge?
  - If a resource has not yet been procured, that does not on its own constitute a procurement challenge.
  - Resource size relative to buyer size could demonstrate a procurement challenge or a technology that appears cost-effective at the system level.
    - However, resources can find multiple buyers or multiple buyers can join together to buy a larger resource.
    - Is a proven cost-effective resource not being procured by LSEs because of a size mismatch or other procurement challenges?
  - Resource development timelines could be delayed if many LSEs procure instead of a centralized entity.
    - Does this represent a need for LSEs to initiate additional procurement or a need for centralized action?
- When does a market transformation opportunity justify centralized procurement?
  - Market transformation should be weighed against the cost to ratepayers.
  - Market transformation requires a resource with large potential and without easily available substitutes, that can achieve cost reductions through learning and/or economies of scale.

Centralized procurement of specific resources should be carefully considered

Benefits of centralized procurement

- Addresses procurement challenges for existing technologies
  - Procurement challenges occur when resource procurement has net system benefits, but LSEs are unable to procure that resource on their own
- Supports market transformation for emerging technologies
  - Centralized procurement can support new high-cost technologies with the potential for future cost reductions

Risks of centralized procurement

- May increase ratepayer costs by decreasing procurement competitiveness
  - All source, attribute-based procurement (e.g., X MW ELCC or Y GWh of clean energy instead of resource specific procurement) tends to yield least cost outcomes[1]
  - A single buyer may be subject to seller market power if a prescribed quantity is set with limited sellers
- Decreases ability of LSEs to procure their own resources

[1] "All-Source Competitive Solicitations: State and Electric Utility Practices"

Considering a test for centralized procurement

Category	Test	Offshore Wind	Out-of-state Wind	Geothermal	Pumped Hydro Storage
Procurement Challenges	A) Mismatched size of resource and/or transmission between sellers and buyers				
	B) Cost-effective across broad range of future scenarios, yet not being procured				
Market Transformation	C) Large resource potential				
	D) Serves a key role in future portfolios without readily available substitutes				
	E) Emerging technology with significant likelihood of cost reductions through learning				

- **Questions for stakeholders:**
  - **Are these the right tests?**
  - **Are these the right ratings for each technology?**

Test ratings explained

Category	Test	Offshore Wind	Out-of-state Wind	Geothermal	LDES
Procurement Challenges	A) Mismatched size of resource and/or transmission between sellers and buyers	Large typical project sizes	Large transmission size, incremental small offtakers may be possible but creates financing challenges	Smaller and modular procurement sizes available but some resource zones require high volumes	Large-scale projects, may be challenging to finance and build without a single contract
	B) Cost-effective across broad range of future scenarios, yet not being procured	Cost-effectiveness depends on scenario analyzed.	Selected across all RESOLVE cases and currently being procured by LSEs	Selected across all RESOLVE cases and currently being procured, at least in small volumes by LSEs	Selected across all RESOLVE cases but may not be cost-effective. Not being procured by LSEs
Market Transformation	C) Large resource potential	Supporting infrastructure enables economies of scale for large resource	Large high quality wind resource available with transmission investment	Large resource potential (with high capacity factor, especially in some resource zones	Project locations are generally limited by unique geographic characteristics, for some technologies
	D) Serves a key role in future portfolios without readily available substitutes	Supports resource diversity. Substitutes exist but may face challenges (e.g., in-state or out-of-state wind)	Supports resource diversity. Substitutes exist but may face challenges (e.g., in-state or offshore wind)	Clean firm resource with high capacity factors emerging (e.g., gas with CCS), but unproven substitutes	LDES selected in future portfolios, but many existing and emerging alternatives exist
	E) Emerging technology with significant likelihood of cost reductions through learning	New technology with low amount of deployment globally	Proven, established technology	Some emerging geothermal technologies benefit from learning; conventional geothermal does not	Emerging technologies benefit from learning; conventional technologies do not

Summary of Analysis of Long Lead-Time (LLT) Resources

Additional analysis of other LLTs builds on the more comprehensive offshore wind study

- Data on optimal amounts of additional long lead-time (LLT) resources was extracted from the RESOLVE runs considered in the offshore wind analysis*.
  - Compared to the offshore wind analysis, the analysis of other LLT resources is less robust since it does not explicitly consider LLT cost risk and does not consider a targeted set of benefit scenarios focused on each LLT.
  - However, the analysis still provides useful information to inform optimal builds and timelines for geothermal, pumped storage hydro storage (PSH), and out-of-state (OOS) wind.
- Unlike offshore wind, geothermal, PSH, and OOS wind are all existing technologies with a history of procurement in California and the west.
  - Market transformation is not the focus, but central procurement could overcome significant procurement challenges.

* Scenarios with resource limits on geothermal, pumped storage hydro and/or out-of-state wind were excluded from this analysis on other LLTs

Geothermal

- **Typical project development lifetime**: 7-10 years[1]
- **Optimal resource amounts***: 2.1 - 2.9 GW by 2030, 2.2 - 4.6 GW by 2035
- **Existing procurement orders**: 1 GW (MTR firm zero-carbon renewables) by 2028-2031
- **Can centralized procurement overcome the significant challenges of LSE procurement?**
  - Though longer lead times are required, individual projects are generally not large and have proceeded with LSEs of various sizes in the past without centralized procurement
  - Challenges with sourcing capacity for MTR order have already caused CPUC to delay procurement from 2026 to 2028-2031, indicating major challenges to reach existing procurement targets
    - Challenges are generally focused on expanding the queue of available resources to procure (limited resource sites, long development timelines, limited interconnection queue capacity, etc.).
    - It is unclear whether centralized procurement is the appropriate tool to solve these challenges.

[1]DOE Office of Energy Efficiency & Renewable Energy; 7-10 years estimate from site control
**across scenarios with 0 GW of offshore wind

Pumped Storage Hydro

- **Typical project development lifetime**: 8-12 years*
- **Optimal resource amounts****: 0.5 - 2.6 GW by 2030, 0.5 - 3.1 GW by 2035
- **Existing procurement orders**: 1 GW (MTR long-duration storage) by 2028-2031, which may also be met with 8-hr batteries and other LDES alternatives
- **Can centralized procurement overcome the significant challenges of LSE procurement?**
    - Many LSEs have struggled to make significant progress on the sourcing and procurement of the 1 GW long-duration storage ordered through MTR.
        - The CPUC has extended the deadline for the 1 GW LDES requirement (for the second time) from the initial 2026 date to 2028-2031 COD.
    - Direct alternatives to PSH exist that are more flexible re: modularity, siting, and transmission minimization (i.e., 8-hr li-ion batteries, A-CAES, and other emerging LDES technologies).
    - While PSH may face challenges due to large project sizes, some alternatives exist without the same procurement challenges, which increases the risk to ratepayers of committing to centralized procurement for PSH.

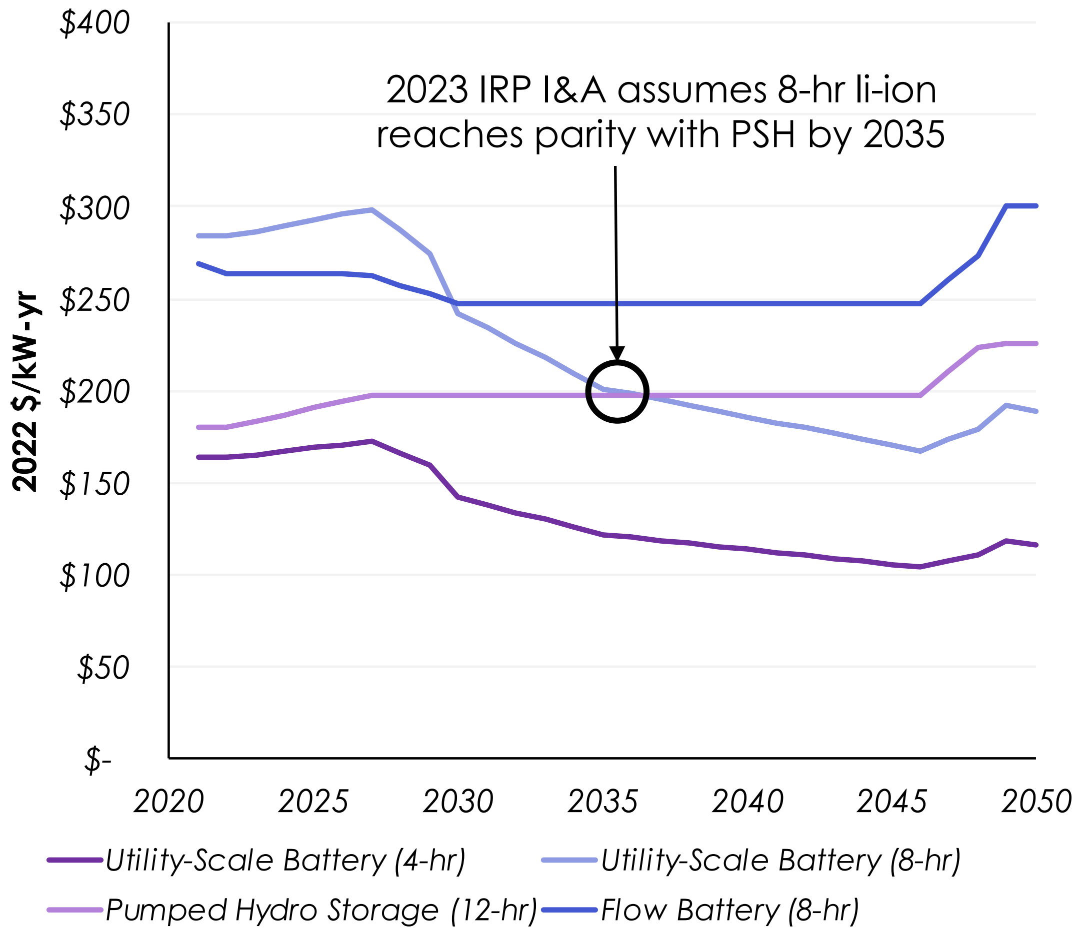
* Source: DOE Office of Energy Efficiency & Renewable Energy; 8-12 years estimate from pre-licensing activities
** across scenarios with 0 GW of offshore wind

8-Hour Battery Storage

- **Existing procurement orders**: 1 GW (MTR long-duration storage) by 2028-2031
  - Staff analysis currently only showing 8-hour battery procurement to meet the LDES obligations of MTR
- **Can centralized procurement overcome the significant challenges of LSE procurement?**
  - Many LSEs have struggled to make significant progress on the sourcing and procurement of the 1 GW long-duration storage ordered through MTR.
    - IRP bi-annual LSE filings for ordered procurement through MTR have illustrated difficulty in meeting the deadline for LDES, that was extended through D.23-02-040 to 6/1/2028. D.24-02-047 provided LSEs the option to request an extension through 6/1/31, contingent on providing evidence that a "good faith effort" has been made towards procurement. This is the second LLT extension.
    - Currently, 361MW of 8-hour battery storage is planned if forecasted online through 6/1/2028.
    - No other LDES alternatives have been identified by LSEs to meet the 1000MW obligation

Alternative long-duration storage technologies

- Pumped storage hydro configurations and costs tend to be highly site specific
  - CPUC IRP I&A uses generic costs based on the 2023 NREL ATB
- Long-duration li-ion batteries and flow batteries are existing commercialized alternatives to PSH
- Additional emerging LDES technologies also exist



Out-of-state Wind

- **Typical transmission project development lifetime**: 10 years
- **Optimal OOS Wind amounts***: 4.3 - 5.2 GW by 2030, 6.7 - 10.1 GW by 2035
- **Can centralized procurement overcome the significant challenges of LSE procurement?**
  - Although the transmission component of out-of-state wind is a long lead-time resource that no one LSE can carry, OOS Tx development is already advancing without centralized procurement.
  - Developing new OOS wind resources and associated multi-state transmission lines requires substantial subscription of the transmission capacity and a centralized OOS wind resource procurement may help speed this up, facilitating faster development.
    - However, it is unclear that centralized procurement is necessary given examples of merchant-based transmission moving forward with LSE-level contract commitments (SunZia).
    - Centralized procurement could potentially drive higher prices versus a longer, but more competitive process, of sales to multiple LSEs.

*across scenarios with 0 GW of offshore wind

E3 Presentation:

Background on Offshore Wind Cost-Benefit Analysis

Offshore Wind Cost-Benefit Analysis

Background and Analytical Approach

- This cost-benefit analysis was conducted to compare the range of potential costs for offshore wind procurement (including transmission) to a range of the potential benefits across a broad range of future scenarios
  - Offshore wind benefits represent avoided investment and operating costs from RESOLVE, calculated through comparison of system costs with and without offshore wind at different procurement amounts
- The cost-benefit analysis was conducted on the 25 MMT Least-Cost case to enable comparison to a portfolio without any offshore wind
- Results were analyzed using the following key metrics:
  - $/MWh offshore wind net benefits: levelized avoided costs vs. levelized resource + Tx costs
  - $ Net Present Value (NPV) net benefits: net ratepayer impacts across the offshore wind lifetime
  - This analysis provides insights into the electric system value and cost risk of offshore wind procurement, including how those risks change as increasing levels are procured

RESOLVE's analytical approach was adjusted to focus on offshore wind cost-benefit analysis and ratepayer risk

PSP Modeling Approach

Offshore wind costs
- 2 cost scenarios

Resource and policy inputs
- 15 scenarios

→ RESOLVE Optimization →

Optimal offshore wind amounts
- MW by year

*Focused on **finding optimal offshore wind** levels*

Cost Risk Modeling Approach (this study)

Forced-in offshore wind procurement trajectories
- 7 scenarios

Resource and policy inputs
- 16 scenarios

→ RESOLVE Optimization + Post-Processing →

Offshore wind costs
- 5 cost scenarios

Offshore wind cost/benefit and risk analysis
- NPV and $/MWh costs
- NPV and $/MWh benefits
- Range of net benefits or costs

Above results for each OSW trajectory

*Focused on finding a **range of offshore wind benefits to inform cost-benefit analysis***

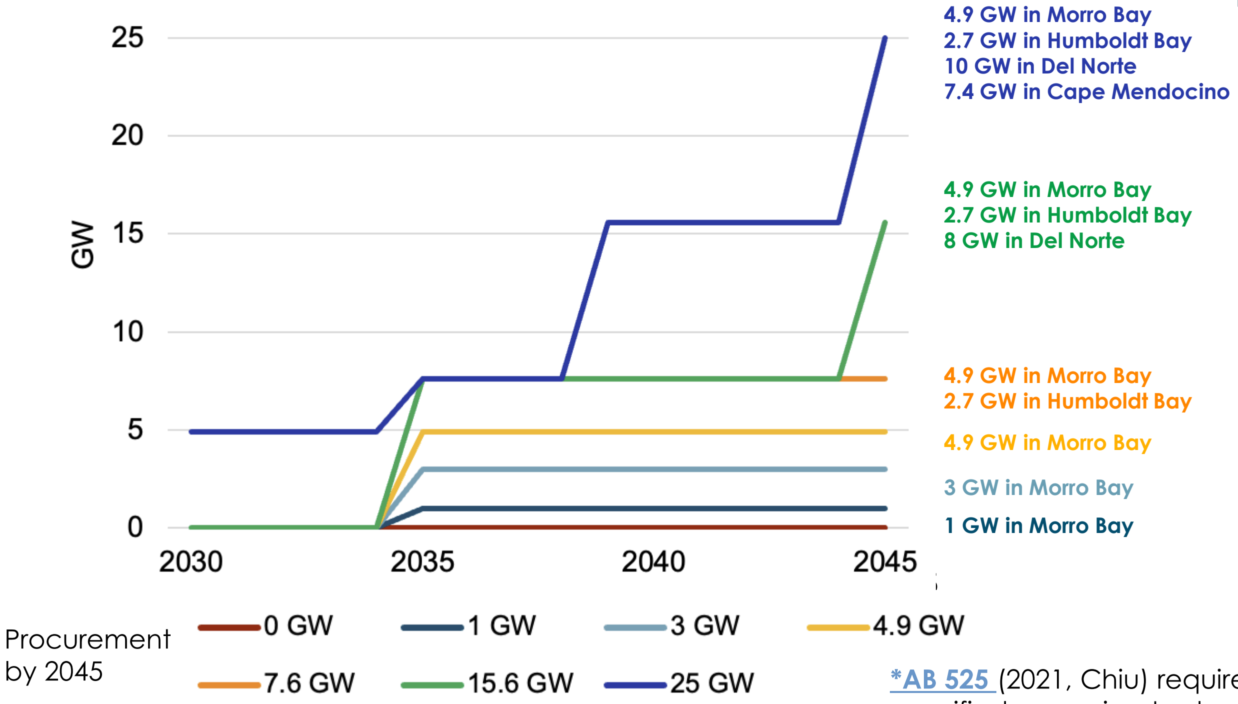
- Focused on optimizing offshore wind within the broader set of long-term system needs
  - Output = optimal offshore wind levels for each scenario

- Focused on building out a robust set of ratepayer cost and risk scenarios
  - Output = range of benefits vs. costs across a broader range of cost + benefit scenarios

Offshore Wind Procurement Trajectories Studied

- This analysis evaluates in detail procurement amounts of 0 GW, 1 GW, 3 GW, 4.9 GW, and 7.6 GW by 2035
    - Additional limited analysis was performed for higher long-term scenarios that reach 15.6 GW or 25 GW by 2045

Offshore Wind Procurement Trajectories



Probable Development Implications of Build Levels

*25 GW: AB 525 trajectory**

15.6 GW: Intermediate buildout between 7.6 GW and 25 GW

7.6 GW: Full utilization of Morro Bay + Humboldt

4.9 GW: Full utilization of Morro Bay

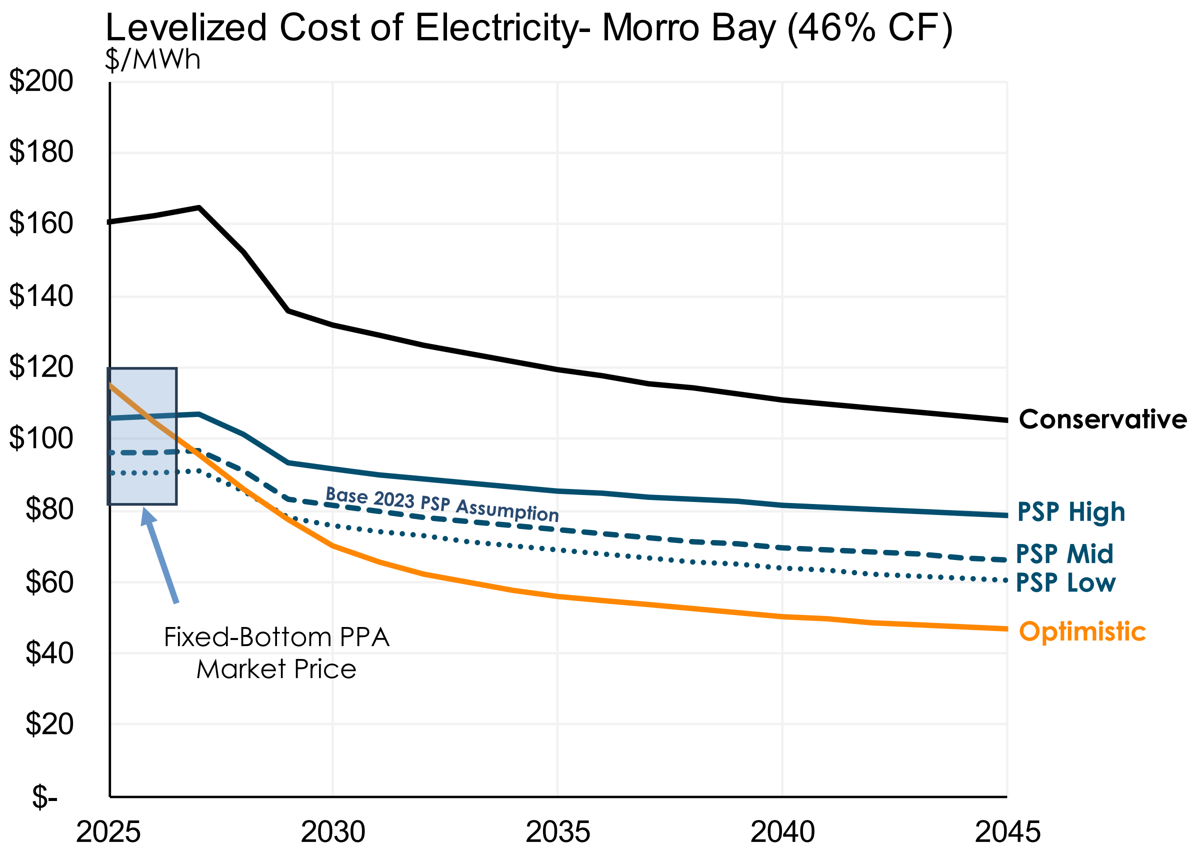
3 GW: Partial utilization of Morro Bay

1 GW: Estimated minimum viable project size

*AB 525 (2021, Chiu) requires the California Energy Commission, in coordination with specified agencies, to develop a strategic plan for offshore wind energy developments installed off the California coast in federal waters. The Draft Assembly Bill 525 Offshore Wind Strategic Plan is posted here. An aspirational goal of 25 GW by 2045 has been set in the CEC's AB 525 process.

California Floating Offshore Wind Resource Cost Scenarios

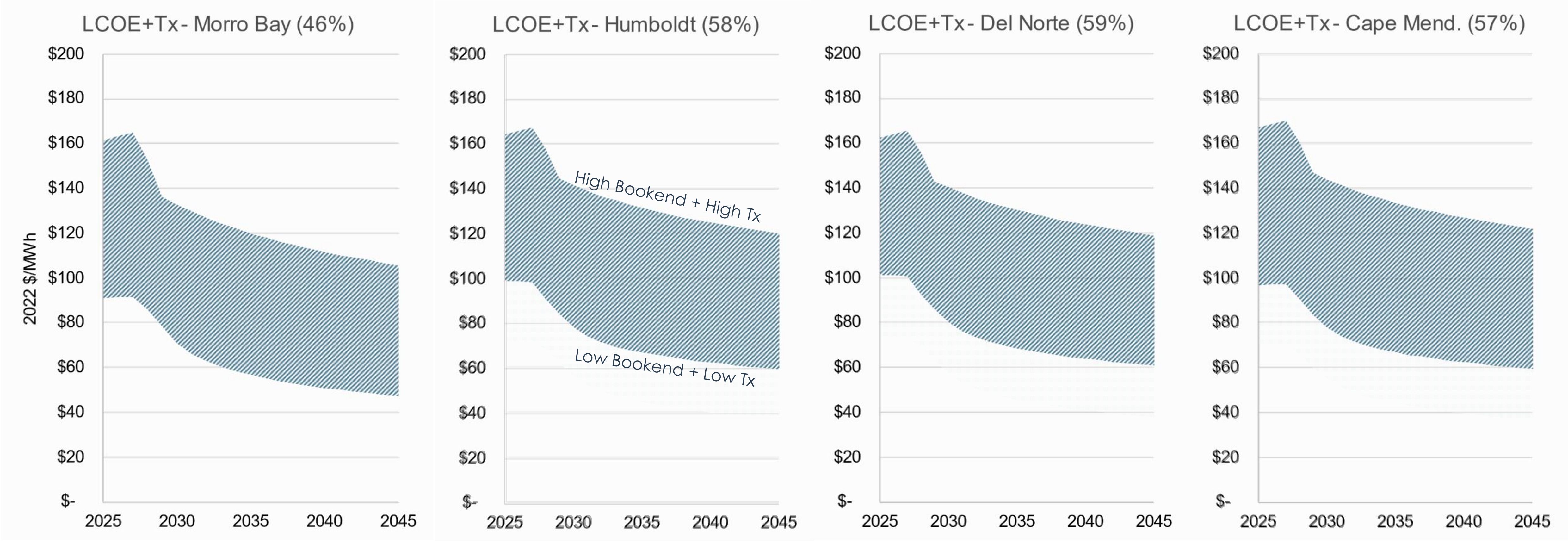
- Five cost trajectories reflect uncertainty in projected floating offshore wind capital costs
- Conservative costs apply the NREL ATB trajectory to floating offshore wind pilot project costs ($10,000/kW)[1]
- Optimistic costs align with the 2035 DOE Earthshot target[2], applying a high 11.5% learning curve[3] to pilot project costs, assuming 16.5 GW of global procurement by 2030[4]
- Floating offshore wind is an emerging technology that will be more expensive than fixed-bottom projects
  - The magnitude and timing of floating offshore wind cost declines will be dependent on technology advances in floating platforms and a scale-up of California's port and vessel infrastructure



[1] Shields, M., et. al. NREL, 2022. https://www.nrel.gov/docs/fy23osti/81819.pdf
[2] Floating Offshore Wind Shot
[3] Schatz, 2023. http://schatzcenter.org/pubs/2023-OSW-R2.pdf
[4] NREL 2023 ATB. https://atb.nrel.gov/electricity/2023/offshore_wind

** Costs shown above do not include system transmission costs.*
** Assumes cost recovery term and system useful life of 25 years, for consistency with I&A. Longer terms (e.g. 30 years from NREL ATB) can lower costs by 3-5%.*

Higher Output from North Coast Resources Offsets Higher Transmission Costs



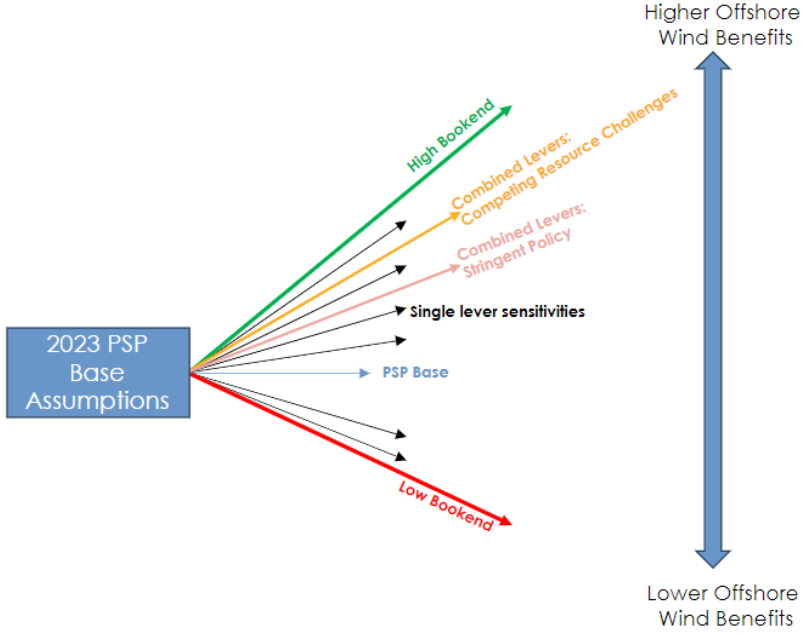
All project sites have comparable LCOE after factoring transmission costs, as higher capacity factors offset the additional costs to deliver North Coast offshore wind

Benefit - Cost = Net Benefits

Offshore Wind Cost-Benefit Analysis

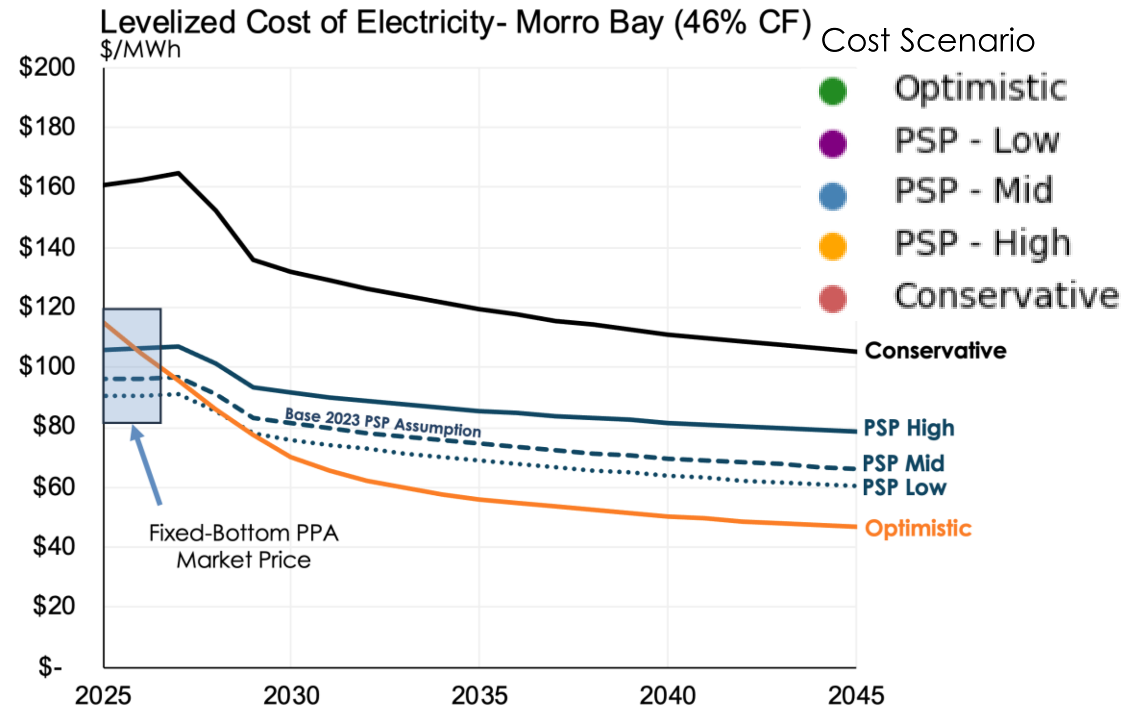
Benefit Scenarios

- Benefits calculated as avoided investment and operating costs when OSW is forced into RESOLVE
- Scenarios were developed for resource costs, resource availability, resource capacity contribution, gas retirements, load growth, and state GHG policy
  - **PSP base** uses 2023 PSP I&A (without LSE plans)
  - **Individual adjustments** to cost, availability, etc. are **"levers"**
  - **Combinations of levers** were also tested, including **bookend scenarios**



Cost Scenarios

- There is high uncertainty in floating offshore wind costs
  - The five trajectories evaluated represent a large distribution of projected offshore wind capital costs
  - Scenarios beyond the PSP low/mid/high were considered



E3 Presentation:

Offshore Wind Cost-Benefit Analysis Results

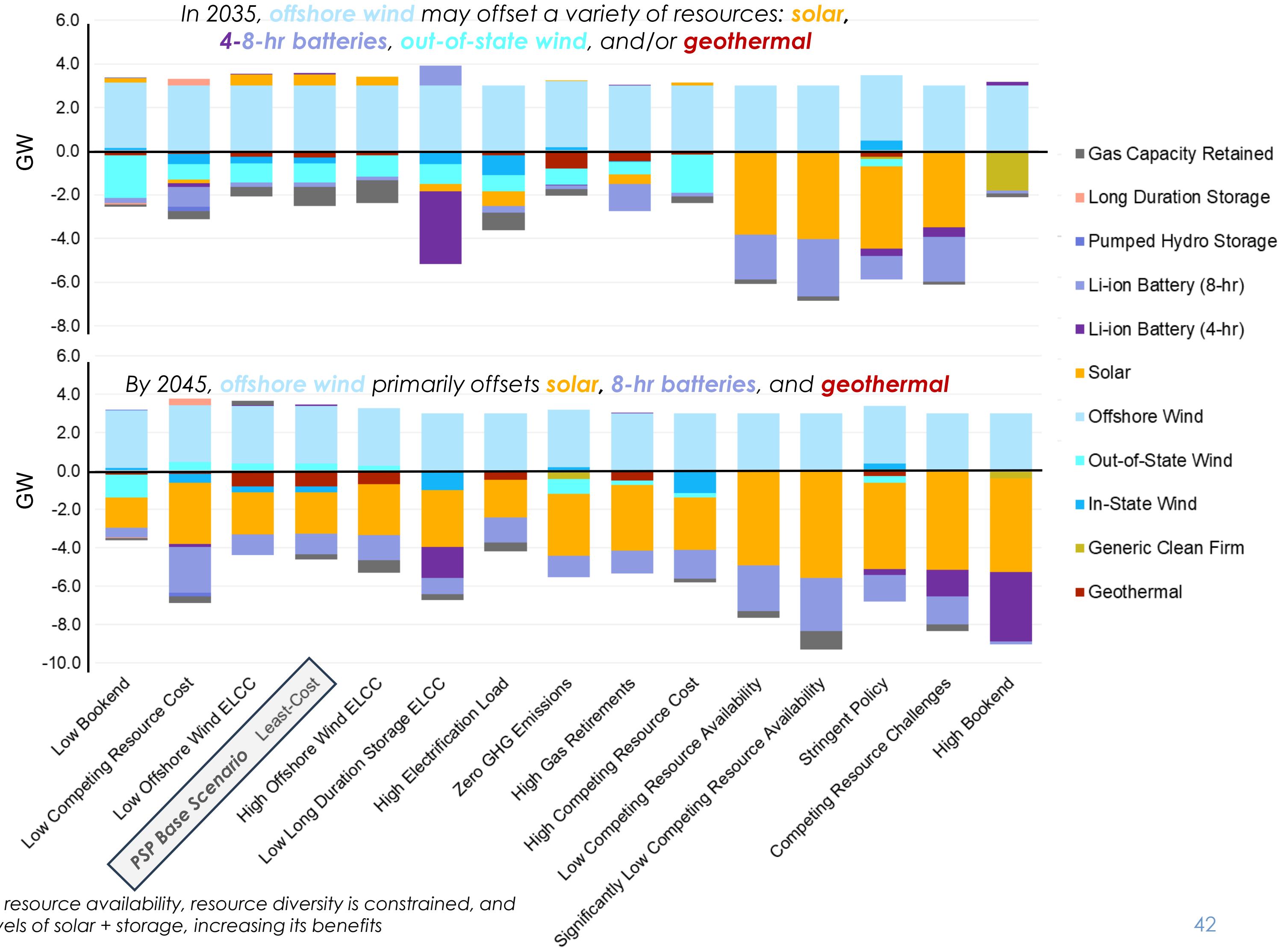
3 GW Morro Bay Scenario

Avoided alternative resource buildout drives OSW system benefits

- Offshore wind's long-run value (by 2045) is to **provide additional resource diversity** by **replacing solar + storage**
- **Offshore wind development may also defer* or avoid a small amount of other diverse resources** (geothermal, in-state or out-of-state wind, clean firm capacity)
- A **small amount of additional gas retirements (up to 1 GW)** may also be facilitated

2035

2045



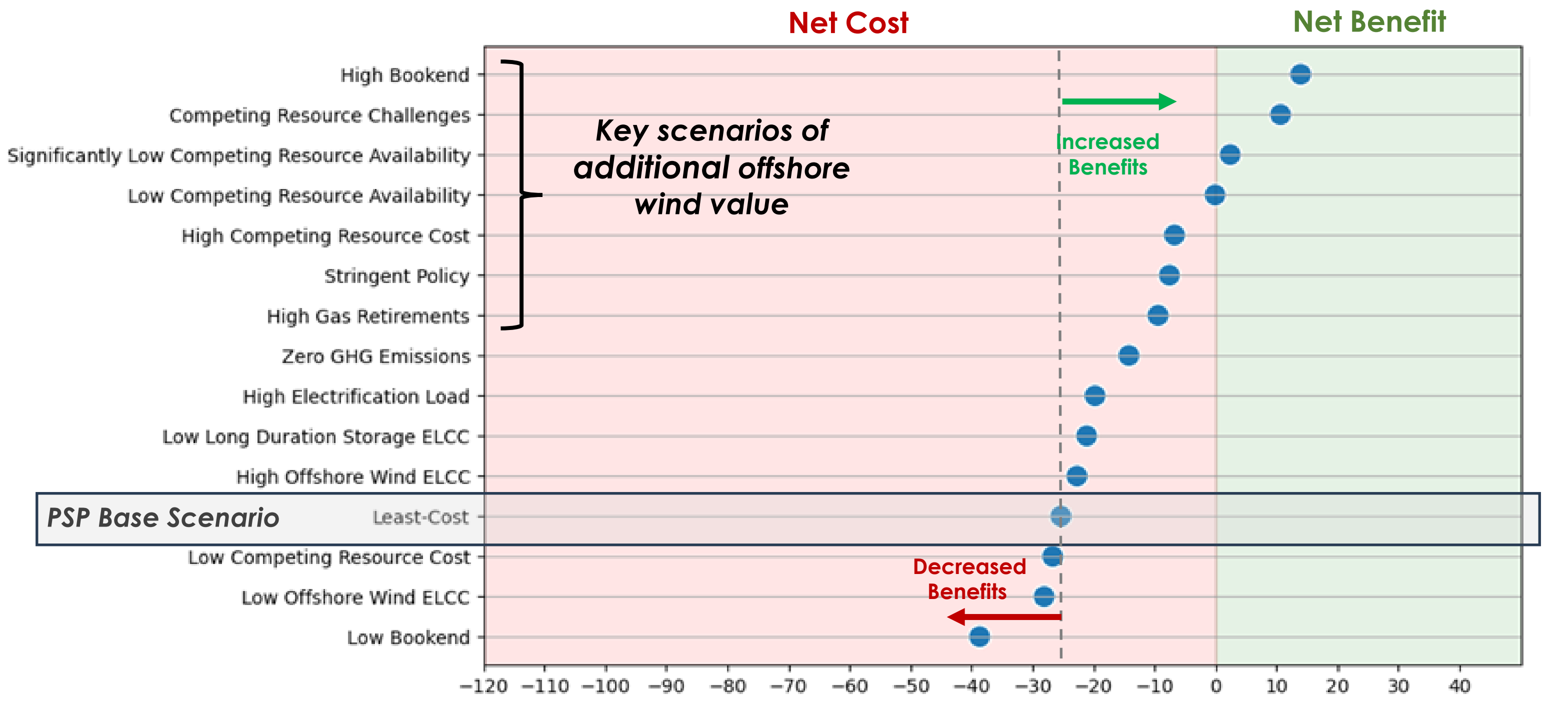
**Avoided resources in the 2035 chart that go away by 2045 (such as out-of-state wind in many cases) indicate a delayed build (instead of avoided build)*

Under low competing resource availability, resource diversity is constrained, and OSW avoids higher levels of solar + storage, increasing its benefits

Higher offshore wind value driven by competing resource availability/cost, gas retirements, and lower 2045 GHG targets

- Offshore wind is not cost-effective under the base 2023 Preferred System Plan (PSP) assumptions
- Key drivers of additional offshore wind value are:
  - Competing resource availability or cost
  - Gas retirements
  - Lower GHG emissions in 2045
- Drivers of offshore wind value are similar across offshore wind procurement amounts
  - The $/MWh impact of each lever, however, generally declines at higher amounts of offshore wind procurement
- Benefit scenarios with multiple levers applied* tend to compound effects of individual levers

Offshore Wind Net Benefits (Benefits minus Costs)
3 GW Morro Bay in 2035 (PSP Mid Cost Scenario)



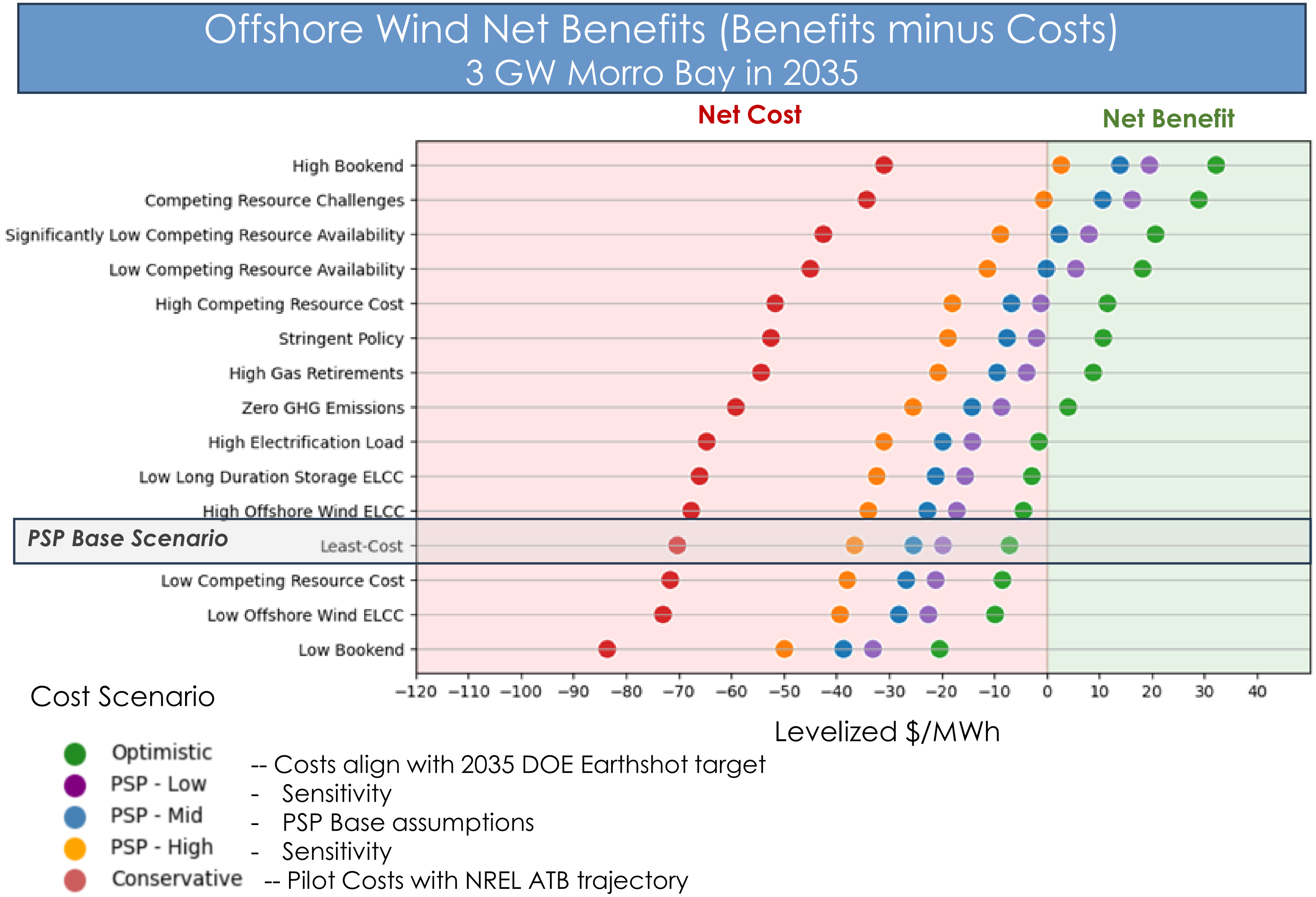
Y-axis = Scenario

X-axis = Levelized $/MWh

* "Stringent policy" assumes 0 MMT carbon emissions grid by 2045, additional gas plant retirements, and even higher electrification loads
"Competing resource challenges" assumes high competing resource costs, low competing resource availability, and low LDES ELCC

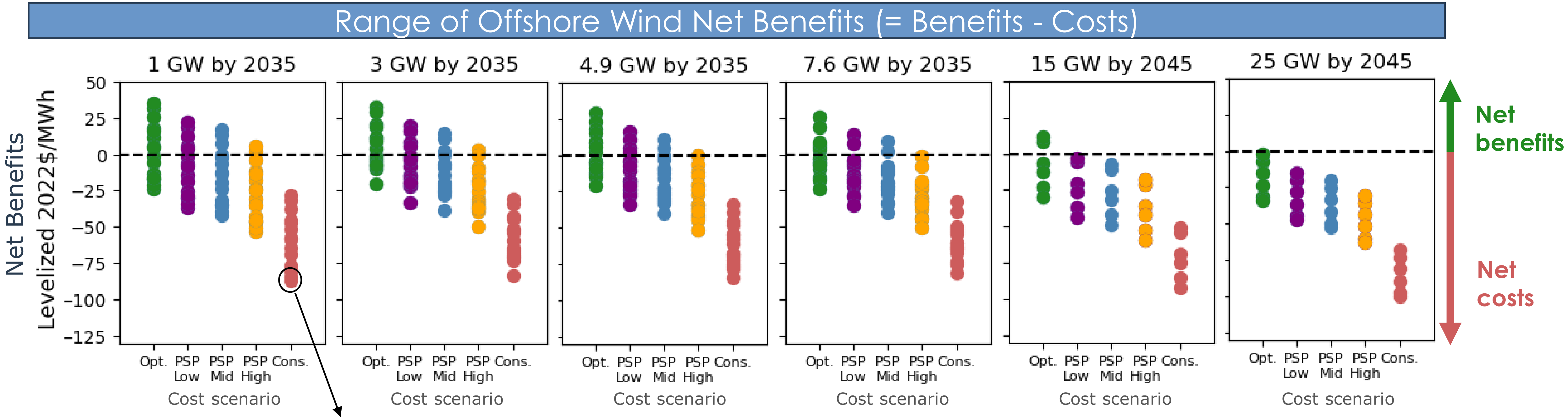
Scenarios tend to show net costs for procuring 3 GW offshore wind, except in some scenarios of higher benefits and/or low costs

- Most scenarios yield negative net benefits (i.e., net costs) for 3 GW of offshore wind
- Under the highest offshore wind cost assumptions (~$120/MWh), offshore wind always has negative net benefits
- Under the lowest offshore wind cost assumptions (~$60/MWh), offshore wind may have net benefits
- Key drivers for positive net benefits are:
  - Competing resources challenges (limited availability and/or high cost)
  - Low offshore wind cost
- Stringent policies* with mid to low offshore wind costs (~$70-75/MWh) are within ~$10/MWh of being cost-effective



* Assumes 0 MMT carbon emissions grid by 2045, additional gas plant retirements, and even higher electrification loads

Summary of Offshore Wind Cost-Benefit Analysis



Each datapoint represents net benefits for a given combination of

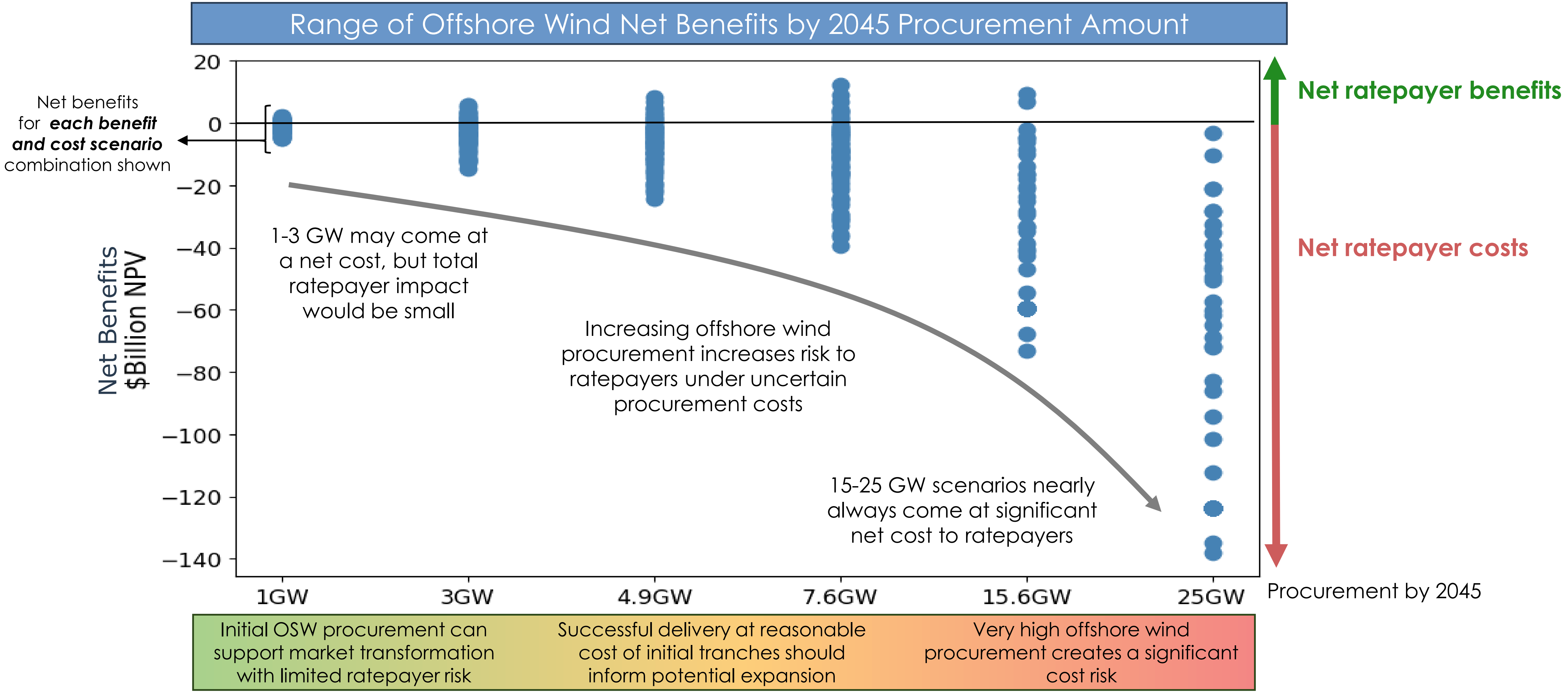
- ***Benefit scenario*** (representing ***avoided CAISO operating & investment costs***)
- ***Cost scenario*** (representing ***OSW costs***, including transmission)

*There are **some scenarios** with **positive net benefits** for 1-7.6 GW, but none in the highest cost scenario*

*15.6 GW and 25 GW have **few scenarios** with **positive net benefits***

- There are fewer combinations of costs and benefit scenarios that achieve net benefits than those that achieve net costs
  - Higher costs (due to more expensive transmission upgrades) and declining marginal benefits lead to lower net benefits at higher levels of offshore wind, especially at levels above 7.6 GW

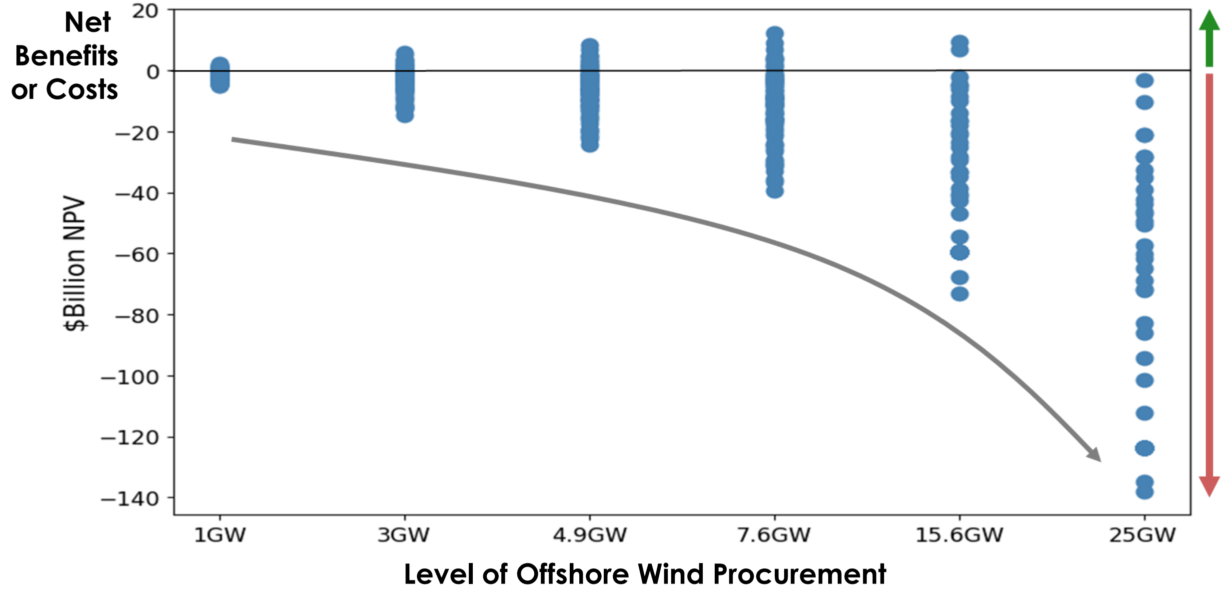
Across all scenarios studied, 1-3 GW of offshore wind minimizes total ratepayer cost and risk



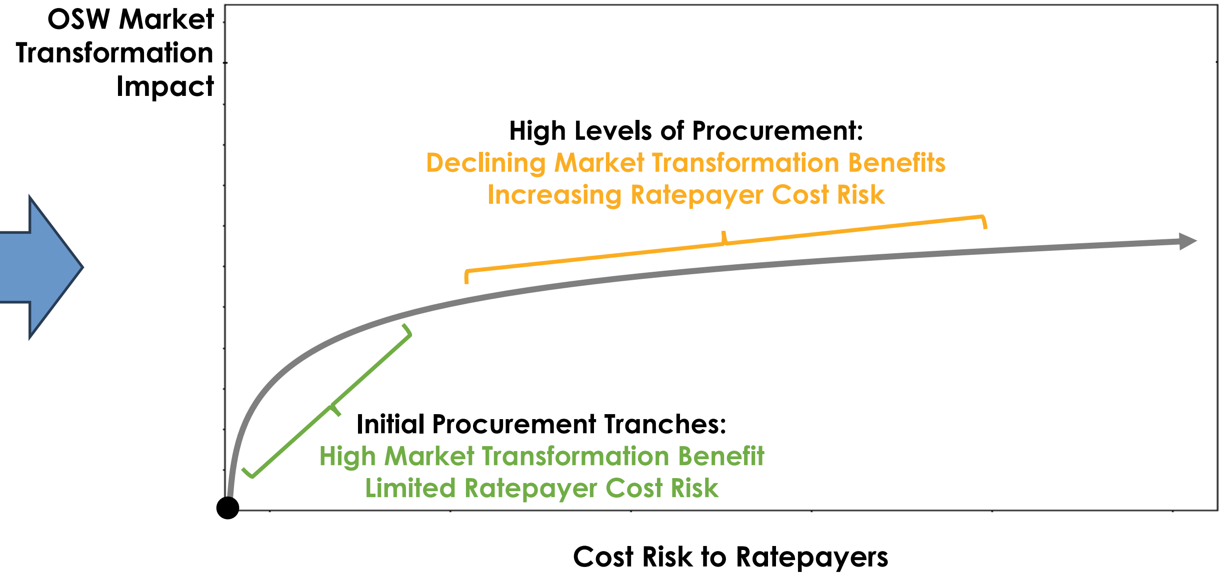
NPV $Billion calculated in 2022 $, with NPV discounted to 2035, when offshore wind procurement costs are assumed to commence

Balancing the benefits of developing the CA offshore wind industry against the cost risk to ratepayers

RESOLVE cost-benefit analysis

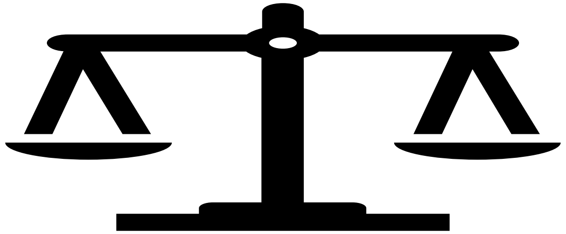


Offshore wind procurement



Cost Risk to Ratepayers

Quantitative analysis shows offshore wind may have net cost to ratepayers, a risk that may increase with high levels of procurement



Offshore Wind Market Transformation

Initiating procurement of offshore wind can support technology advancement, infrastructure development, and potentially future cost reductions

Key Conclusions for OSW: Cost-Benefit Analysis

- Offshore wind's long-run system value in this analysis is primarily to provide additional resource diversity.
- Under certain scenarios, 1 – 7.6 GW of offshore wind in 2035 may be cost-effective given the assumptions in this study.
  - Key drivers of these offshore wind value are competing resource challenges (limited availability and/or high cost), high gas retirements, and lower 2045 GHG emissions targets.
  - Net benefits are highly sensitive to offshore wind costs.
    - Offshore wind is never cost effective at costs over $100/MWh, but may be cost effective at lower costs (~$60-80/MWh or less).
- Declining marginal value plus larger transmission costs at higher levels of procurement (15-25 GW) lead to few scenarios at higher levels of procurement with net system benefits in this analysis.

* Lowest costs for 25 GW assumes ~$60/MWh for all 25 GW, meaning if initial procurement tranches are higher than $60/MWh, then future tranches would have to be lower than $60/MWh for all 25 GW to be procured at ~$60/MWh

Questions in Ruling for Parties

Eligible Resources Clarifying Questions

1. Please comment on whether Figure 1 above outlines the appropriate criteria for considering whether a resource should be procured via the DWR centralized procurement mechanism. Are these the right criteria or are there others that should be added or substituted?
2. Should other resource types (beyond OSW, OOS wind, geothermal, and LDES) also be considered for centralized procurement through DWR at this time? Provide rationale if you suggest other resources should be included.
3. In addition to the list of criteria for eligible resources in the AB 1373 statute, are there additional criteria that should be taken into account by the Commission when determining which resources should be procured through the DWR centralized procurement mechanism? Specify.
4. AB 1373 contains specific criteria for eligible pumped hydroelectric facilities. What particular projects currently under development can meet the criteria and should they be procured centrally by DWR?
5. How could developers leverage the many incentive opportunities that are available from the Federal government through the Inflation Reduction Act and the Bipartisan Infrastructure Law to assist with the financing of LLT resource development? How could developers and contractors access the Department of Energy or other agency grants for resource and infrastructure development that are available for projects that improve reliability and grid flexibility? How might centralized procurement help leverage federal funds for each resource type?

Need Determination Clarifying Questions

6. Comment on the cost-benefit analysis conducted, including the analysis presented in the slide deck posted on the Commission's web site. Does the analysis serve as a reasonable basis for a need determination? Specify how and why.
7. Are the quantities of resources contained in the PSP portfolio adopted in D.24-02-047 a reasonable basis for considering utilization of the centralized procurement mechanism? Provide your rationale.
8. What need determination for centralized procurement should the Commission make before the September 1, 2024 AB 1373 deadline and why? Specify which resource types, in what amount, and by when.
9. What other elements of future Commission need determinations (such as the scope of analysis, cost assumptions, ways to manage uncertainty) would provide the best foundation for a centralized procurement solicitation?

Relationship to LSE Procurement Clarifying Questions

10. Is the rationale described above for DWR centralized procurement to be used for new uncontracted resource types, such as OSW, as a public good for GHG reduction purposes reasonable? Why or why not?
11. If DWR centrally procures undeveloped resources as a public good, how should that procurement relate to the individual LSE procurement (existing resources under contract and/or future procurement)?
12. How should any DWR centralized procurement relate to the eventual RCPPP design, given that the Commission has not yet adopted an RCPPP design and yet must make an initial need determination by September 1, 2024?
13. This ruling proposes that LSEs not be allowed to opt out of DWR centralized procurement requested by the Commission. If you disagree with that proposal, explain why with citations and discussion of relevant provisions of AB 1373.
14. Should a need determination for DWR centralized procurement be made by the Commission during every IRP cycle during the consideration of the PSP or at some other time? Explain the rationale for your preferred approach.

Relationship to LSE Procurement Clarifying Questions (cont.)

15. A logical point for POUs to engage with DWR on opting into centralized procurement would be after the Commission makes a need determination, but prior to DWR initiating procurement activities. Comment on whether this is appropriate and include any necessary and relevant implementation concerns or details.
16. If DWR procures resources on behalf of POUs, it is possible that related costs currently socialized through existing processes, such as transmission costs flowing into the transmission access charge (TAC), may be incurred. What other costs of benefits might be implicated, and what is the best means for addressing them?
17. The centralized procurement mechanism could provide an alternative pathway towards procurement of diverse resources that are currently infeasible for individual LSEs or small consortiums of LSEs to develop. What process should the Commission develop to encourage parties, especially developers, to provide candid feedback about timing and pricing considerations necessary to develop LLT resources through this mechanism, while also providing the most value to ratepayers?

Allocation of Cost and benefits Clarifying Questions

18. For centralized procurement of resources not yet in LSE portfolios such as OSW, is it appropriate for the costs of any DWR contract to be allocated to all LSEs based on the TAC area's share of a 12-month coincident peak load? If not, provide rationale and explanation for another cost allocation methodology.
19. For centralized procurement of resources that already exist in at least some LSE portfolios, what is the appropriate method for allocating costs and benefits?
20. How would DWR's solicitation and contracting process need to change for circumstances where POUs and/or individual LSEs seek additional volumes of procurement beyond the amount of need determination authorized by the Commission? How would those additional costs and benefits be allocated fairly to benefitting LSEs and/or POUs?
21. How should the allocation of benefits beyond energy and capacity (such as, but not limited to: RPS value, renewable energy credits, IRP compliance, or GHG-reduction value) be allocated to LSEs?
22. How should the AB 1373 requirements for nonbypassable surcharges be implemented?

Allocation of Cost and benefits Clarifying Questions (cont.)

23. Some LLT eligible resources may require substantial infrastructure development, the costs of which are incremental to costs related to the deployment of the resource itself (for example, OSW requires port and transmission development; geothermal requires transmission development and construction in challenging environments). How do these contingent, necessary costs influence the overall financial impact of resource development for different eligible resources

24. How do costs not directly related to the specific energy projects factor into the affordability question for ratepayers for deployment of LLT resources through centralized procurement? How could centralized procurement help address or mitigate these additional costs?

Procurement Process and Timeline Clarifying Questions

25. Is the proposed timeline and activities description appropriate for DWR's initial solicitation activities? If not, what should be the expected timeline and why? What other activities and/or interim milestones should be considered or required?
26. Is there an optimal contract structure for DWR to consider when contracting with resources through the centralized mechanism? Should the Commission review contract structures or other pre-bid activities in advance of their completion?
27. Comment on how the "procurement group" for DWR required by AB 1373 should be implemented.
28. Is an application the appropriate mechanism for Commission consideration of individual contracts proposed by DWR after the conduct of its solicitation? Explain.
29. Include any other process recommendations for the Commission to request or require for DWR's conduct of centralized procurement

Procurement Process and Timeline Clarifying Questions (cont.)

30. Specifically for developers of LLT resources: What would be the optimal timing and minimum threshold amount of a DWR centralized procurement solicitation from your perspective? Explain your rationale. In addition, delineate the categories of costs associated with your projects and when such costs should be firm enough to allow binding bids in a solicitation (for example, due to supply chain issues, components may only be available by a certain date to inform bid development; transmission availability is expect by a certain date; etc.). Be as specific as possible to assist the Commission in designing a reasonable process and timeframe. If desired, information in response to this question may be requested to be submitted under seal, if supported by relevant justification.
31. Assuming that the Commission will give direction to DWR on the expected online date for centrally-procured LLT resources, how might such a directive be framed? For example, should the Commission specify commercial operation by a certain date, by a certain year, or within a range of years?

Wrap Up and Next Steps

Next Steps

- Workshop materials, including workshop recording and a transcript of the Q&A will be posted on the IRP website: AB 1373 Centralized Procurement of Specified Long Lead-time Resources (ca.gov)
- Party comments due May 24, 2024.
- Reply comments due June 5, 2024.
- Thank your attention, patience, and thoughts.

End of Presentation- Thank You!