Maine Energy Storage Market Assessment

Sponsored by the State of Maine Governor's Energy Office

Stakeholder Session #3: Study Results & Next Steps

March 28, 2022

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ENERGY STORAGE & MAINE ENERGY AND CLIMATE POLICY

Maine Won't Wait: Maine's four-year climate action plan identified energy storage as an important factor in achieving emissions reduction goals, maximizing the value of renewable energy on the grid.

Targets: L.D. 528 signed into law June 2021, established state storage targets, directed an Energy Storage Market Assessment.

Assessment: This assessment of existing and emerging technologies, market factors, and a technical cost-benefit analysis is meant to help inform policy makers as they work to support a landscape ready to deploy storage to meet our 2030 goal of 400 MW and to most effectively capture the benefits of storage for the grid, society, and for ratepayers.

Next Steps: The GEO is working to set up a standing energy storage forum to continue engagement with stakeholders, evaluate policy considerations. *Survey to share interest and stay engaged in forum is live.*

Agenda

- Using the ‘Chat’/’Raise Hand’ feature to ask questions in WebEx
- Introductions
- Project Overview & Stakeholder Feedback
- Key Takeaways
- Cost Sensitivities
- Policy Considerations & Future Analysis
- Q&A with Stakeholders
- Closing Remarks from GEO

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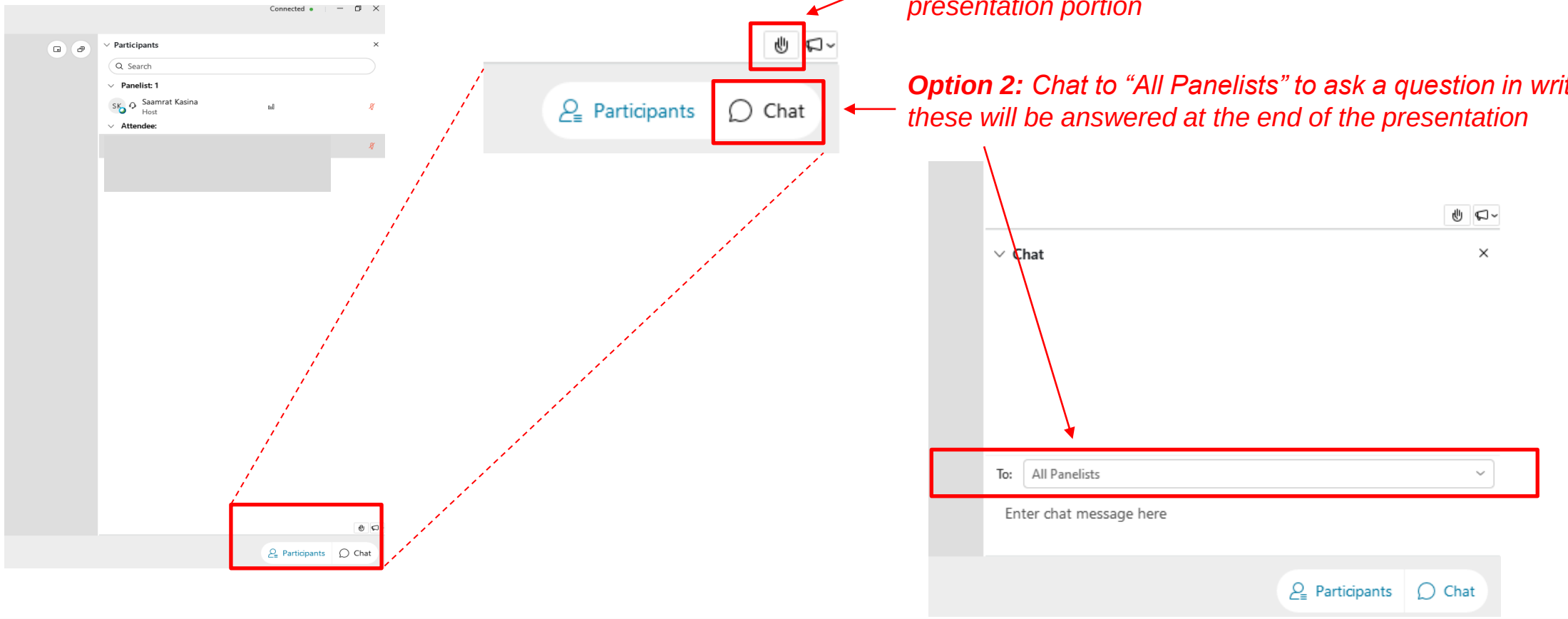
Using ‘Chat’ and ‘Raise Hand’ in WebEx to ask questions

Two Ways to Ask Questions

- Questions will be answered at the end of the presentation portion
- Please use the ‘Raise Hand’ or ‘Chat’ feature to ask questions

Option 1: *“Raise Hand” to ask questions at the end of presentation portion*

Option 2: *Chat to “All Panelists” to ask a question in writing and these will be answered at the end of the presentation*



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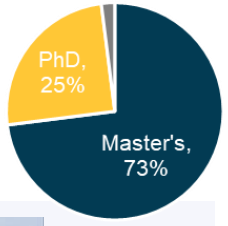
Introductions

About E3

90+ full-time consultants | 30 years of deep expertise | Engineering, Economics, Mathematics, Public Policy…




San Francisco

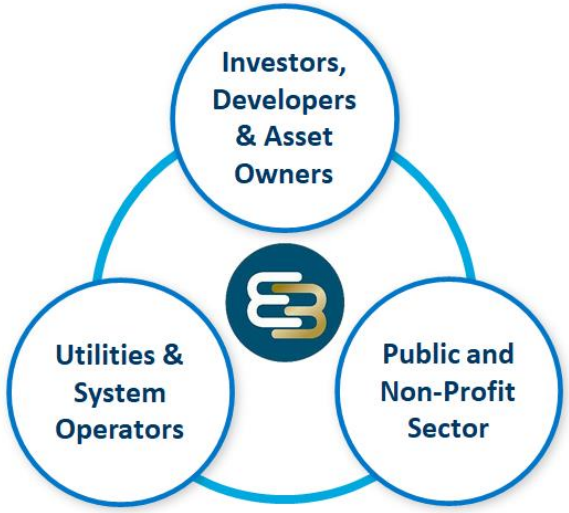

New York


Boston


Calgary

E3 Clients

300+ projects per year across our diverse client base



Recent Related Projects

- Maine Renewable Energy Goals Market Assessment (2021)
- Net Zero New England: Electric Reliability under Deep Decarbonization (2020)
- New York Energy Storage Roadmap – NYSERDA (2018)
- New York Peaker Repowering/Replacement Study – NYSERDA (2019)
- Minnesota Dept. of Commerce, Minnesota Energy Storage Cost-Benefit Analysis (2019)
- Energy Storage Market Analysis, Business Model Review, and Strategic Advice – Macquarie Capital (2016, 2018 – 2019)
- California Energy Commission, EPC-19-056, Assessing the Value of Long Duration Storage (2020-present)

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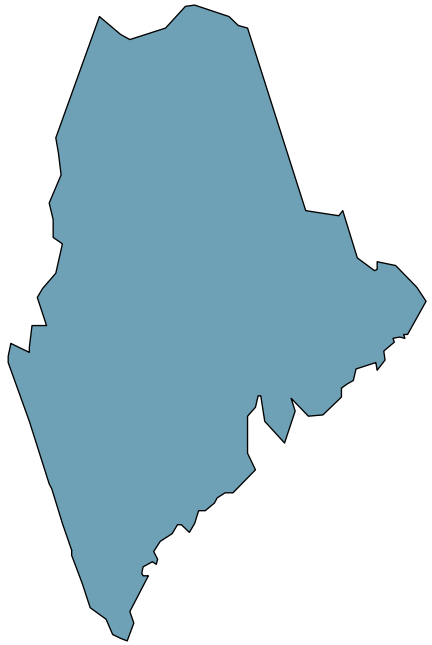
Project Overview & Stakeholder Feedback

Project Overview

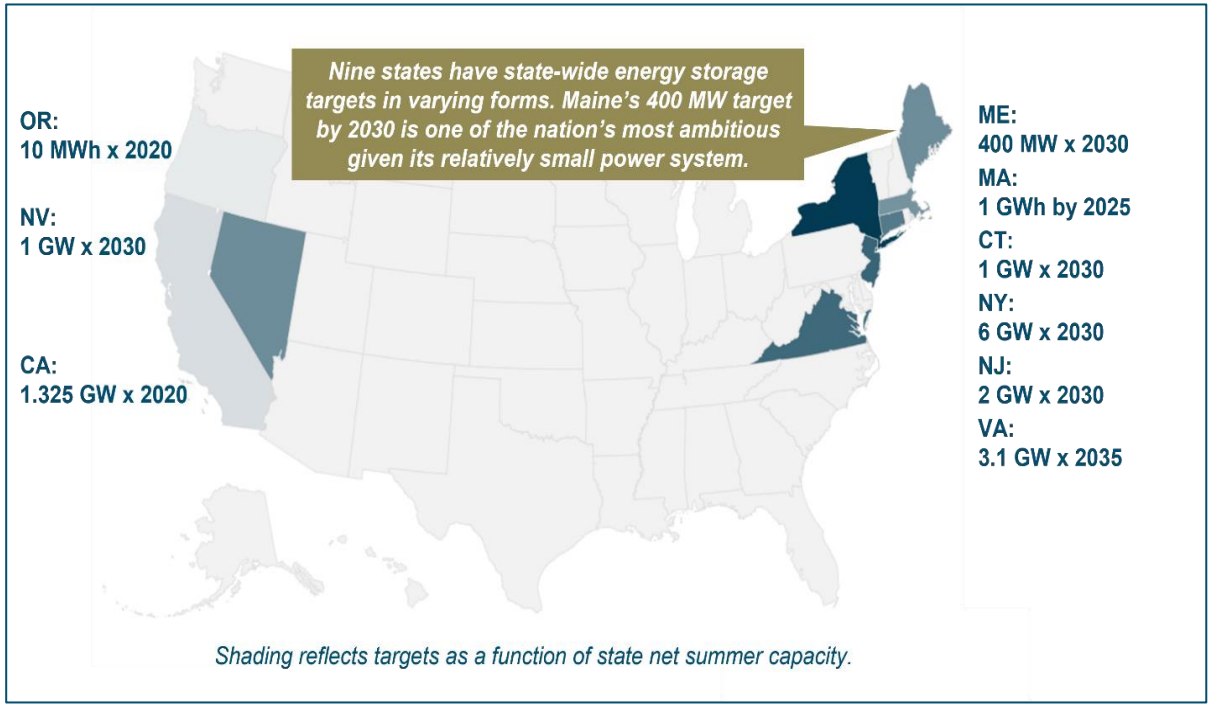
- **E3 worked with the Governor's Energy Office to assess the energy storage market in Maine**
  - Satisfies the requirements set forth in 2021 ***Act to Advance Energy Storage in Maine***, which also sets Maine storage targets
    - 300 MW by 2025
    - 400 MW by 2030

- **Study questions:**
  - **Technology Assessment:** Which storage **technologies and use cases** are likely to be valuable to Maine, today and in the future?
  - **Policy and Market Factors:** What **market and policy factors** may influence the speed and predictability of storage deployment in Maine?
  - **Cost-Benefit Analysis:** What are the costs and benefits of energy storage deployment over the next decade? What are the considerations for policy?
- **Study output included a public report with findings and policy considerations**



Regional and State Context

U.S. State Energy Storage Targets as of Jan. 2022

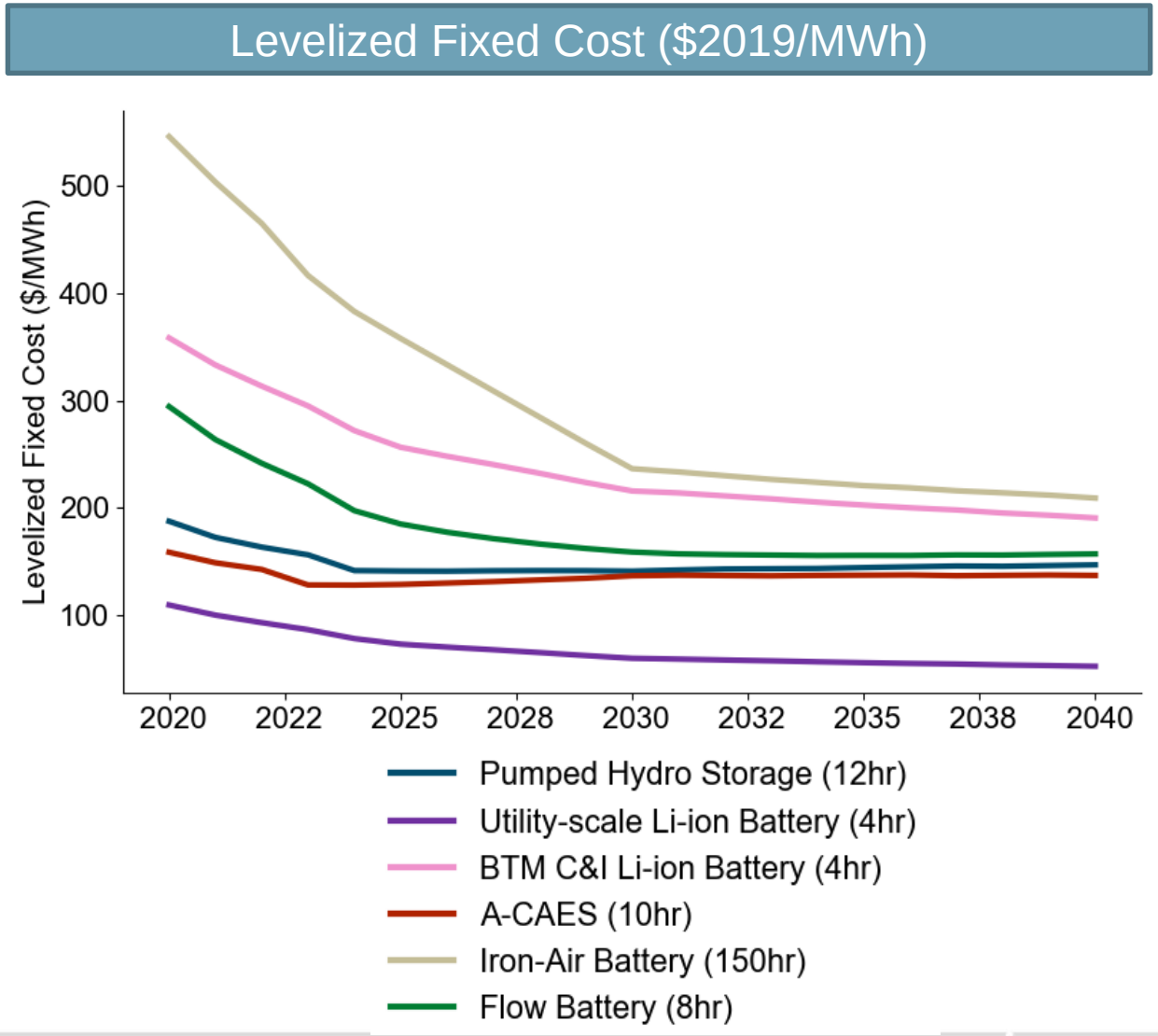


Planned and Operating Storage Projects in Maine as of Jan. 2022

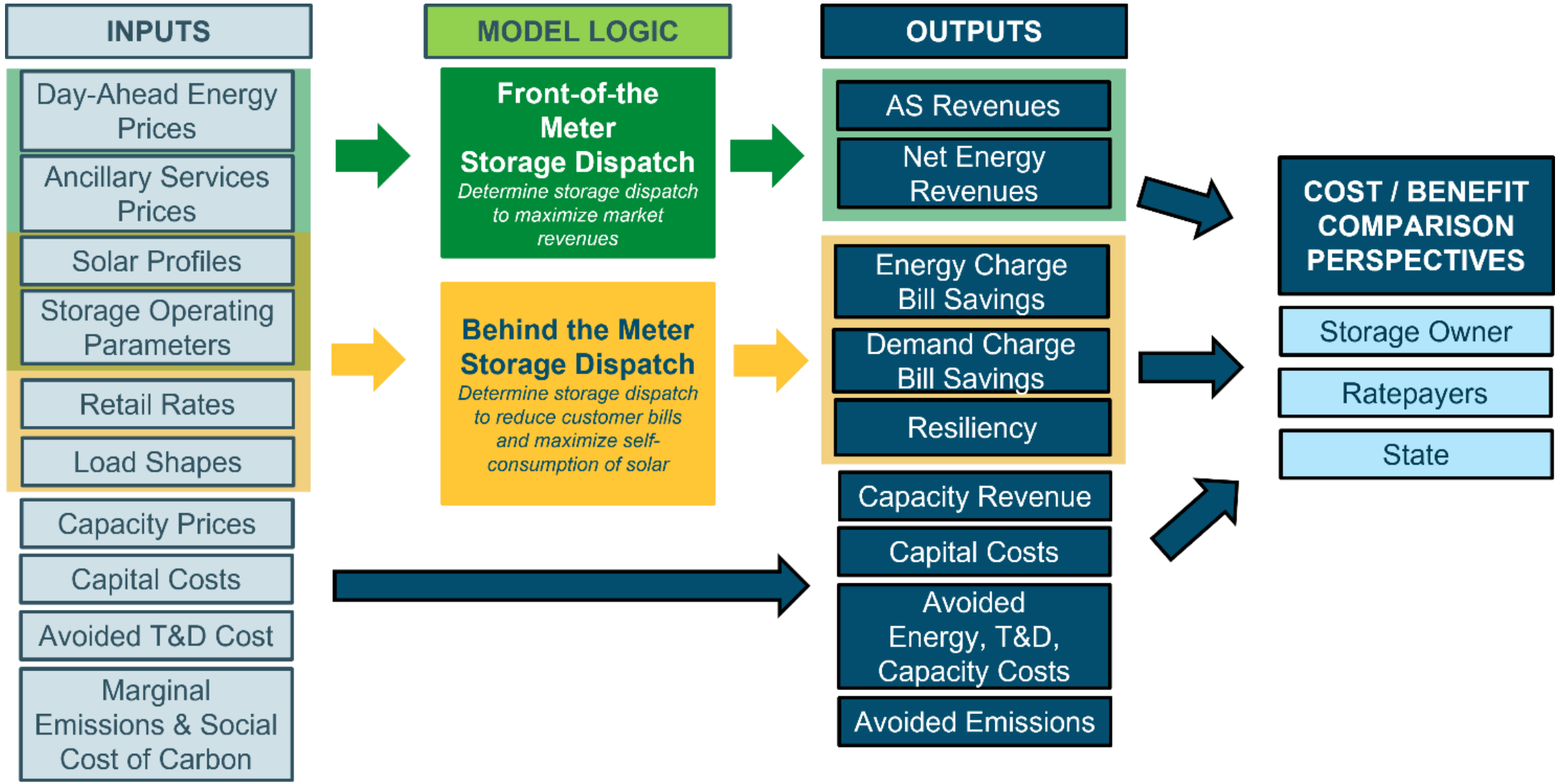
Plant Name	County	Unit Status	Expected Online Date	Grid Connected (Y/N)	Capacity (MW)
Boothbay Storage Project	Lincoln	Operating	5/5/2015	Y	0.5
William F Wyman	Cumberland	Operating	12/31/2016	Y	16.7
Madison BESS	Somerset	Operating	5/30/2019	Y	4.7
Madison BTM	Somerset	Operating	3/31/2020	Y	1.5
Great Lakes Millinocket Battery	Penobscot	Operating	12/31/2020	Y	20.9
Industrial Drive Rumford BESS Project	Oxford	Operating	7/1/2021	Y	4.9
Middlesex Road Topsham Solar	Sagadahoc	Planned	3/1/2022	Y	4.99
CED Denmark Solar Hybrid	Oxford	Planned	11/1/2022	Y	2.3
Manchester BESS	Kennebec	Planned	1/1/2023	Y	14
Sanford ESS	York	Planned	1/31/2023	Y	5
South Portland ESS LLC	Cumberland	Planned	1/31/2023	Y	10
Cross Town Energy Battery Energy Storage	Cumberland	Planned	4/1/2023	Y	175
Bonny Eagle Renewable BES	Cumberland	Planned	1/1/2025	Y	7.8
Rumford Renewable BES	Oxford	Planned	1/1/2025	Y	6.9
Total					**275**

Cost-Benefit Analysis Leveraged Storage Technology Assessment, with Focus on Near-Term Deployment

- **The cost-benefit spreadsheet model evaluated different use cases for Li-ion batteries, given the following factors analyzed in the storage technology assessment**
  - The ability to provide a range of high value services in the near term and long term
  - Maturity and commercial availability
  - Low capital cost or cost reduction potential
  - Able to be deployed in Maine within the study period (2022-2031)
- **Emerging and long-duration storage technologies were evaluated in the storage technology assessment and the report**



Modeling Methodology



Stakeholder Feedback

The Maine GEO and E3 project team received many helpful comments – thank you to all who participated and provided feedback.

+ **Over 180 individuals representing over 70 organizations participated in the stakeholder process, providing thoughtful, detailed feedback through:**
  - Stakeholder sessions
  - Online forms
  - Direct email submissions and conversations

+ **100+ questions and comments from over 30 individuals helped guide our study and findings:**
  - Technologies, costs & use cases
  - Benefit-Cost analysis modeling
  - Hurdles and policy considerations
  - Considerations for additional analysis and sensitivities

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Key Takeaways

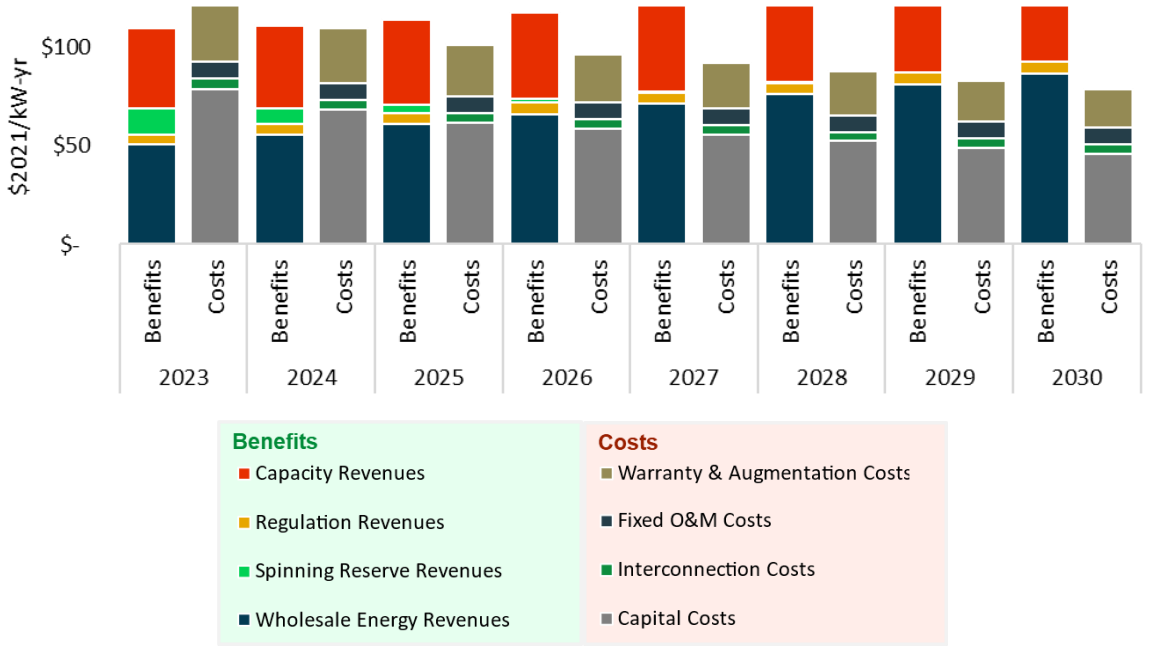
Study Key Takeaways #1 and #2

- While several promising energy storage technologies may help Maine achieve its target, batteries will likely comprise most of the storage deployed in Maine in the next five years
- Energy storage may provide many distinct benefits to Mainers, with potential value streams evolving as the needs of the electric grid and customers change

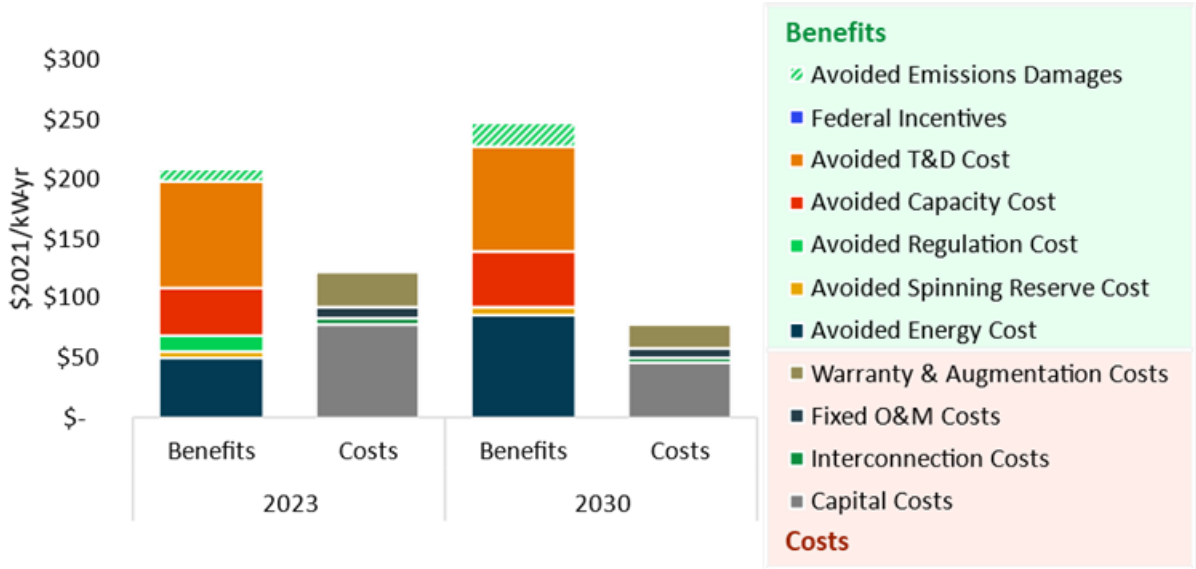
Study Key Takeaway #3

+ **Cost-benefit analysis results show cost-effectiveness for wholesale ("grid-connected") storage but continued cost declines and the ability to monetize multiple value streams will be important**

Owner Levelized B/C Comparison for Wholesale Storage by Install Yr.



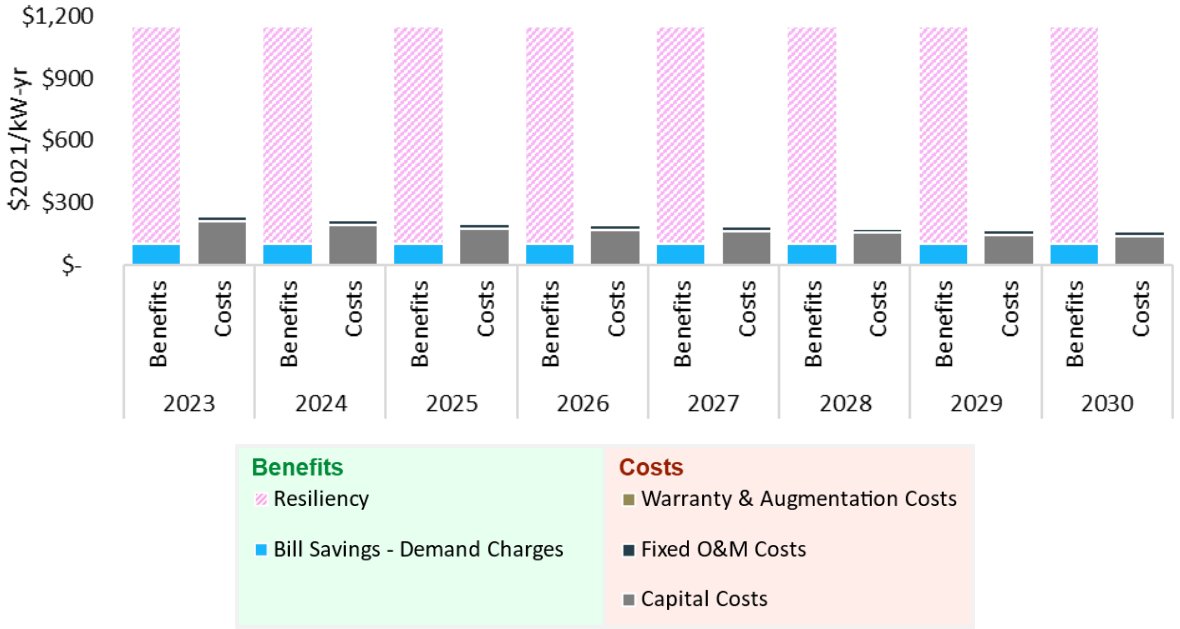
Societal Levelized B/C Comparison for Wholesale Storage by Install Yr.



Study Key Takeaway #4

+ **Customer-sited storage can reduce customer bills and increase resiliency by protecting against outages (loss-of-load)**

Owner Levelized B/C Comparison for C&I Customer-sited Storage by Install Yr.



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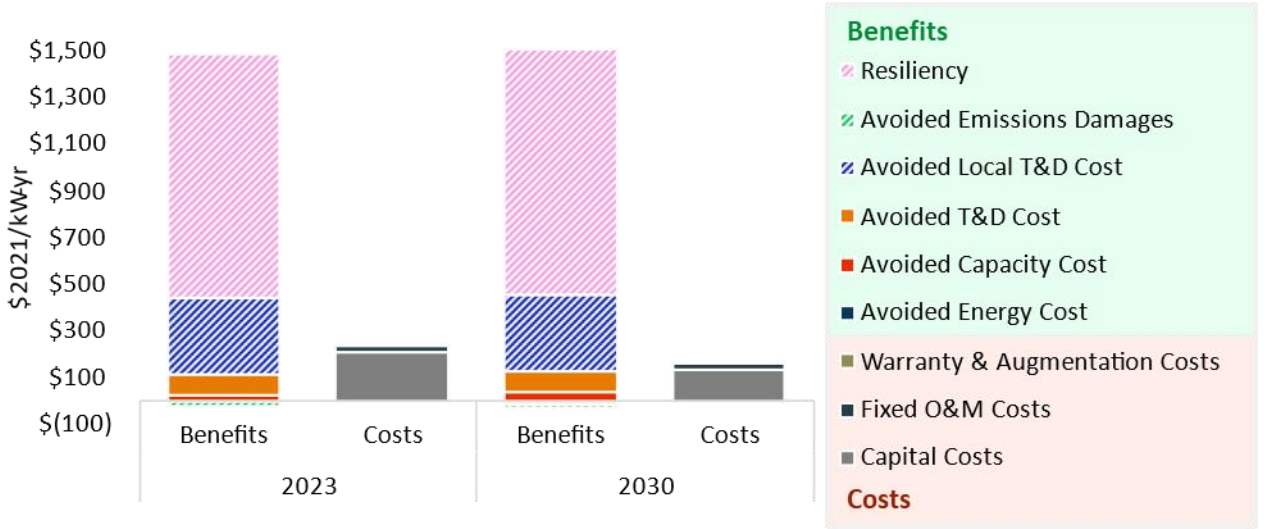

Study Key Takeaways #5 and #6

- **Long-duration energy storage technologies may support New England's need for clean, firm energy in a deeply decarbonized future**
  - As decarbonization targets become stricter, regional reliability needs will increase during times of high load and low renewable production
  - As emerging technology costs fall, long-duration energy storage could meet this need
- **Notable hurdles remain related to near-term storage deployment in the state**
  - Technology costs
  - Accessing and monetizing revenue streams

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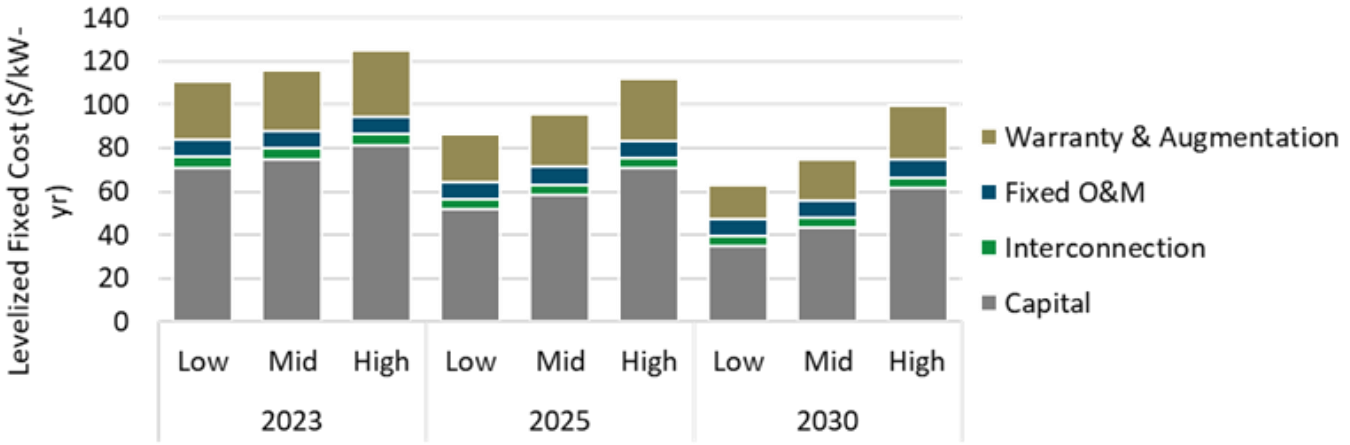
Cost Sensitivities

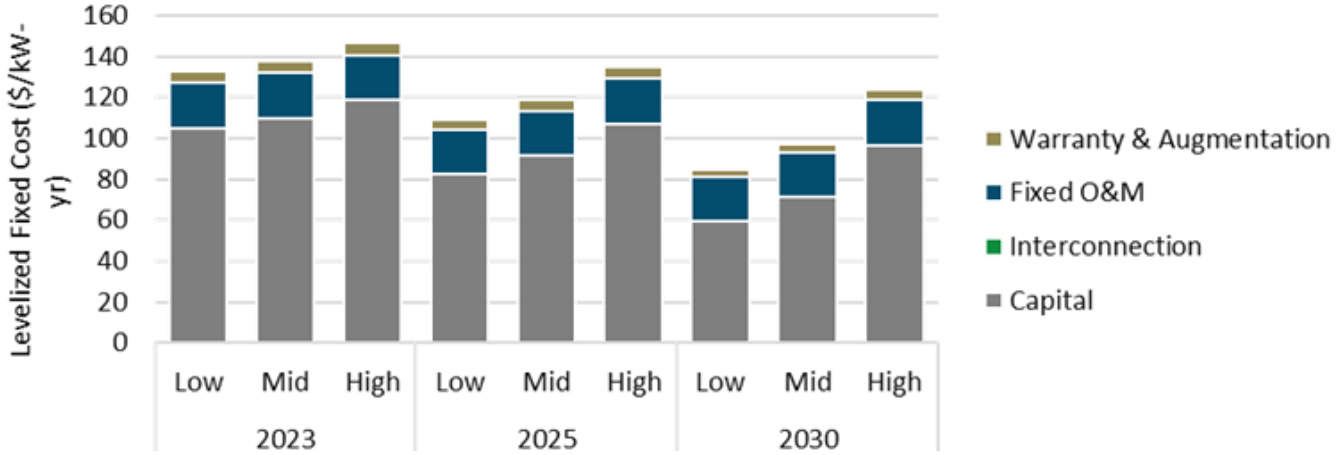
Cost Sensitivities Performed Using NREL Cost Ranges

- **Cost-benefit analysis results shown previously use mid-range cost estimates**
- **Sensitivities were performed using high and low estimates of costs**
- **Costs are similar in the near term, but diverge in the longer term as uncertainty of how markets will evolve increases**
  - Capital cost trajectories are based on "Conservative" and "Advanced" technology innovation scenarios projections from NREL's 2021 Annual Technology Baseline (ATB), which is based on cost projections in a literature review

Cost Estimate Ranges for Wholesale Standalone Storage



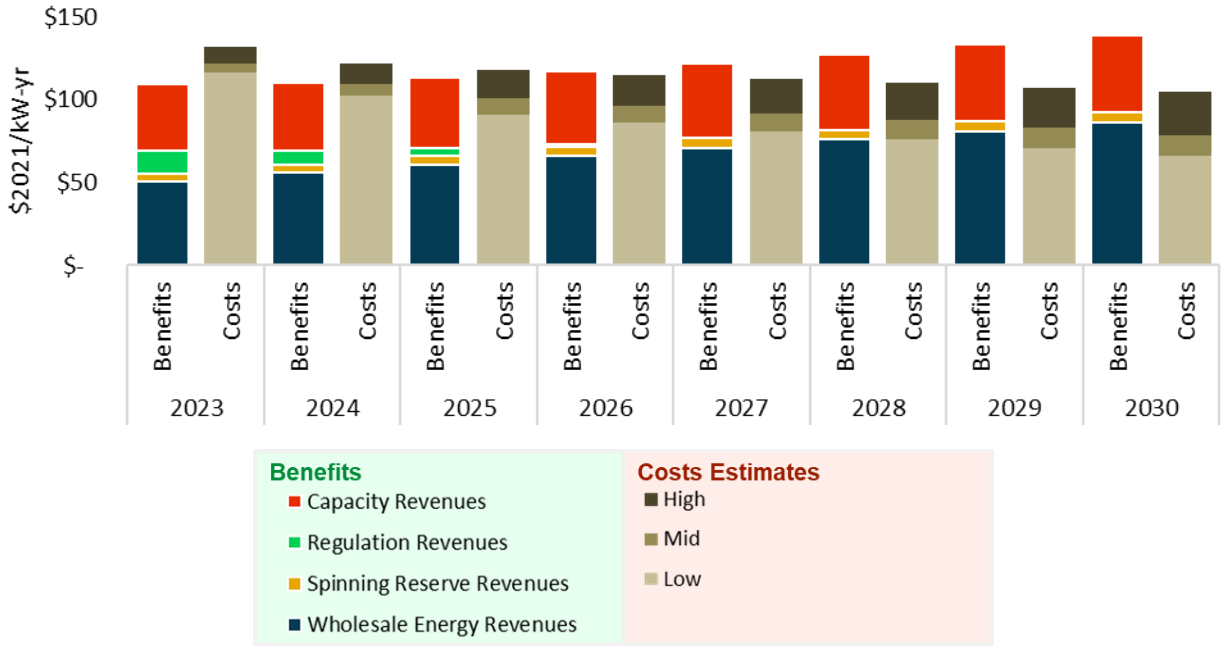
Cost Estimate Ranges for C&I Standalone Storage



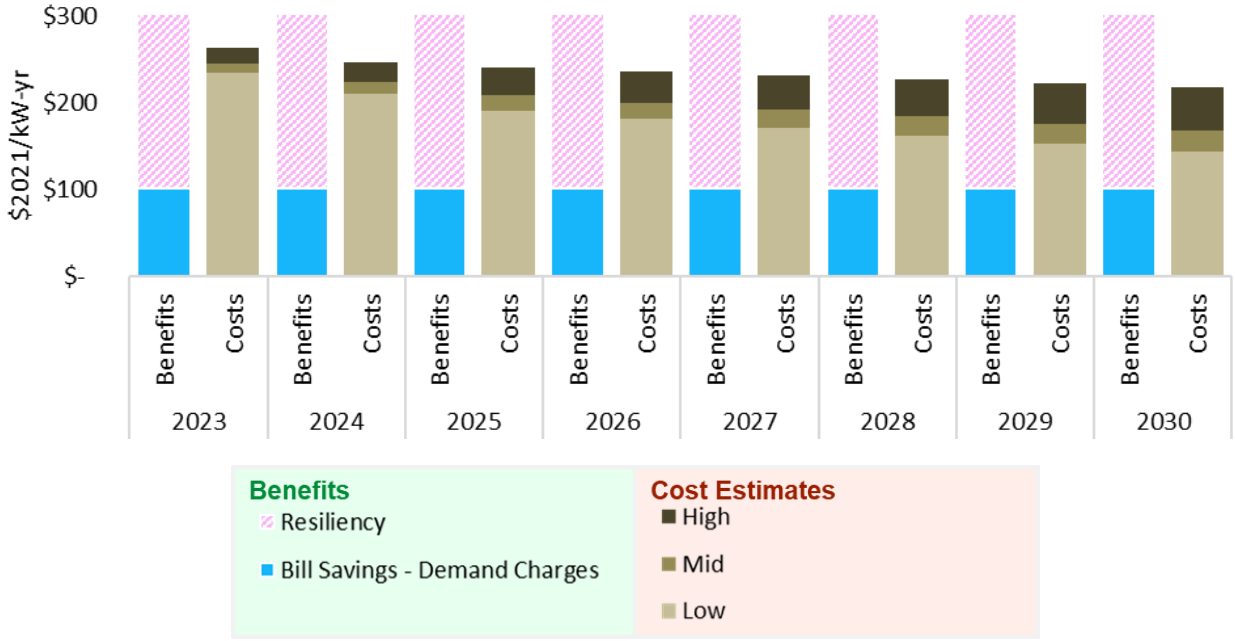
Cost-effectiveness of wholesale storage could be delayed by a couple years with higher costs

- Higher costs for wholesale storage could delay the cost-effectiveness by a couple years and lead to 35% higher costs (relative to the mid-range) for 2030 installed projects, while lower costs could lead to cost-effectiveness for projects installed late this decade even without capacity revenue
- For C&I storage, resiliency benefits outweigh even higher cost estimates, but higher estimates would increase costs by 30% (relative to the mid-range)

Owner Levelized Benefit-Cost Comparison for Wholesale Storage by Installation Year and Cost Ranges



Owner Levelized Benefit-Cost Comparison for C&I Storage by Installation Year and Cost Ranges*



* Resiliency benefits, which extend to ~$1000/kW-yr, are cut-off to highlight difference in costs.

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Policy Considerations & Future Analysis

Near-term Policy Considerations for Maine

- **Technology:** Supporting technology neutral approaches to policy that seek to grow Maine's energy storage market
- **Development:** Supporting actions that ease the development process for storage resources
- **Data:** Initiating data collection to track storage deployment progress.
- **Policy Leadership:** Emphasizing storage in the continued efforts to invest in energy efficiency and renewable energy at state-managed facilities and property.
- **Information:** Making resources and information available to local municipalities and tribes to accommodate energy storage development given a rapidly developing industry
- **Planning:** Monitoring guidance from the DOE and other federal agencies regarding end-of-life considerations and the decommissioning of storage installations.
- **Stakeholder Group:** Leveraging the GEO's role as a convenor by developing and running an ongoing energy storage stakeholder group.

Longer-term Policy Considerations for Maine

- **Rate Design:** Supporting adjustments to customer rate design that align customer price signals with societal avoided costs and locational values.
- **Cost-Benefit Analysis Frameworks:** Supporting the consideration of the best set of possible value streams from all possible perspectives for energy storage in cost-benefit analysis frameworks.
- **Programs:** Supporting efforts to implement incentive programs for energy storage that have the potential to bring high value benefits to Maine.
- **Charging Tariffs:** Supporting the development of fair and transparent charging tariffs for wholesale storage resources that are connected to the distribution system but participating in ISO-NE wholesale markets.

Potential Future Analysis

- Peaker Replacement Analysis
- Jobs and Economic Impact Assessment
- Location-specific Nodal Modeling
- Equity Analysis

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Q&A with Stakeholders

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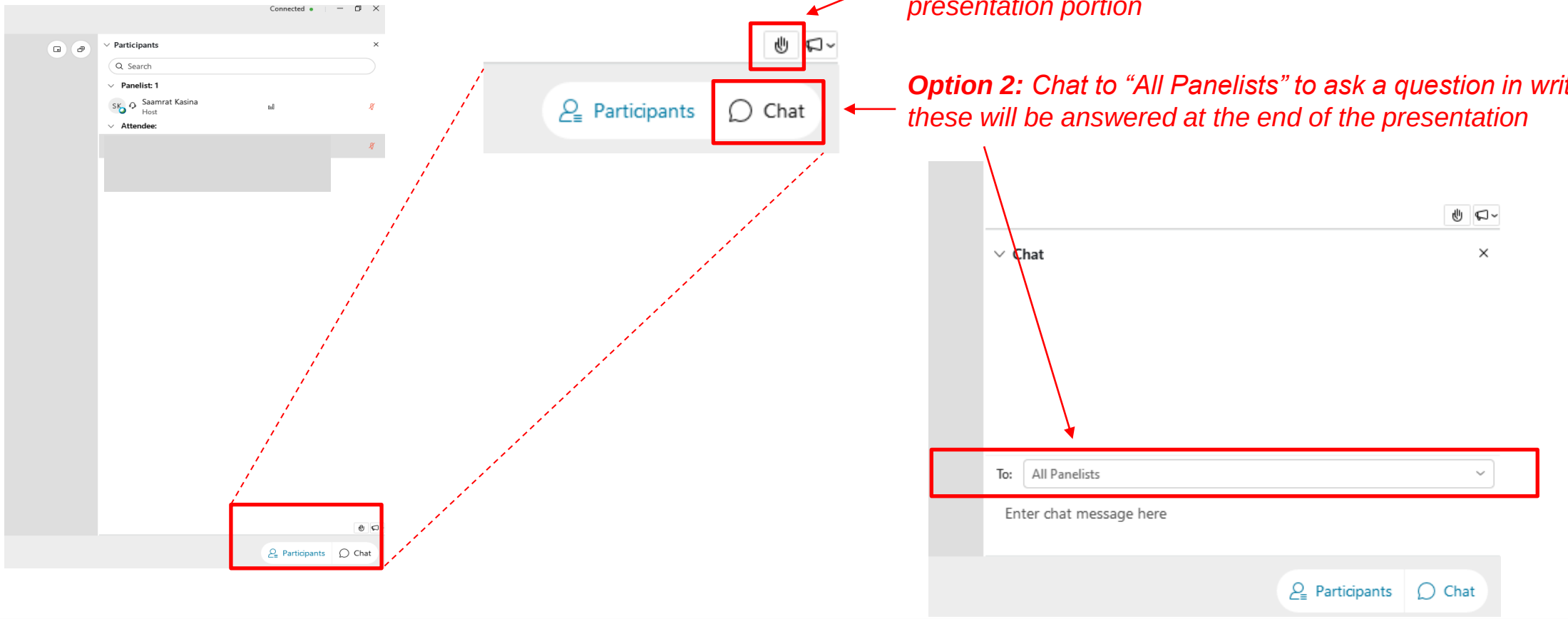

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Closing Remarks from GEO

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+ Energy Storage Forum

- Share your interest and stay informed via survey → https://forms.office.com/g/ZJdK8x0TDq

+ Stakeholder Feedback

- Get in touch with your comments and questions → Caroline.Colan@maine.gov

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Thank You

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