The Road to 100% **Renewable Electricity** 2030

We invite all attendees to respond to a short pre-workshop survey via PollEverywhere. All responses will be anonymous. Thanks in advance for your responses!

https://PollEV.com/eresources411

State of Rhode Island Office of Energy Resources

Public Technical Workshop #3 Agenda for December 3, 2020

Remarks from Commissioner Ucci

Presentation Part 1: Analytical Insights

Break (≈ 11:20 – 11:30)

Presentation Part 2: Policy Recommendations

Q&A

Concluding Remarks

The Road to 100%

Commissioner Nicholas Ucci

SECRETARY OF STATE
PUBLIC INFORMATION CENTER
2020 JAN 17 AM 10: 52

State of Rhode Island and Providence Plantations

Gina M. Raimondo
Governor

EXECUTIVE ORDER

20-01

January 17, 2020

ADVANCING A 100% RENEWABLE ENERGY FUTURE
FOR RHODE ISLAND BY 2030

WHEREAS, Rhode Island and the world face significant environmental, economic, energy, and public health challenges from the impacts of climate change; and

WHEREAS, Rhode Island is committed to mitigating economy-wide greenhouse gas emissions and their effect on climate change, while spurring new and innovative opportunities for investment and job growth throughout the state's clean energy economy; and

WHEREAS, Rhode Island's clean energy sector has seen a 74% increase in jobs since 2014, demonstrating that protecting against climate change and strengthening our economy are complementary goals; and

WHEREAS, the Resilient Rhode Island Act establishes targets for Rhode Island to reduce greenhouse gas emissions to 10% below 1990 levels by 2020, to 45% below 1990 levels by 2035, and to 80% below 1990 levels by 2050; and

WHEREAS, the Rhode Island Executive Climate Change Coordinating Council (EC4), in its December 2016 Greenhouse Gas Emissions Reduction Plan, made clear that a business-as-usual approach to reducing economy-wide greenhouse gases is insufficient to meet Resilient Rhode Island Act emission reduction targets; and

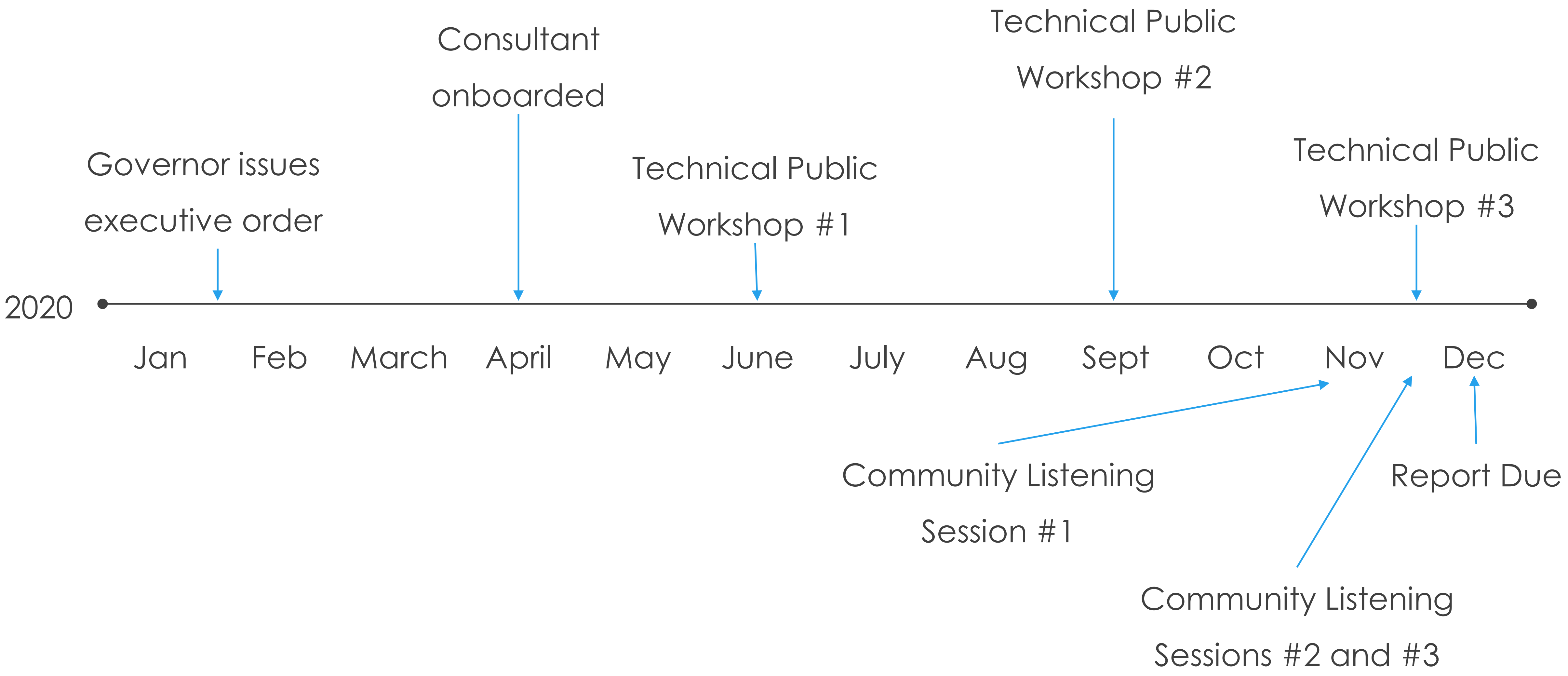
Executive Order 20-1

Goal
Meet 100% of the state's electricity demand with renewable energy resources by 2030.

Process
OER shall conduct economic & energy market analysis, and develop viable policy & programmatic pathways.

Results
Implementable action plan by December 31, 2020.

Timeline



Project website: www.energy.ri.gov/100percent

100% x ‘30 Webpage

www.energy.ri.gov/100percent

Workshop materials will be posted here.

Public Comment

Please submit public comments by December 15, 2020 to:

Energy.Resources@energy.ri.gov

State Project Team

RI Office of Energy Resources
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Linda George, Administrator
Joel Munoz
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Public Utilities Commission
Ronald Gerwatowski, Chairman
Todd Bianco, Ph.D.
Emma Rodvien

Department of Environmental Management
Terry Gray, Associate Director

DRAFT WORK PRODUCT

100% Renewable Energy by 2030 in Rhode Island

PUBLIC WORKSHOP #3

PRESENTED BY
Dean Murphy
Michael Hagerty

DECEMBER 3, 2020

Brattle

Webinar Logistics

This webinar is being recorded

By default, everyone but the panelists will be muted

If you have a substantive question, ask via the Q&A button at the bottom of your webinar screen

- You can see all the questions that have been asked – give a thumbs up if you want to ask a similar question
- If you are connected only by phone, press *9 to be recognized and allowed to speak during Q&A (please identify yourself by name and organization)

For technical questions about webinar logistics, send a chat to Ellen Paal (host)

- Any logistical question you can't figure out through the webinar: email ellen.paal@brattle.com

We'll have a 10-minute break at approximately 11:20

Workshop #3 Agenda

1. **Introduction – Recap of Workshops 1 & 2**
2. **Ratepayer Cost Impact – Revised Analysis (Bookend Portfolios)**
3. **Economic Impact Analysis (Bookend Portfolios)**
4. **Develop and Evaluate Mixed Portfolios – Combinations of Resource Types**
   - Q&A; Break
5. **Policy Recommendations**
6. **Planning and Enabling Recommendations**
7. **Equity Recommendations**
   - Final Q&A

Recap of Workshops 1 and 2

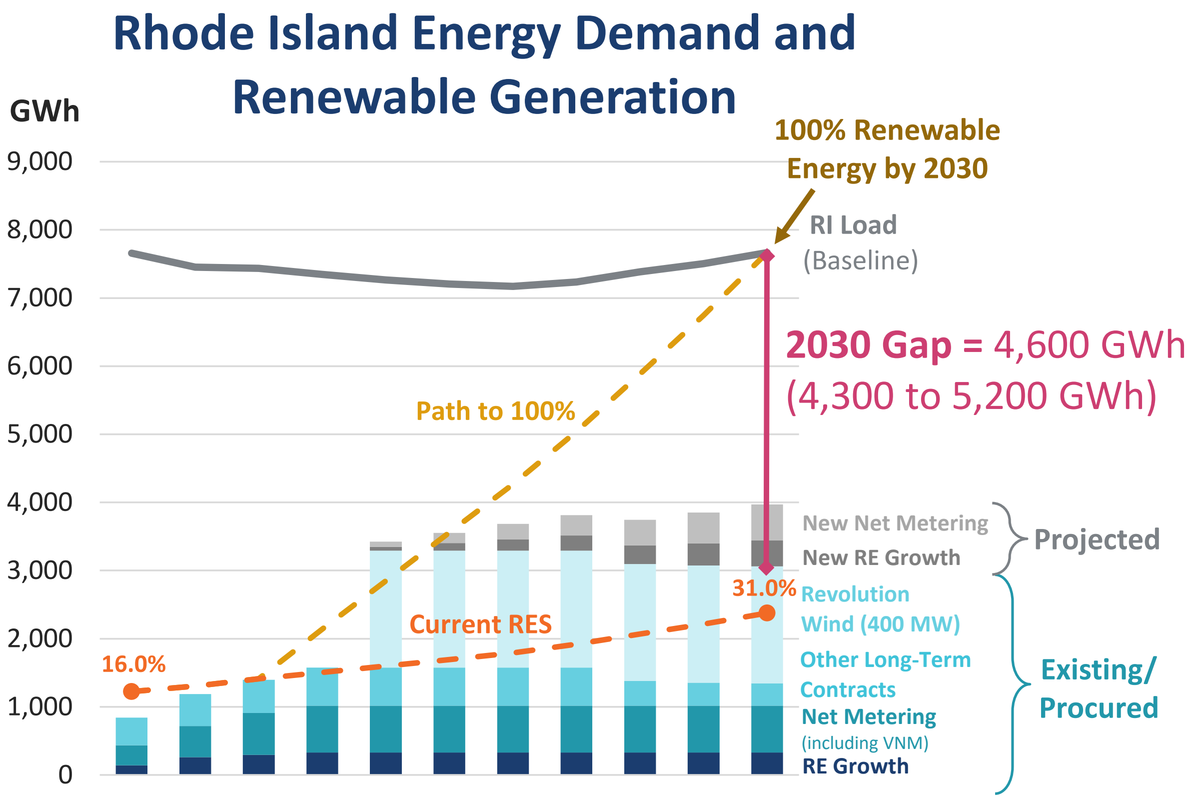
The first and second public workshops were held (via Zoom) on July 7 and September 29

Slides are available on the OER website: http://www.energy.ri.gov/100percent/

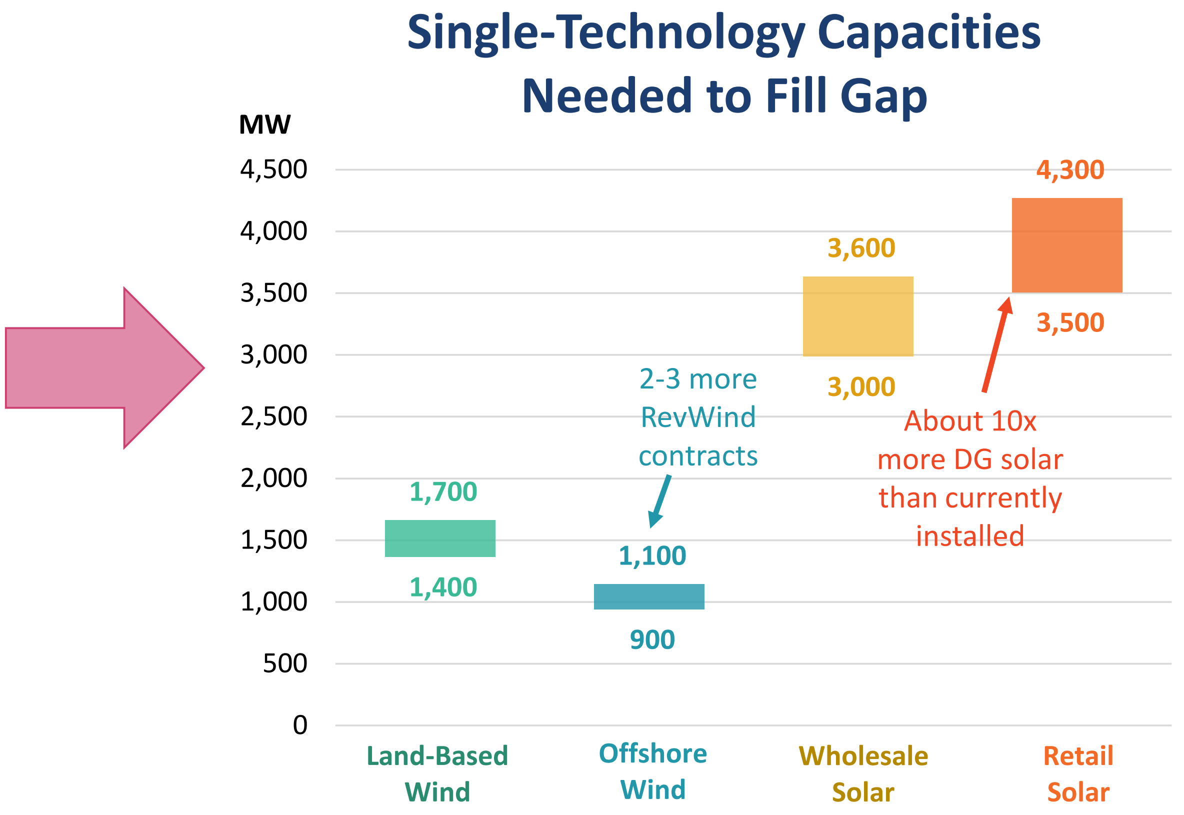
Renewable Energy Generation to Meet 100% in 2030

Rhode Island must increase its RES, and accelerate new renewables to achieve 100% by 2030

- Gap is slightly higher at 4,600 GWh (was 4,400 GWh), now accounting for the end of some existing contracts



Note: Load is grossed up to account for BTM PV that produces RECs.



Renewable Energy Resource Summary

Cost projections are necessarily uncertain – potential upward cost risks include:

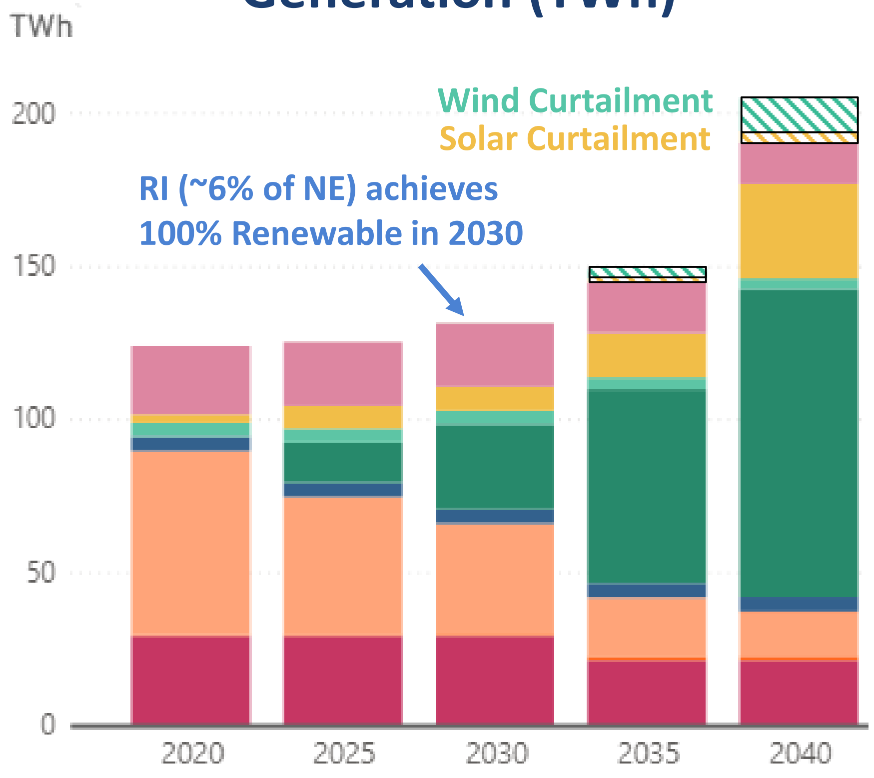
- **Offshore Wind**
  - Highly competitive early projects may have depressed prices, limiting future cost declines
  - Transmission upgrade costs may increase as the most attractive interconnections are utilized
- **Land-Based Wind**
  - Transmission availability and upgrade costs, particularly for northern New England
  - Siting issues
- **Wholesale Solar**
  - Interconnection costs, siting availability
- **Retail Solar**
  - Interconnection costs: rules allocating cost to project vs including in distribution charge

Potential downward cost factors: Technological/cost advances could reduce costs more/faster for any of these technologies, as seen recently for offshore wind and solar

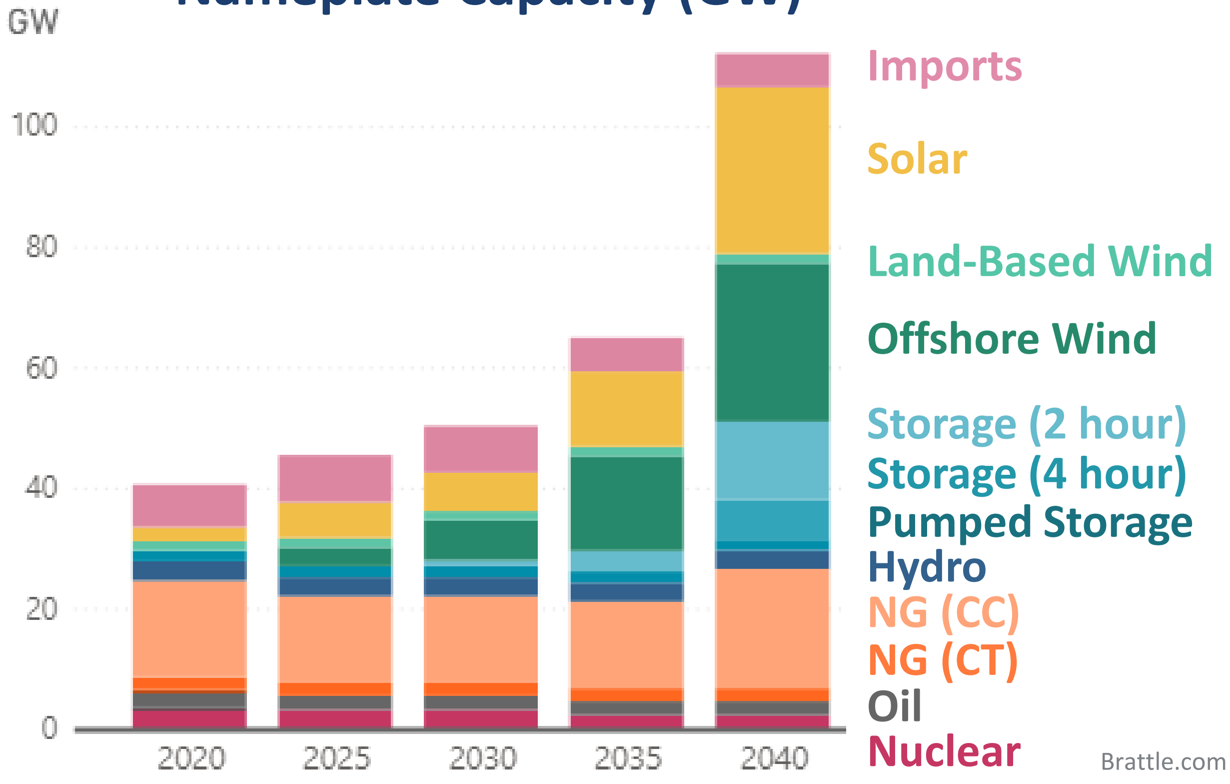
Future New England Grid

- The shift to more renewables reduces energy revenues as prices fall in hours renewables generate
  - Average price for load also falls as supply curve shifts right, and low/zero price hours increase
- Different renewable resources can receive different energy prices – due to generation timing

Generation (TWh)



Nameplate Capacity (GW)



Resource Costs and Ratepayer Impacts

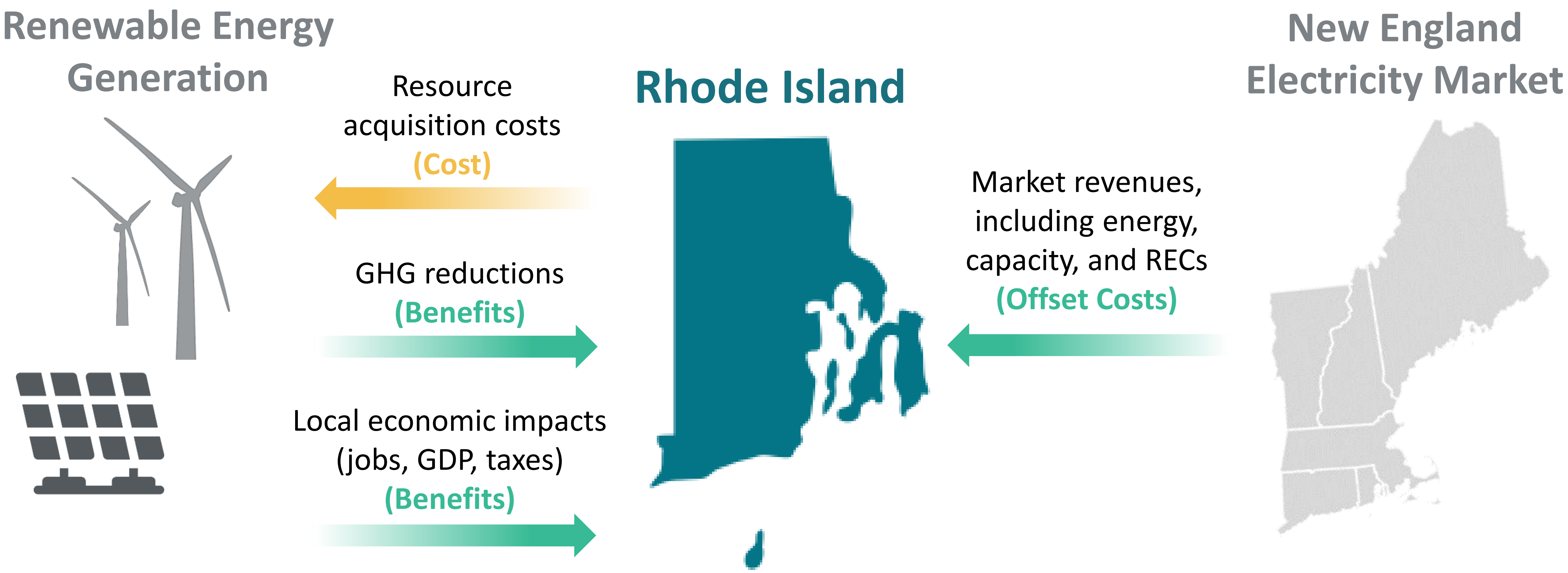
Resource Costs: Prior draft resource costs have been updated (see below)

- Feedback from stakeholders and developers suggests broader cost ranges, potentially higher system upgrade and interconnection costs

Evaluating Above-Market Cost to ratepayers of several Bookend Portfolios:

- Prior draft results have been updated with revised cost information (see below), and extended

Analyzing Renewable Costs and Benefits to Rhode Island



Net Cost to RI Ratepayers = Resource Acquisition Costs - Market Revenues

Economic Impacts: Local Development, GDP, Jobs

Other factors: Equity, Land Use, Additionality of GHG Abatement

Ratepayer Cost Impacts
- Bookend Portfolios -

Updates to Above-Market Ratepayer Cost Impacts

Following Workshop 2, we incorporated stakeholder feedback into our ratepayer cost impact analysis, making the following changes:

1. Updated renewable resource acquisition costs to consider a wider range of uncertainty in the costs of the renewable generation resources and system upgrades
2. Added capacity market revenues to the calculation of above-market costs to ratepayers
3. Developed a view of future REC market prices, to use market REC purchases as a reference point to measure the relative costs of RI renewable energy programs

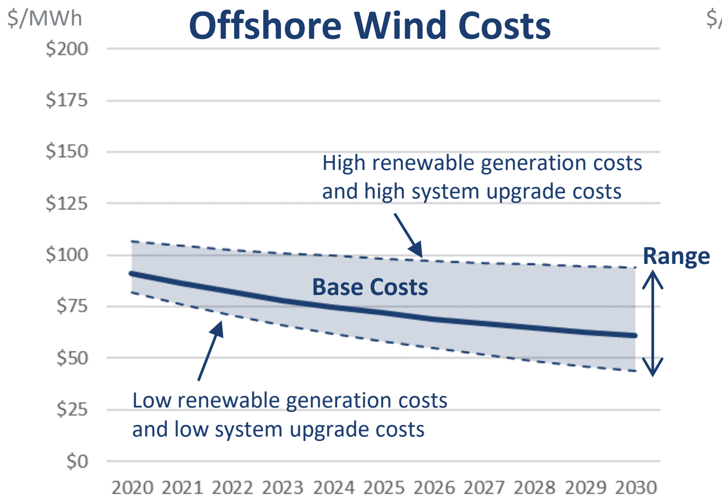
Updated Resource Acquisition Cost Projections

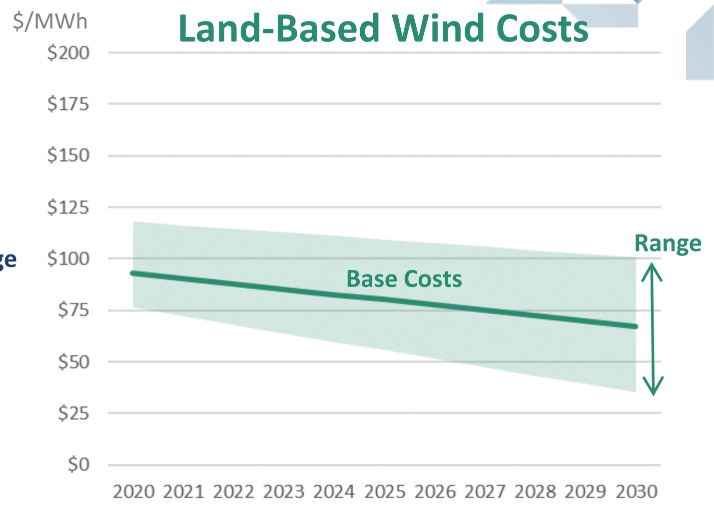
We received input from renewable developers to consider a broader range of future renewable generation costs

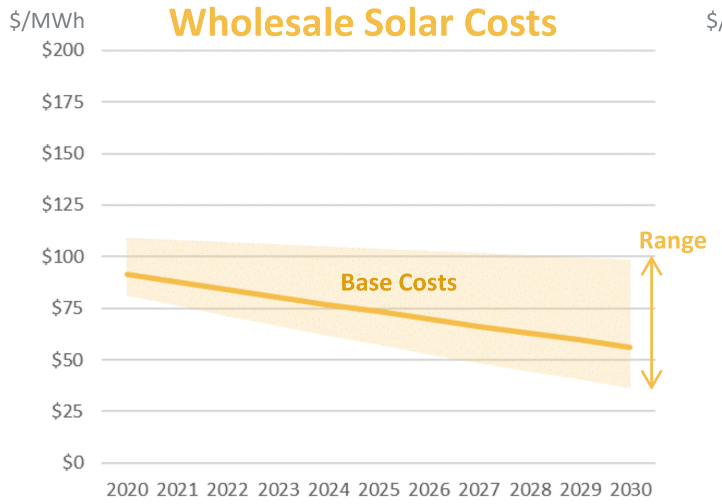
We updated renewable cost projections to reflect greater long-term cost uncertainty

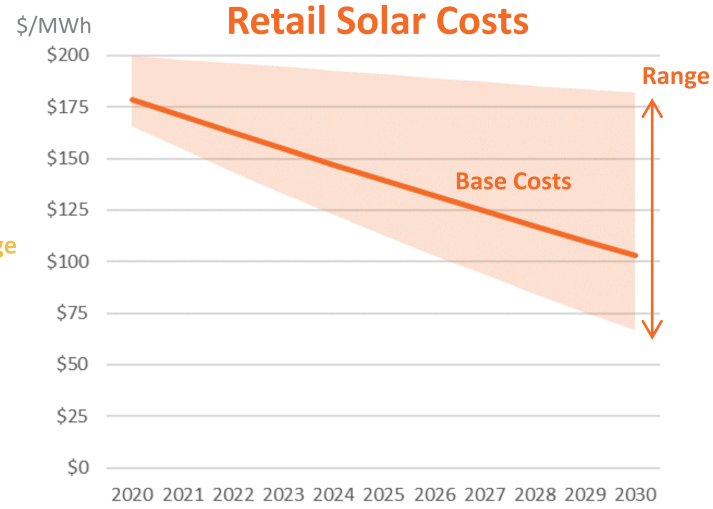
- *Renewable Generation Costs*: Increased cost range based on NREL's 2020 ATB, including "conservative" case with limited cost declines
- *System Upgrade Costs*: Increased cost range based on best available market data on system capacity and upgrade costs for each resource type

Net impact is an increase in Base Costs of $6-10/MWh and High Costs of $25-40/MWh









Notes: All monetary values in 2020 dollars. Total resource costs account PTC and ITC phaseout, maintaining 10% ITC for solar through 2030.

Capacity Market Revenues for Renewables

In addition to energy market revenues, renewables may also receive capacity market revenues that will reduce net ratepayer costs

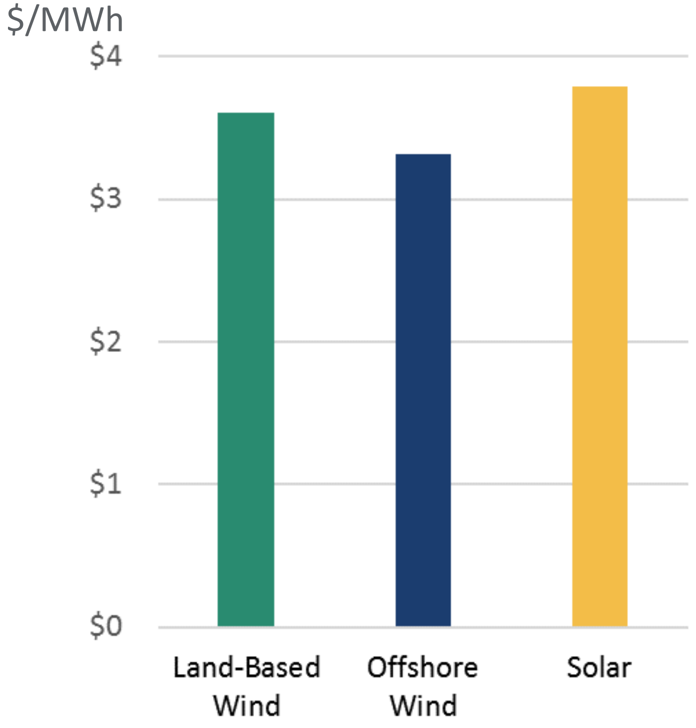
- Renewable capacity supported by state programs can enter the ISO-NE Forward Capacity Market through recently introduced substitution auctions
- But, only 54 MW of renewable capacity have cleared due to limited participation and low primary auction prices ($2/kW-mo)

We included future capacity market revenues in our analysis, reducing the net ratepayer costs of renewable generation

- Assume $4.5/kW-mo, based on average price in 5 most recent auctions
- Rely on ISO-NE's 2020 ORTP study for renewable qualified capacity
- Discount capacity revenues by 50% to account for decline in qualified capacity and potential for limited capacity to clear in future years

Analyze range from $0/MWh (don't clear the substitution auction) to about $14/MWh (based on ISO-NE Net CONE of $8.7/kW-mo)

Base Capacity Market Revenues



Sources and Notes: Assumed average capacity price over past 5 auctions of $4.50/kW-mo; qualified capacity based on draft 2020 ISO-NE ORTP study; assumed capacity factor of 35% for land-based wind, 45% for offshore wind, and 16% for solar. Monetary values in 2020 dollars.

Projected Renewable Energy Credit (REC) Prices

RECs are generated by qualified renewable generation resources and used by Load Serving Entities to meet RES requirements

- RECs are bought and sold by market participants in New England
- REC prices fluctuated from $5/MWh to $50/MWh over past five years

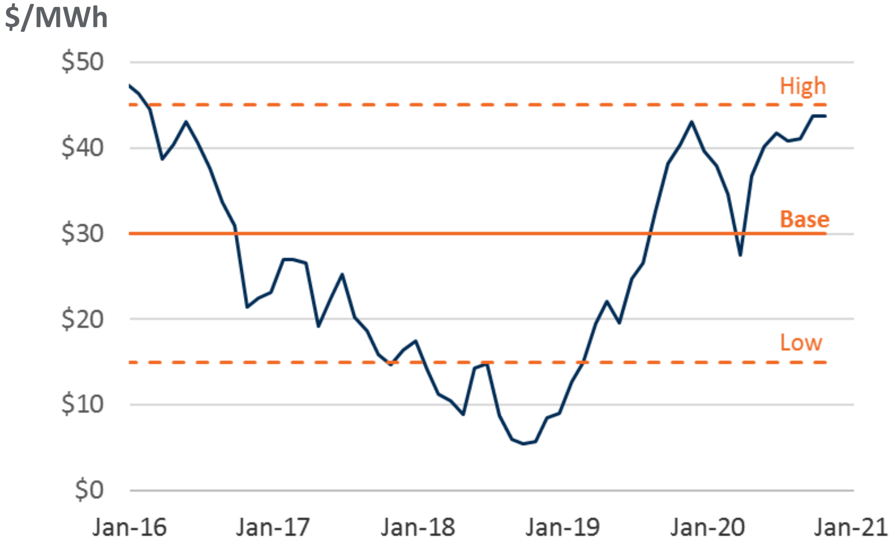
Future RI and New England REC prices depend on short-term balance of renewable energy procurements and state RPS goals

- Low REC Prices: Total renewable generation exceeds RPS demand
- High REC Prices: RPS demand exceeds total renewable generation; capped at the Alternative Compliance Payment (ACP) in each state

We assume a Base REC price of $30/MWh, reflecting historical average and price needed to attract new utility-scale resources

- Analyze a range of $15/MWh to $45/MWh based on historical prices

Average RI REC Prices (2018 – 2020)



Source: S&P Global Market Intelligence, accessed November 23, 2020.

Alternative Compliance Payment Rates

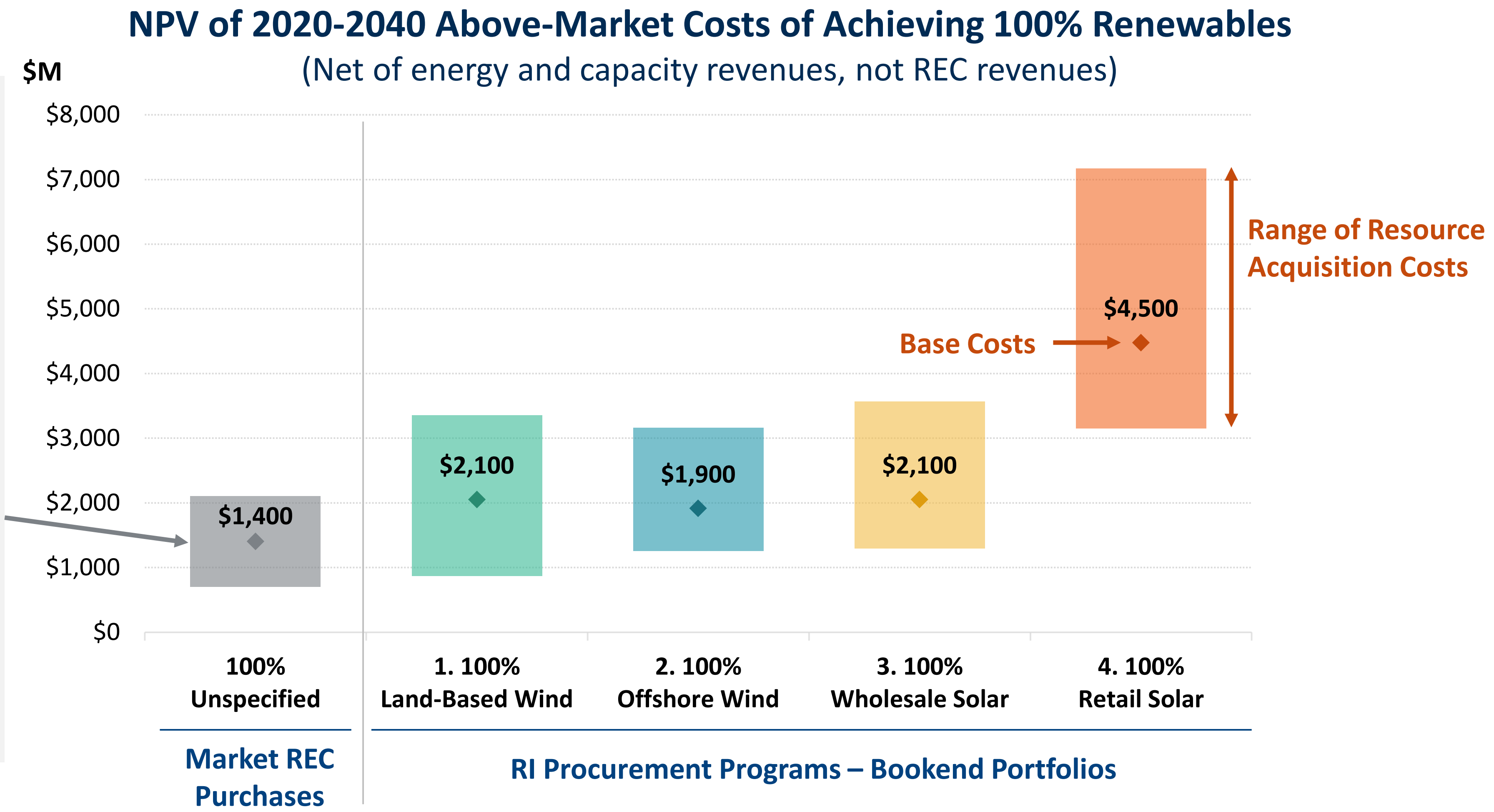
State	2020 ACP	ACP Escalation
Rhode Island	$72/MWh	Escalates with inflation
Massachusetts	$72/MWh	Escalates with inflation
Connecticut	$55/MWh	Fixed in nominal dollars

Ratepayer Cost Impacts to Achieve 100% Renewable by 2030

Above-market costs are similar across utility-scale resources and much lower than distributed solar

Short-term REC purchases may result in lower costs of meeting 100% RES (or may not), but may also have less desirable impacts, including:

- Lower GHG impacts, if renewable energy is not entirely additional
- Limited support for local renewable resources
- Increased ratepayer exposure to volatile REC prices



Note: All monetary values are in 2020 dollars. Ratepayer costs reflect the total incremental costs of achieving 100% net of energy and capacity revenues.

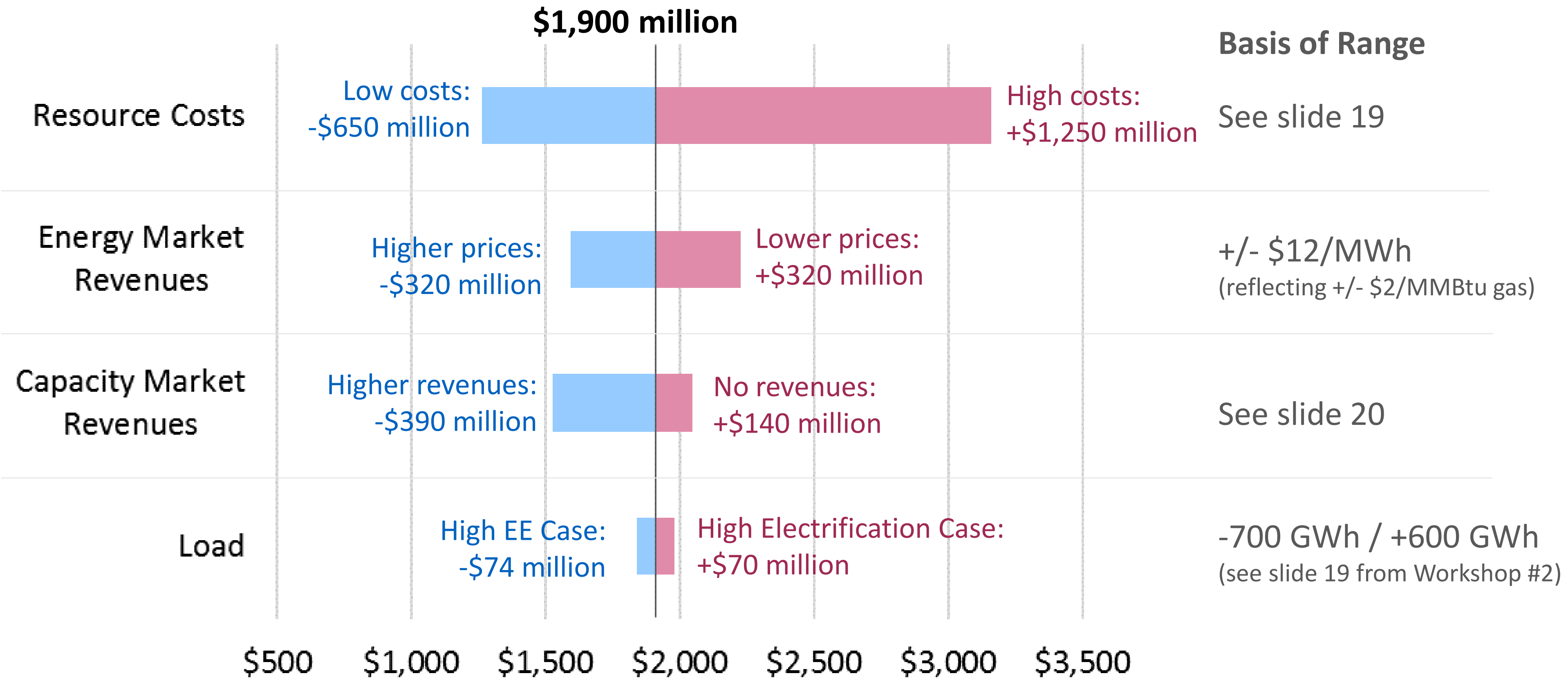
Sensitivity Analysis for 100% Offshore Wind Bookend

Resource acquisition cost uncertainty has the greatest impact on ratepayer costs

- Higher energy and capacity market revenues reduce above-market costs
- Load has a relatively small impact compared with other factors

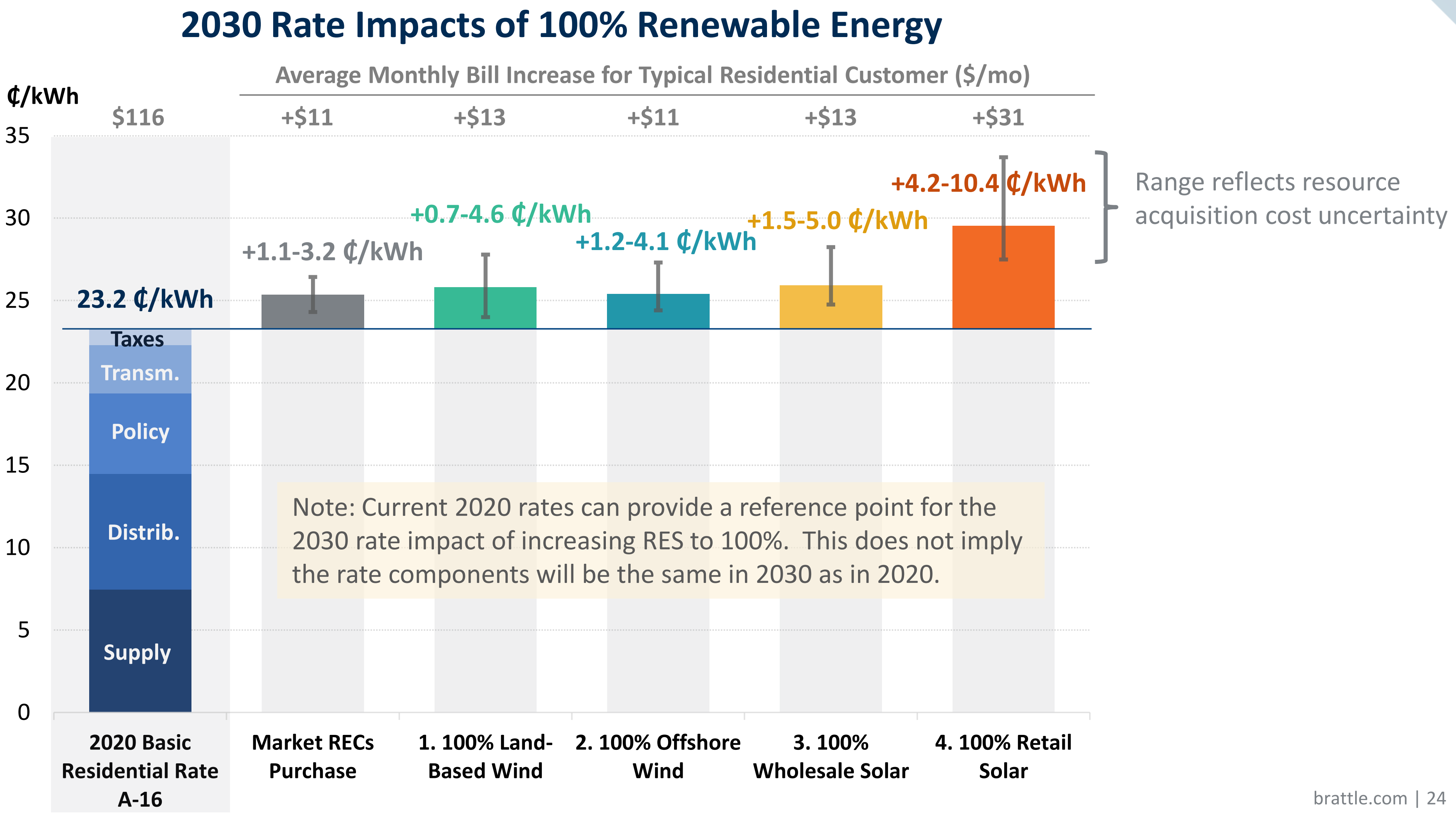
NPV of 2020-2040 Above-Market Costs of Achieving 100% Renewables

(Net of energy and capacity revenues, not REC revenues)



Note: All monetary values are in 2020 dollars. Ratepayer costs reflect the total incremental costs of achieving 100% net of energy and capacity revenues.

Incremental Ratepayer Cost Impacts to Achieve 100%



Sources and notes: All monetary values are shown in 2020 dollars. Assumes typical residential customer consumes 500 kWh/mo.

Net Metering Shifts Costs to Non-Customers

Rhode Island is projected to have about 400 MW of net metered generation by 2022-23 based on current projections

- Equivalent to about 500 GWh of generation
- About 85% is from VNM facilities, which tend to be larger solar facilities (up to 10 MW) vs. residential rooftop solar (5 – 15 kW)
- VNM is limited to certain customers accounting for ~6% of load

NEM/VNM customers reduce their metered demand and their utility bill, resulting in cost shifts to non-NEM customers

400 MW of NEM/VNM generation shifts $55 million to non-NEM customers, increasing their rates by 0.8 ₵/kWh

- Volumetric rate = 20.4 ₵/kWh; NEM credits = 17.0 ₵/kWh
- Market value of $60/MWh, including energy, RECs, and capacity

RE Growth Program does not result in similar cost shifts

Comparison of RE Growth and VNM/NEM Programs

	RE Growth	VNM/NEM
Purchasing Entity	National Grid	Customer
Developer Compensation	Fixed price for energy, RECs, and capacity based on competitive procurement	Price negotiated by developer and customer (may be done through public solicitations)
Regulatory Oversight	Reviewed by PUC	No oversight
Costs to Ratepayers	All program costs spread evenly across ratepayers	Non-NEM customers subsidize NEM customers
REC Ownership	Transferred to NGrid	Retained by developer or customer, depending on contract

Economic Impact Analysis
- Bookend Portfolios -

Rhode Island Economic Impact Analysis with IMPLAN

We use IMPLAN to estimate GDP and jobs impacts of alternative portfolios to achieve 100%

- Each portfolio is compared to meeting 100% with market REC purchases at assumed REC price (nominally $30)
- Not the overall impact of reaching 100%, but rather the impact of how to achieve 100%, given the 100% goal

Impacts on GDP and jobs occur through 3 channels

1. Construction expenditures (for in-state projects) – before project is online
2. O&M expenditures (in-state projects) – after project is online
3. Tariff impacts (all projects) – cost to RI ratepayers of project (contract for energy + RECs)
   - Assessed relative to buying market energy + market REC (at assumed REC price) to meet 100% renewable
   - Positive impact if Portfolio is cheaper than market energy + REC prices; negative if more costly

Economic impact analysis does not capture all considerations

- Does not include potential positive economic benefits of seeding a new “export” industry, like offshore wind, in RI
  - Additional positive impacts may accrue from future OSW projects procured by other states in Rhode Island waters, beyond the impacts of the initial project(s) developed for Rhode Island

Rhode Island Economic Impact Analysis with IMPLAN (cont'd)

Each renewable generation type has particular construction cost and expenditure profile for 1-3 years

- Different technologies expend costs in different RI economic sectors (for in-state projects)
  - E.g., construction labor, cement, structures, wind turbines/blades, solar panels and inverters, …
- Those expenditures affect Rhode Island GDP and jobs through interactions in the economy

O&M expenditures work similarly, in the operating phase of the project

Economic impact depends on technology(ies) employed, and whether projects are in-state/out-of-state

- Retail Solar is entirely in-state; Land-Based Wind is (almost entirely) out-of-state
- Offshore Wind and Wholesale Solar projects could be in-state (from RI port, for OSW) or out-of-state
  - Out-of-State projects: Construction, O&M do not contribute (significantly) to in-state GDP & jobs
  - Some out-of-state projects may have modest impacts in RI (not counted here)
    e.g., MA solar facility uses components from RI supplier, or employs RI workers who commute

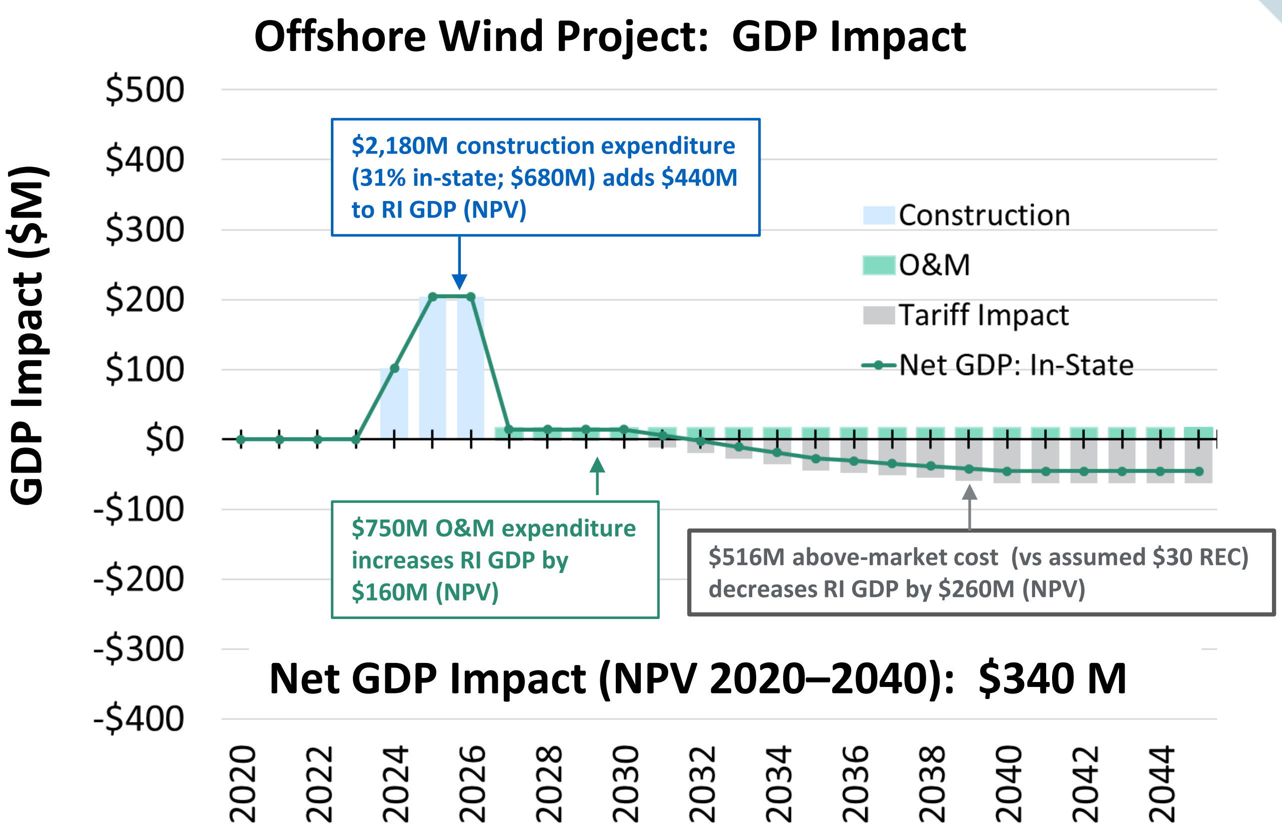
The actual local Rhode Island impact of any <u>particular</u> project will depend on how that project is executed

- IMPLAN uses representative or typical sector allocations
  - Any particular project may have a different mix of local vs out-of-state suppliers and labor

RI GDP Impact – 600MW OSW Project, Online 2027, In-State

Economic impact includes 3 categories: Construction, O&M, Tariff Impact

- Construction causes in-state expenditures (if sourced from RI port), boosting RI GDP & jobs
  - O&M is similar
- Tariff Impact (based on OSW contract cost vs. $30 REC + energy) can raise or lower GDP, jobs
  - Positive impact if OSW is cheaper than assumed $30 REC, negative if more costly
- Out-of-state projects may not yield the same construction and O&M benefits for RI economy
  - Tariff impacts are same (if same cost)
- "Above-market" costs appear to increase with time; "market" energy price falls as renewable penetration increases (REC assumed constant)
  - Fossil is less dominant with time



CO_2 Offset: 600 MW OSW produces 2.7 TWh, offsetting 1.2 million tons CO_2/yr when online in 2027 (assuming 0.45tCO_2/MWh system marginal emission rate) Valued at $75/t$CO_2$ avoided, this is $93M/yr. Market REC purchases would yield similar CO_2 offset benefit, if RECs create additional emissions reductions.

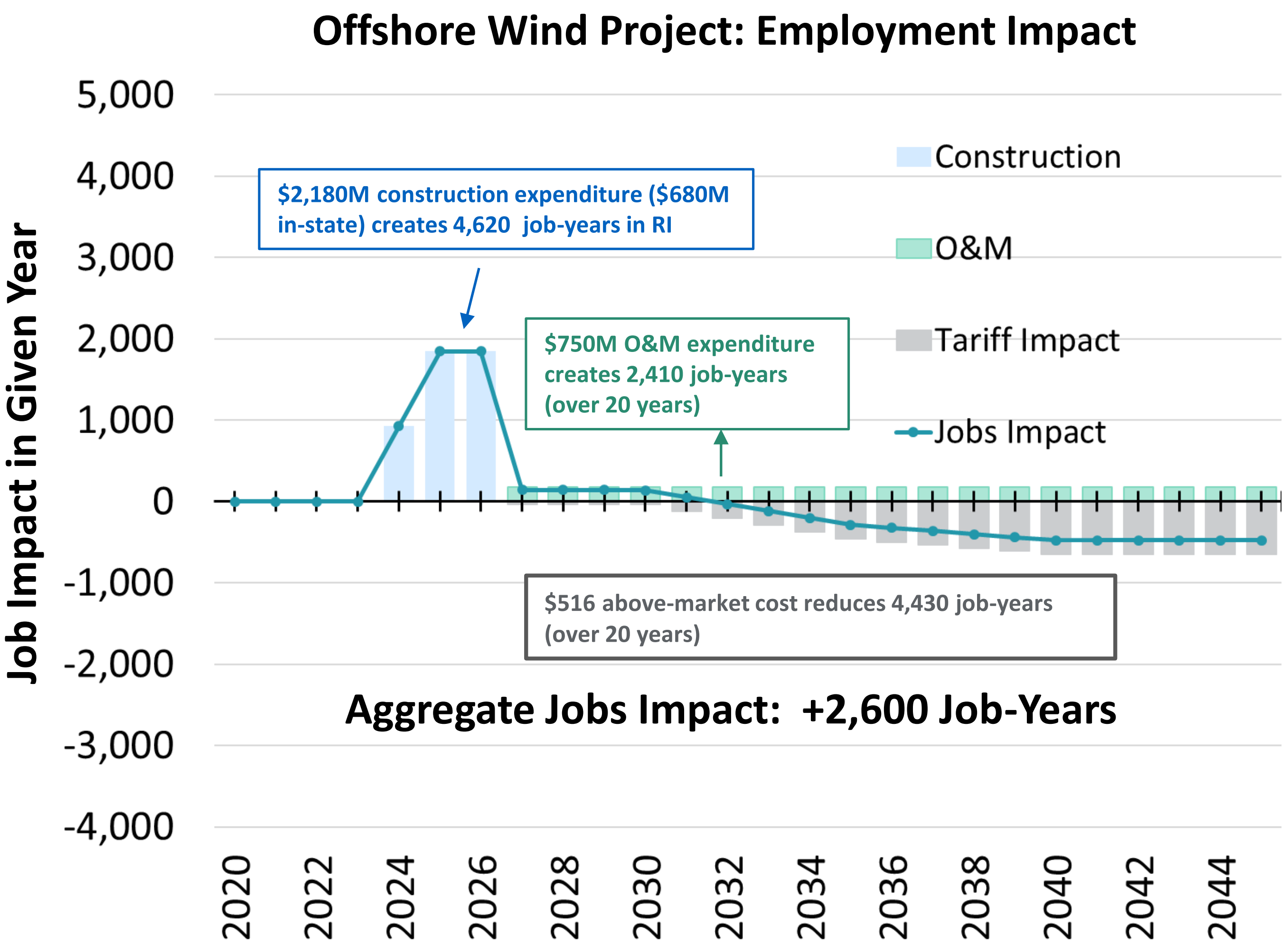
RI Jobs Impact – 600MW OSW Project, Online 2027, In-State

Similar to GDP impact, jobs are also affected by Construction, O&M, Tariff Impact, in a qualitatively similar profile

- Construction and O&M create jobs directly
  - Increased economic activity also supports additional indirect and induced jobs
- Tariff Impact effect: If OSW is less costly than REC + energy, Tariff is lower with OSW, increasing jobs (induced impact)
  - If more costly, it reduces jobs

Note that GDP incorporates the economic impact of the jobs effects

- ***Jobs effect is not additive to GDP***
  - It just gives another way to look at the overall economic impact



Economic Impact Analysis: All-Offshore Wind Portfolio

To meet 100% Renewable with all Offshore Wind would require a series of projects

- Illustrated here as equal-size projects coming online each year, 2025-2030, with overlapping construction periods
  - Since OSW projects are quite large, an actual profile would be more "lumpy" – this pattern is illustrative

Construction periods overlap, 2022-2029

O&M and Tariff Impacts begin when first project comes online

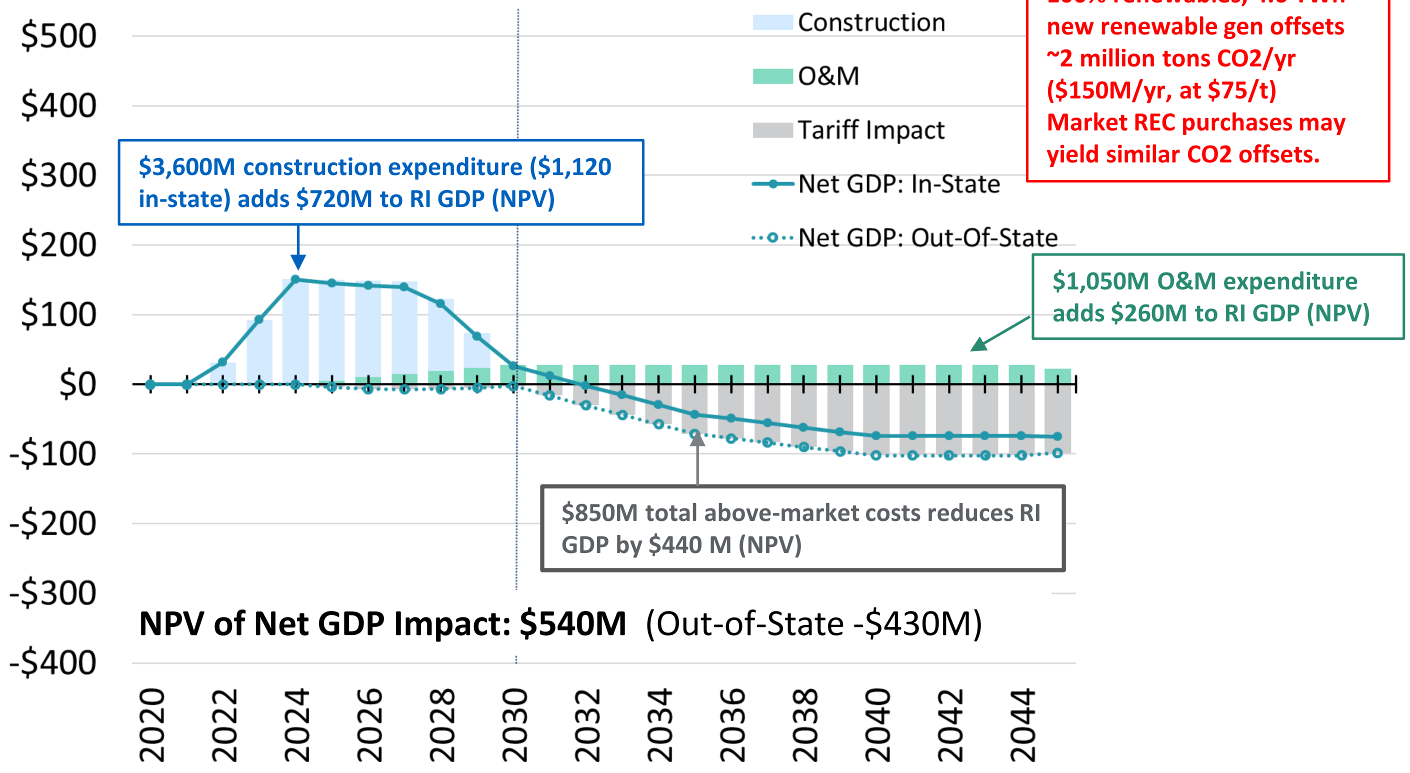
- **Growing to 2030 as more come online**

Net impact initially positive, dominated by Construction

- **Tariff Impact may be positive or negative, vs purchasing RECs**

Out-of-state project assumes no in-state Construction, O&M benefits

Offshore Wind Portfolio: GDP Impact



By 2030 when RI reaches 100% renewables, 4.6 TWh new renewable gen offsets ~2 million tons CO_2/yr ($150M/yr, at $75/t) Market REC purchases may yield similar CO_2 offsets.

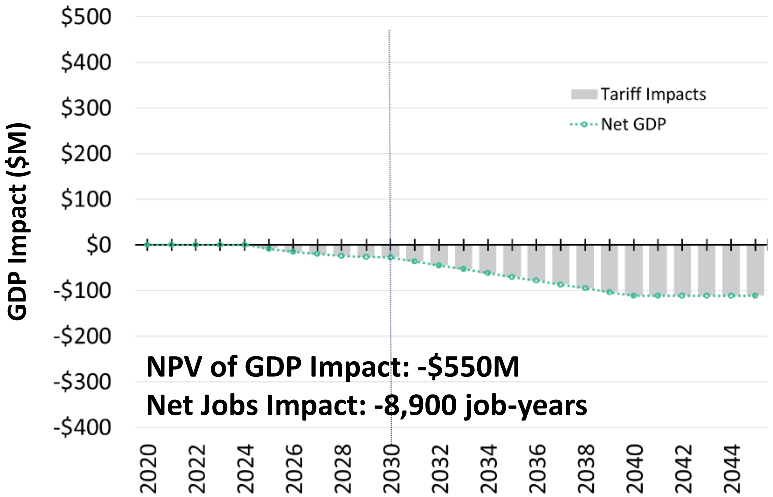
Shows impacts only for resources online by 2030. The impact of additional renewable resources likely to be needed beyond 2030 is not included here.

GDP Impact: Comparing Bookend Portfolios

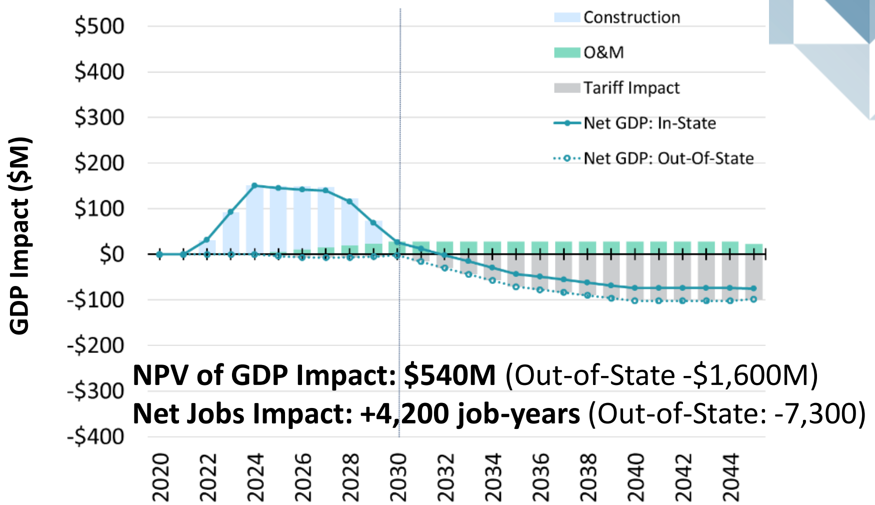
Resources have similar profiles

- **Construction (if in-state) creates early GDP benefits**
- **O&M (if in-state) creates modest GDP benefits in operation**
- **Tariff impact may be positive or negative, based on resource cost vs market energy + REC cost**
  - **Compares meeting 100% with specified resource, vs buying market RECs**
  - **Negative as illustrated here; assumed $30 REC price makes renewables slightly above-market cost**
  - **Positive at higher REC price and/or lower renewable cost**
- **Solid line nets the 3 components**
- **Retail Solar: much larger negative Tariff Impact; partly offset by higher positive Construction effect**

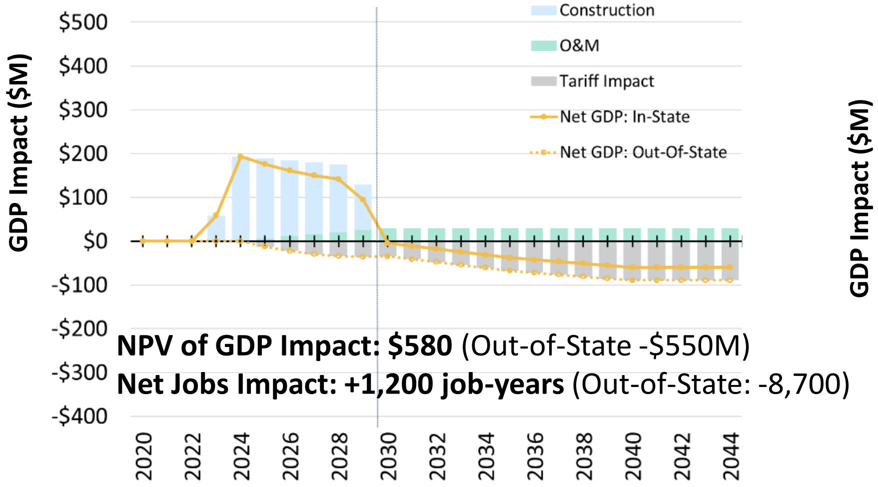
1. Land-Based Wind



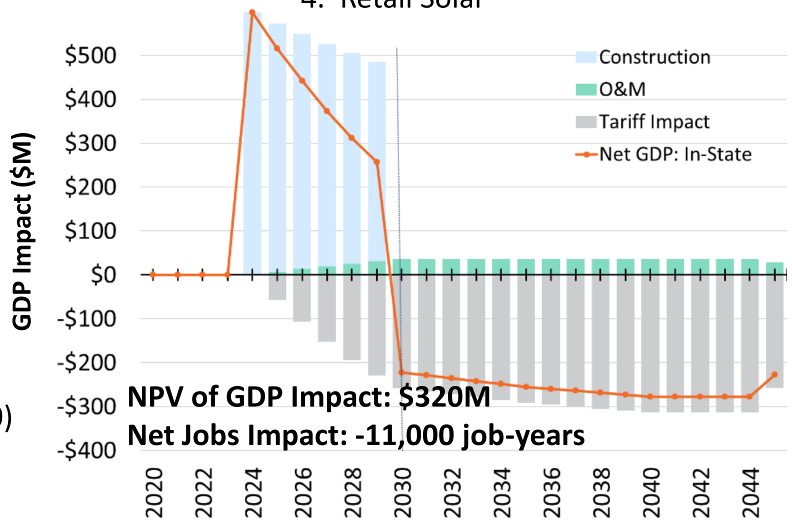
2. Offshore Wind



3. Wholesale Solar



4. Retail Solar



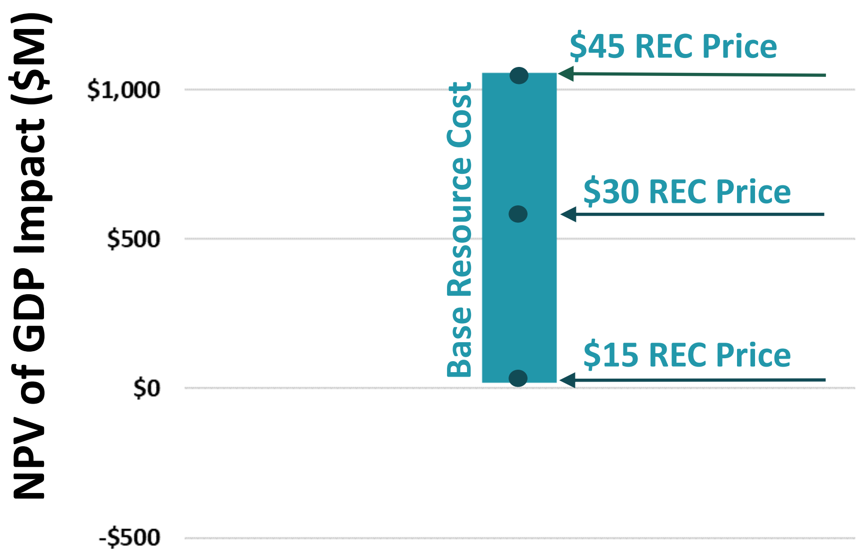
Shows impacts only for resources online by 2030. The impact of additional renewable resources likely to be needed beyond 2030 is not included here.

Illustrating Uncertainty in GDP Impact (vs REC Purchases)

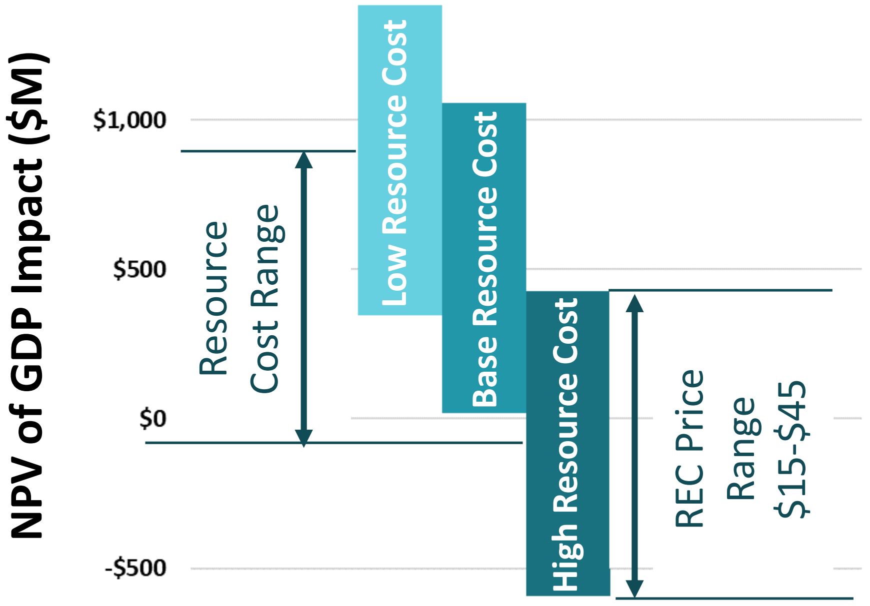
We consider two types of uncertainty

- Each bar represents a different Resource Cost assumption: Low, Base, or High
  - Incorporating uncertainty in both the generation resource and the necessary system upgrade costs
- Height of bar shows differences due to different REC price assumption ($15, $30, $45) used as a reference

Offshore Wind: GDP Impact (NPV)
REC Price Uncertainty, with Base Resource Cost



Offshore Wind: GDP Impact (NPV)
Resource Cost & REC Price Uncertainty



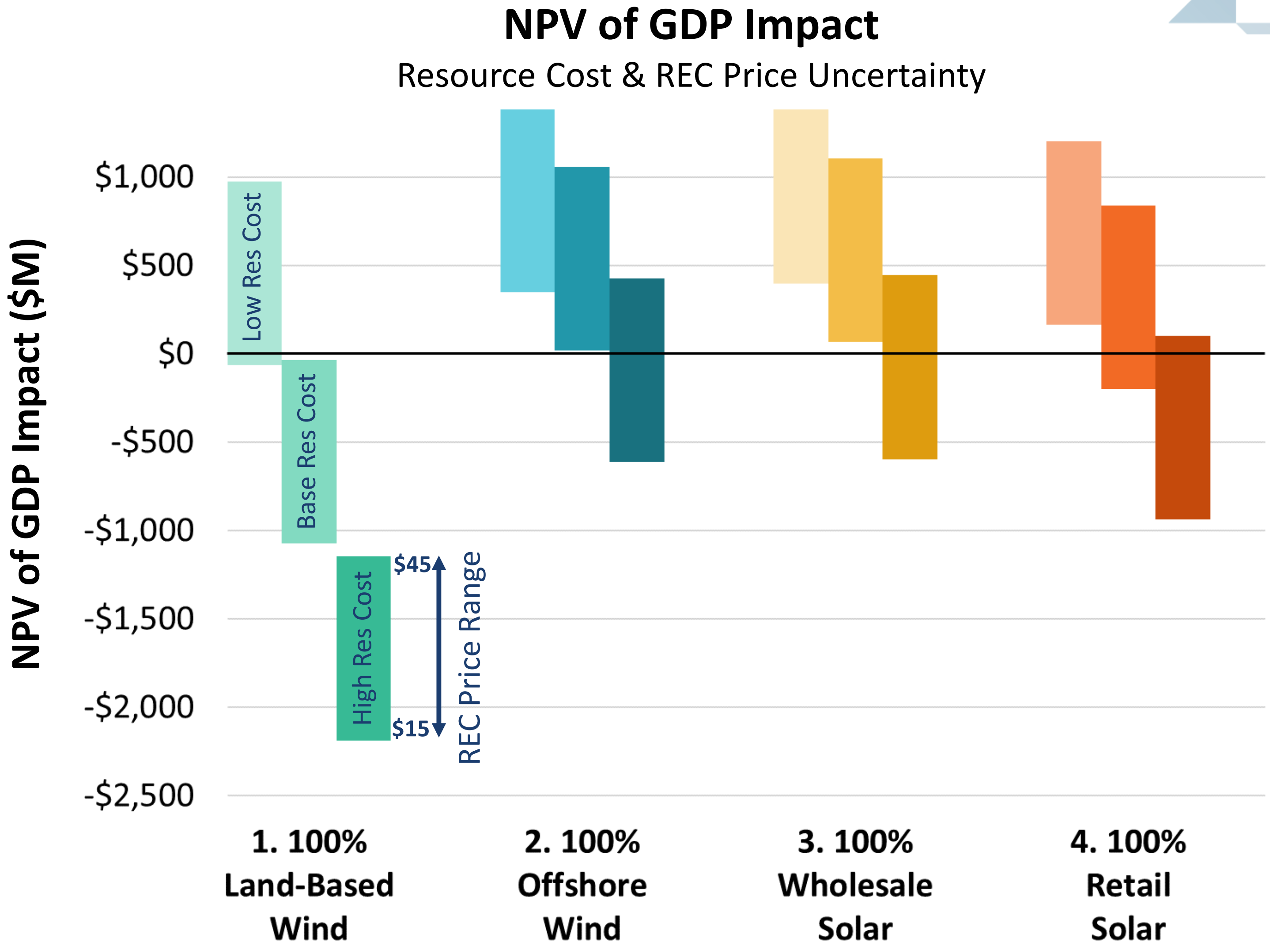
Bookend Portfolios – GDP Impacts (vs REC Purchases)

Each bar is a Resource Cost case:
High, Base, or Low Cost

- Range of bar shows effect of REC price assumption: $15, $30, $45

For In-State Resources:

- Higher above-market cost (Tariff Impact) is partly offset by positive effect of higher in-state Construction expenditure – both within and across resources
  - Thus Retail Solar, while much higher cost, has similar GDP effect
  - And LBW has lower GDP impact due to lack of in-state investment, and falls faster at higher Cost

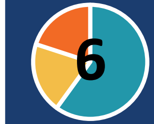
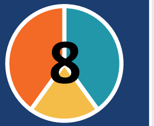
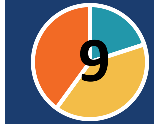


Develop and Evaluate Mixed Portfolios

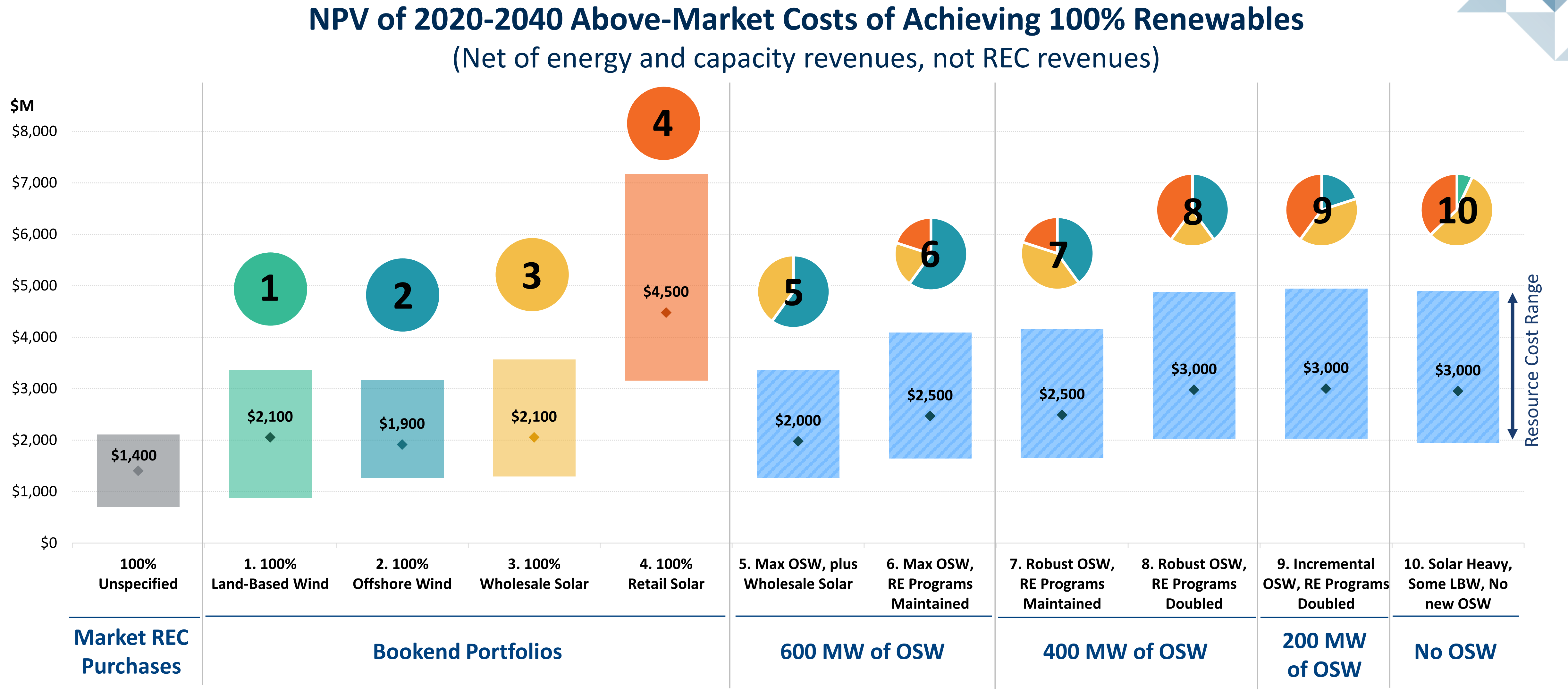
Mixed Renewable Portfolios

- We also considered representative technology combinations to fill the Gap
- Based on recently announced RI RfP for up to 600 MW of Offshore Wind
  - 600 MW, 400 MW, or 200 MW OSW
    - i.e., 2,700 GWh, 1,800 GWh, or 900 GWh (fill ~60% / 40% / 20% of Gap with OSW)
    - Combinations of Retail and/or Wholesale Solar to fill remaining Gap
- Also a Portfolio with no OSW
  - Mostly Retail/Wholesale Solar
  - Limited Land-Based Wind (~7% of Gap)
- Many other combinations are possible; these representative mixes give many insights

Mixed Renewable Portfolio Descriptions

#	Description	Offshore Wind	Land-Based Wind	Retail Solar	Wholesale Solar
 5	Max OSW, plus Wholesale Solar	600 MW (2,700 GWh)	---	---	Fill remaining gap (1,900 GWh)
 6	Max OSW, RE Programs Maintained	600 MW (2,700 GWh)	---	Fill 50% of remaining gap (950 GWh)	Fill 50% of remaining gap (950 GWh)
 7	Robust OSW, RE Programs Maintained	400 MW (1,800 GWh)	---	Fill 33% of remaining gap (950 GWh)	Fill 66% of remaining gap (1,850 GWh)
 8	Robust OSW, RE Programs Doubled	400 MW (1,800 GWh)	---	Fill 66% of remaining gap (1,850 GWh)	Fill 33% of remaining gap (950 GWh)
 9	Incremental OSW, RE Programs Doubled	200 MW (900 GWh)	---	Fill 50% of remaining gap (1,850 GWh)	Fill 50% of remaining gap (1,850 GWh)
 10	Solar Heavy, Some LBW, No new OSW	---	100 MW (300 GWh)	Fill ~40% of remaining gap (1,800 GWh)	Fill ~60% of remaining gap (2,500 GWh)

Ratepayer Impact of Mixed Portfolios

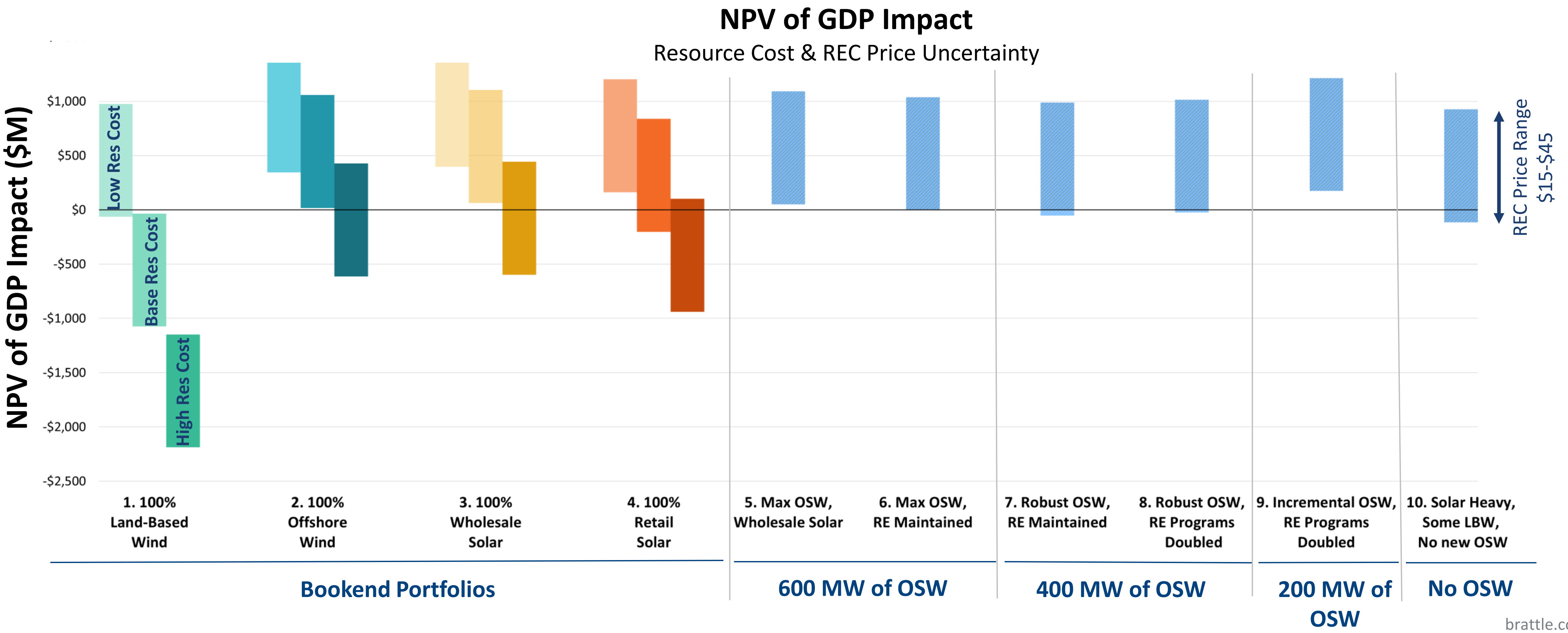


Note: All monetary values are in 2020 dollars. Ratepayer costs reflect the total incremental costs of achieving 100% net of energy and capacity revenues.

Mixed Portfolios – GDP, Jobs Impacts (vs REC Purchases)

Each bar shows a different Resource Cost assumption: High, Base, or Low

- Height of bar shows range due to different REC price assumption: $15, $30, $45



Above-Market Cost vs Economic Impacts

Two metrics tell somewhat different stories
– Lowest Above-Market Cost is not (necessarily) best Economic Impact

Retail Solar has much higher Above-Market Cost; LBW, OSW, Wholesale Solar are similar to one another

LBW, OSW, Wholesale Solar have similar Above-Market Costs; Retail Solar is much higher

- Thus, Above-Market Cost of Portfolios is closely related to the share of Retail Solar in the portfolio

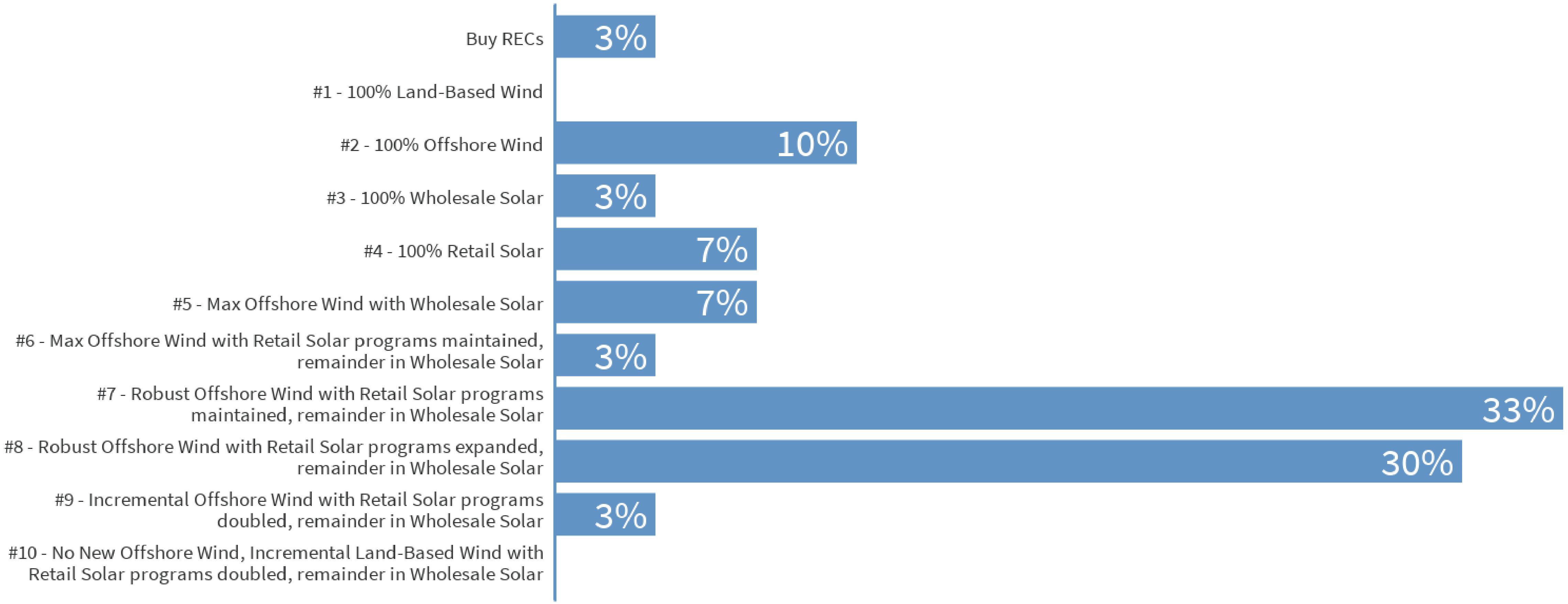
But positive economic impact of in-state construction helps offset higher costs, in terms of GDP and jobs

- Retail Solar has similar net economic impacts as in-state OSW, Wholesale Solar
  - More local impact per dollar expended; positive/negative components are both larger, and roughly balanced
  - Though note: Positive and negative economic impacts (GDP, jobs) don't accrue to same populations

LBW lacks these local benefits, so has lower economic impacts (same for out-of-state OSW or solar)

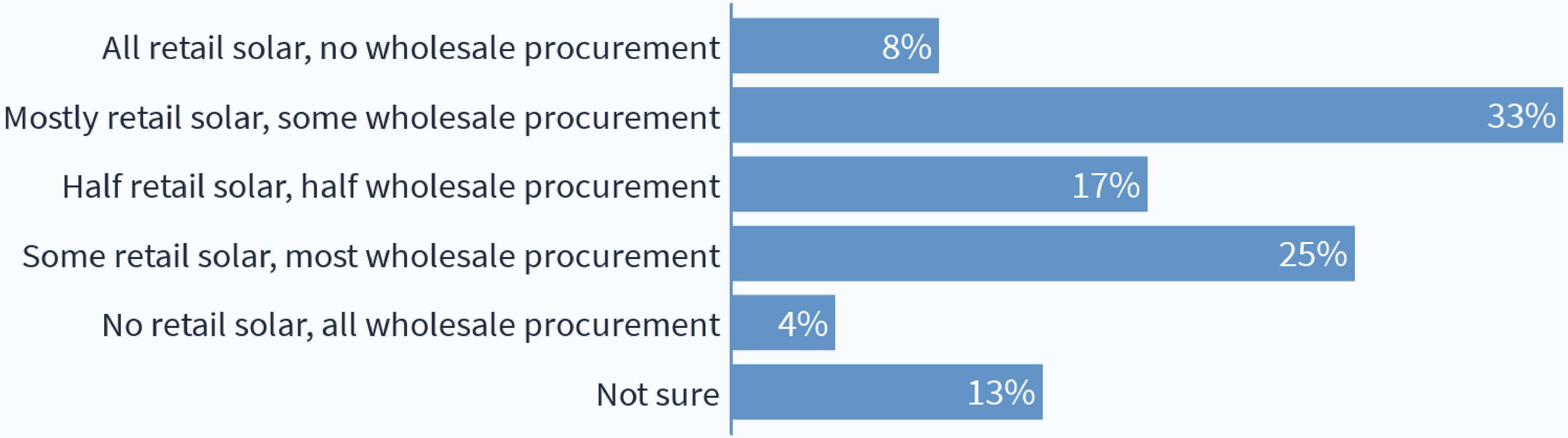
- A substantial out-of-state cost advantage might offset this, but is not expected (could be for specific projects)

#1 - Which portfolio is most appealing to you? [choose your top 2]

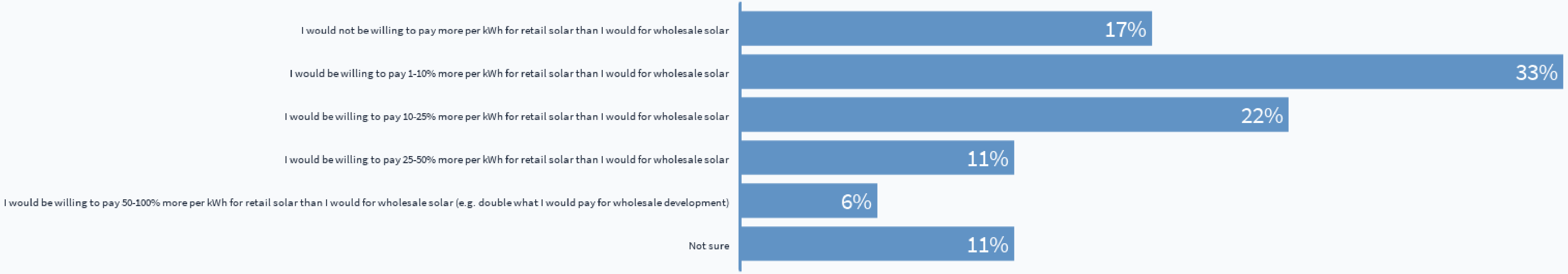


#2 - Why is your preferred portfolio most appealing?

#3 - Retail solar development costs more than wholesale procurement, but delivers additional economic development benefits. Which portfolio would you lean toward preferring? [select one]



#4 - Retail solar development costs more than wholesale procurement, but delivers additional economic development benefits. How much more per kWh would you be willing to pay for retail solar development relative to wholesale development?



The Road to 100%

Q&A/Break

Presentation will resume at 12:05 PM

STATE OF RHODE ISLAND
OFFICE OF ENERGY RESOURCES

Pathway to 100% Renewable by 2030

Draft Policy Recommendations

Note: These slides supplement additional project materials – readers should refer to the complete set of materials for additional information and context.

Mission statement

The Rhode Island Office of Energy Resources' (OER) mission is to lead the state toward a **clean, affordable, reliable**, and **equitable** energy future.

OER develops policies and programs that respond to the state's evolving energy needs, while advancing **environmental sustainability**, **energy security**, and a vibrant **clean energy economy**.

OER is committed to working with public- and private-sector stakeholders to ensure that all Rhode Islanders have access to cost-effective, resilient, and sustainable energy solutions.

Putting the pieces together...

There are four integrated components of the 100% Renewable by 2030 effort:

Foundational principles, developed by the project team to align with the Governor's executive order and informed by stakeholders.

Technical analysis, informed by principles and stakeholder input, illuminated the costs and benefits of hypothetical resource portfolios.

Stakeholder input, informed the foundational principles, analytical inputs and assumptions, and shaped policy recommendations – thank you!

Policy and programmatic recommendations, developed to satisfy the goals of the Executive Order in a manner consistent with the principles, technical analysis, and stakeholder input.

Project Insights

- If we define 100% renewable electricity as the procurement and retirement of Renewable Energy Certificates (RECs) to match Rhode Island usage, then 100% renewable electricity is achievable at a range of costs with a corresponding range in benefits.

- Establishment of a clear definition for 100% renewable electricity is important, and achievement of that definition must be supported by transparent accounting.

- RI's current renewable portfolio contains a mix of local resources and large-scale procurements. The portfolio analyses suggest directions in which that balance could shift and that a diverse mix of local resources and large-scale procurements can provide a range of benefits.

- Achievement of our clean energy future requires ratepayers to support investment to drive long-term energy, economic, and environmental benefits through charges on their bills. Utility bills will increase *regardless* of our ultimate portfolio of renewable resources – but *net* economic and energy benefits and costs will be determined by how that portfolio is shaped over time.

Project Insights

- While there is significant uncertainty in the future costs of renewable energy resources, utility-scale resources (solar, offshore wind, and land-based wind) have similar cost ranges. Distributed resources have significantly higher costs.

- In-state renewable resources (including those in adjacent Federal waters) provide material local economic benefits relative to out-of-state resources and/or market purchases of RECs.

- Regional dynamics - including market design and transmission planning – will affect local costs but also create opportunities.

- Different renewable resource portfolios will cause different (and as yet unknown) investment needs in the distribution and transmission grid, and may require integrated planning to optimize outcomes.

- To achieve and maintain 100% renewable electricity beyond 2030, policy, programmatic and technical (e.g. storage) solutions may need to evolve as regional penetration of clean energy resources accelerates and increasingly-challenging grid impacts emerge.

Guiding Principles for 100% Renewable Goal - Summary

Decarbonization Principles

- Exemplify climate leadership
- Create incremental power sector decarbonization
- Facilitate broader decarbonization

Economic Principles

- Pursue cost-effective solutions
- Improve energy and environmental equity
- Create economic development opportunities

Policy Implementation Principles

- Ensure solutions are robust and sustainable beyond 2030
- Build upon RI's existing renewable energy mechanisms
- Be consistent with other RI priorities and policies

Decarbonization Principles

Exemplify climate leadership

- Set goals consistent with avoiding the worst impacts of climate change globally
- Provide an example to states attempting to achieve similar targets

Create incremental power sector decarbonization

- GHG reductions should be “additional” – beyond what would occur otherwise
- Verifiable, e.g., with NEPOOL-GIS tracking
- Account for load met by behind-the-meter generation, as well as metered load

Facilitate broader decarbonization

- In other sectors and beyond Rhode Island
- Collaborate with regional partners to maximize GHG reductions

Economic Principles

Pursue cost-effective solutions

- Lowest reasonable costs to consumers
- Leverage market competition to reduce ratepayer costs and energy price volatility
- Maintain affordability of electricity for all Rhode Islanders
- Consider cost impacts on all customers, particularly vulnerable customers

Improve energy and environmental equity

- Improve equitable outcomes as prioritized by communities in energy and environment realms

Create economic development opportunities

- Foster opportunity in Rhode Island’s clean energy economy

Policy Implementation Principles

Ensure solutions are robust and sustainable beyond 2030

- Continue to achieve 100% renewable to 2050 and beyond, at lowest reasonable cost
- Flexible in response to growing electrification load, market and technological uncertainties and surprises
- Consider early adoption of “integration” resources (batteries, long-term storage, demand response, etc.)

Build on RI’s existing renewable energy mechanisms

- Align with and leverage existing programs and laws

Be consistent with other RI priorities and policies

- Responsible siting: balancing conflicting demands with open space, housing, etc.
- Social & economic policies: labor, housing, econ. dev., etc.
- Ensure continued power system reliability

Policy and Programmatic Recommendations

Study insights inform three categories of recommendations:

Policy

Recommendations for defining, achieving, and procuring 100% renewable electricity.

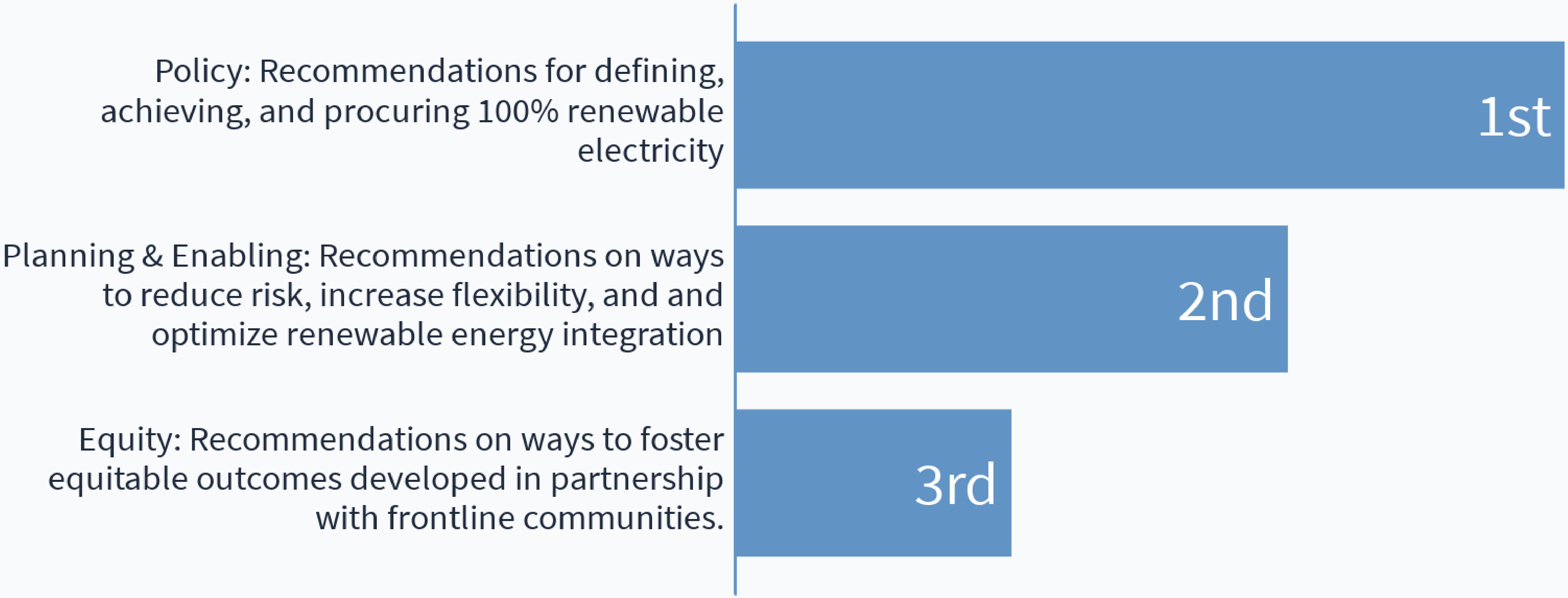
Planning & Enabling

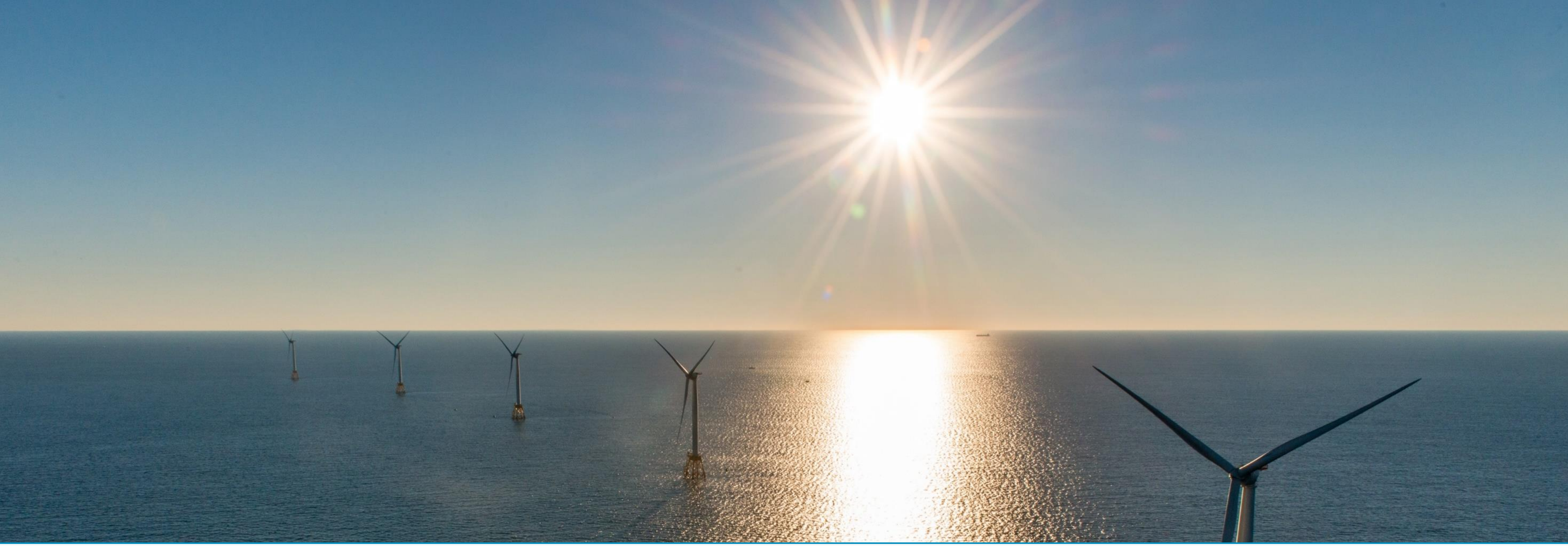
Recommendations on ways to reduce risk, increase flexibility, and optimize renewable energy integration.

Equity

Recommendations on ways to foster equitable outcomes developed in partnership with frontline communities.

#5 - Which category of policy recommendations are you most interested in discussing? [Rank]





Policy Recommendations

Policy Recommendations

Policy is needed to establish a strong, statewide framework and reach our goals in ways that align with our foundational principles.

We must ensure we meet our clean energy goals by advancing a **100% Renewable Energy Standard.**

Continued efforts to decrease energy consumption necessitate extension of **Least-Cost Procurement and Nation-Leading Energy Efficiency Programs.**

Maintaining continued support for in-state development, while supporting **programmatic evolution** to deliver more affordable and sustainable outcomes.

Policy Recommendations

Advance a 100% Renewable Energy Standard (RES)

- RES is an existing, market-based mechanism that can ensure our electricity demand is offset with renewable resources over time.

- The utilization of Renewable Energy Certificates (RECs) establishes a verifiable mechanism to ensure compliance while facilitating renewable energy project financing.
  - Counting RECs from local DG is critical to tracking progress.
  - Oversight/reporting conducted annually by the PUC.

- Can extend beyond 2030 to ensure 100% renewables match changes in demand (e.g. load growth due to heating decarbonization).
  - The RES, in isolation, is unlikely to drive investment in incremental RE generation if needed (e.g. load growth, resource retirement, etc.)
  - In time, additional mechanisms may be needed to better match renewable generation with real-time demand (e.g. monitoring MA's Clean Peak Standard, enhanced demand response, targeted incentives for renewable-paired storage, etc.), keeping in mind the relative cost-effectiveness of each mechanism.

Policy Recommendations

Advance a 100% Renewable Energy Standard (RES)

- Action Item: in 2021, propose legislative amendments that results in a 100% RES:
  - Seek to maximize the value of existing long-term REC procurements on behalf of all electric distribution customers

- Maps to Guiding Principles:
  - Exemplify climate leadership
  - Create incremental power sector decarbonization
  - Pursue cost-effective solutions
  - Ensure solutions are robust and sustainable beyond 2030
  - Build upon RI's existing renewable energy mechanisms

- Key Analytical Insights:
  - Sets pathway to support additional renewables to achieve 100%
  - Flexible to accommodate uncertainty in future generation and load

Policy Recommendations

Extend Least-Cost Procurement of Energy Efficiency and Demand Response

- Rhode Island's existing LCP/EE law sunsets after 2023.
- Any future in which Rhode Island and the region achieve its GHG reduction goals in a clean, affordable, reliable, and equitable manner must include robust, cost-effective EE programs, investments, and innovation.
  - Our analysis assumes ongoing energy efficiency programs, without which those findings underestimate the scale of renewable energy resources – and costs – we will need to meet our goals.
- EE is the lowest-cost means of reducing energy consumption and costs, avoiding the need to serve the same level of demand with more cost-intensive resources (including renewables).
  - Supports local businesses, investment, and job creation
  - Reduces exposure to energy price volatility
  - Supports improved building comfort and health
- Since 2007, EE programs have saved over 10M MWh and 18M MMBTUs at a cost lower than the cost of procuring traditional electric supply, leading to substantial energy cost savings.
- Today, Rhode Island's energy efficiency programs are nationally-recognized and support roughly 2/3 of our clean energy jobs.

Policy Recommendations

Extend Least-Cost Procurement of Energy Efficiency and Demand Response

- Action Item: In 2021, purse an extension of the state's LCP requirements beyond 2030 to foster programmatic certainty, while establishing a platform for continued investment and job growth in our local economy.

- Maps to Guiding Principles:
  - Exemplify climate leadership
  - Create incremental power sector decarbonization
  - Facilitate broader decarbonization
  - Pursue cost-effective solutions
  - Improve energy and environmental equity
  - Create economic development opportunities
  - Ensure solutions are robust and sustainable beyond 2030
  - Build upon RI's existing renewable energy mechanisms
  - Be consistent with other RI priorities and policies

- Key Analytical Insights:
  - Cost effective EE reduces costs of achieving 100% renewables

Policy Recommendations

Continued Support for Utility-Scale Renewable Procurements and Local Renewable Development that Reflects Evolving Market Conditions

- Our clean energy laws/programs strive to achieve multiple policy objectives, including, but not limited to: GHG reductions and environmental sustainability; energy reliability; energy affordability; economic development; and job creation.

- To achieve and sustain 100% renewables – while advancing broad-based policy objectives – Rhode Island will require both continued growth in local distributed generation resources and competitive procurement of large-scale renewable resources.

- Analysis helps set guideposts for further procurement based on needs and tech-specific net benefits but does not support a single centralized procurement plan in favor of market-driven approaches that allow for cross-technology competition where appropriate.
    - Reaching 100% while managing potential cost increases in other components of our utility bills necessitates that *cost-effectiveness* remain a priority across programs.

Policy Recommendations

Continued Support for Utility-Scale Renewable Procurements and Local Renewable Development that Reflects Evolving Market Conditions

- Each of our existing renewable energy procurement programs has unique traits, creating multiple pathways for developers and consumers to participate in our clean energy future.

- However, *some of these programs – particularly those supporting local DG – present significant challenges that Rhode Island must begin to address* including, but not limited to:
  - Examining ways to reduce/control DG costs for local consumers
  - Sustainable siting practices for local DG to balance renewable development with environmental stewardship
    - Collaboration with local cities and towns, state leadership, and others will be critical to future DG development that achieves land-use objectives and fosters more efficient interconnections
  - Integration of storage and other technological solutions
  - Achievement of more equitable outcomes for all RI'ers through improved access, participation, and cost distribution

Policy Recommendations

Continued Support for Utility-Scale Renewable Procurements and Local Renewable Development that Reflects Evolving Market Conditions

- OER supports continuation of the Renewable Energy Growth (REG) program and net metering (NM) – however, further expansion should be contingent on identification and integration of measures to improve sustainability, affordability, and equity.
  - These challenges warrant in-depth collaboration with a diverse set of stakeholders, including policymakers, regulators, industry, environmental advocates, consumer advocates, utilities, and community organizations.
- The Renewable Energy Fund (REF) should be extended beyond its current 2022 sunset and evolve to address gaps in current market conditions considering foundational principles.
  - OER and Commerce have begun this work by utilizing the REF framework to support renewables on brownfields, storage, and soon, microgrid applications.
  - The Clean Energy Internship program, co-managed by both OER and Commerce, should continue beyond 2022.
- Continued support of our burgeoning offshore wind industry is critical to our clean energy economy and a decarbonized future for the region.
  - Consistent with Governor Raimondo's call for an additional 600 MW OSW

Policy Recommendations

Continued Support for Utility-Scale Renewable Procurements and Local Renewable Development that Reflects Evolving Market Conditions

- Action Items:
  - Seek legislative extension of the Renewable Energy Fund (REF) beyond 2022.
  - OER and Commerce will coordinate on identifying administrative and programmatic adjustments to the REF throughout 2021 that further renewable growth and clean energy innovation.
  - Request PUC approval of a competitive market RFP for up to 600 MW of offshore wind in Q1 2021.
  - Commence a forum for stakeholder dialogue and consensus building on the long-term costs/benefits of the state's net metering construct, as well as consider enhancements to reduce ratepayer costs and improve environmental sustainability and consumer equity, with recommendations due by December 31, 2021.

Policy Recommendations

Continued Support for Utility-Scale Renewable Procurements and Local Renewable Development that Reflects Evolving Market Conditions

- With modifications, Maps to Guiding Principles:
  - Exemplify climate leadership
  - Create incremental power sector decarbonization
  - Facilitate broader decarbonization
  - Pursue cost-effective solutions
  - Improve energy and environmental equity
  - Create economic development opportunities
  - Ensure solutions are robust and sustainable beyond 2030
  - Build upon RI's existing renewable energy mechanisms
  - Be consistent with other RI priorities and policies
- Key Analytical Insights:
  - There is significant uncertainty in costs across all technologies
  - Different utility-scale renewable resources have similar cost ranges, which differs from DG resources
  - A mix of resources weighted towards wind will best match demand profiles and reduce system balancing needs
  - In-state economic development benefits should be weighed against resource costs and environmental impacts

Planning and Enabling Recommendations

Planning and Enabling Recommendations

We need to advance innovative, integrated, and collaborative **planning** to **enable** interconnection of clean energy onto the grid while minimizing costs and optimizing land use.

Optimize the electric grid through collboorative, **integrated grid planning**.

Facilitate integration of distributed energy resources by advancing **Power Sector Transformation and Grid Modernization**.

Build out a strategic role for **energy storage** technologies.

Continue **regional collaboration** on wholesale markets and interstate transmission.

Planning and Enabling

Optimize the electric grid through collaborative, integrated grid planning

- Our local grid must begin to more proactively consider the mid- and long-term impacts of accelerated decarbonization on Rhode Island's distribution and transmission systems.

- Increased penetration of renewable energy resources, load growth from beneficial electrification, and competing policy pressures (e.g. related to land use) are three drivers of how and where the electric grid is built out.
  - We propose to consider these drivers and longer time horizons to better understand and plan for future needs.

Planning and Enabling

Optimize the electric grid through collaborative, integrated grid planning

- Grid planning is multi-faceted, technical, and complex. There are no simple solutions that will substantially drive down costs or advance all policy objectives completely. However, more proactive and informed planning may lead to long-term grid optimization, efficiencies, and policy objectives.
  - Current practice is to react to proposals for distributed energy resource deployment. Integrated grid planning could more actively consider state policy objectives, municipal preferences, clean energy resource opportunities/needs, land use/siting, etc.
  - This recommendation does not advocate for immediate investments in grid infrastructure, but asks whether/how electric distribution utilities, state agencies, municipalities, and others might identify zones favorable to renewable energy and remove barriers to DER deployment.
  - Our goal is to explore how we transition from today's electric grid to the electric grid required to meet our long-term clean energy and GHG reduction goals.

Planning and Enabling

Optimize the electric grid through collaborative, integrated grid planning

Two potential areas of exploration are:

- Analyze T&D system needs for several 100% renewable scenarios to identify potential grid challenges and development opportunities.
  - Identify potential for system upgrades – whether project-specific or broader system upgrades – that might enable renewable growth, reduce development risks, balance environmental sustainability, and moderate long-term costs that consumers might otherwise bear.
  - Consider wide variations in load, renewable portfolios, and hosting capacity needs.
- Enhance grid visibility and improve forecasting.
  - Develop strategy for improving probabilistic spatio-temporal forecasting for load, DER, and hosting capacity to be used to integrate and optimize system updates while minimizing costs.
  - Consider longer planning horizons to accommodate long-term needs, which can reduce long-term costs.
  - Consider intersections with beneficial electrification of heat and transportation in electric system planning.

Planning and Enabling

Optimize the electric grid through collaborative, integrated grid planning

- Action Item: in 2021, launch a collaborative effort with National Grid, state agencies, municipalities, and other key stakeholders to explore the potential for a more integrated approach to grid planning.
  - Foster improved understanding of how short/mid-term planning can and should account for longer-term dynamics; estimate long-term impacts to the grid from both DER and load growth and compare grid investments under reactive and proactive approaches.
  - Seek to identify locations for distributed energy resources that could streamline DG development timelines, protect the state's most sensitive environments, and offer the potential to reduce long-term, system wide costs.
  - Critical to this effort will be the identification of underlying data sets necessary for more dynamic forecasting and planning; we need to be realistic about the possible time and resources needed to gather information not currently in-hand.

Planning and Enabling

Optimize the electric grid through collaborative, integrated grid planning

- Maps to Guiding Principles:
  - Exemplify climate leadership
  - Create incremental power sector decarbonization
  - Facilitate broader decarbonization
  - Pursue cost-effective solutions
  - Create economic development opportunities
  - Ensure solutions are robust and sustainable beyond 2030

- Key Analytical Insights:
  - Interconnection costs of distributed solar resources have risen significantly and are likely to continue to do so without more advanced, dynamic planning
  - Electrification demand will require additional investments in the distribution system

Planning and Enabling

Advance Power Sector Transformation and Grid Modernization

- Power Sector Transformation report and recommendations published in 2017. Goals include:
  - Control the long-term costs of the electric system.
  - Give customers more energy choices and information.
  - Build a flexible grid to integrate more clean energy generation.

- The PST report and stakeholder collaboration resulted in National Grid's energy storage and electric transformation initiatives, and is anticipated to result in a proposal for grid modernization and advanced metering.
  - Strategic investments to modernize the grid can improve visibility into load and distributed generation, and can improve control to ensure grid reliability.
  - These investments can reduce the cost of maintaining the electric grid and can allow more distributed energy resources to connect to the grid with less-expensive system upgrades.
  - There is alignment between insights from the PST report and integrating grid planning concepts.

Planning and Enabling

Advance Power Sector Transformation and Grid Modernization

- Progress should be made on the following PST Report recommendations:
  - Improve forecasting and implement a stakeholder engagement plan during forecast development.
  - Consider strategies to compensate the value of distributed energy resources based, in part, on their location, and how those incentives aligns with more proactive distribution system planning.
  - Advance electrification that is beneficial to system efficiency and greenhouse gas emission reductions.
  - Consider opportunities for developing performance incentive mechanisms.
- Advancement of PST investments should consider (and appropriately value) the systems and tools required to support more robust deployment of demand response measures and electrification, which can be leveraged to support additional DG and load-shifting.
- Maps to Guiding Principles:
  - Create incremental power sector decarbonization
  - Facilitate broader decarbonization
  - Ensure solutions are robust and sustainable beyond 2030
  - Be consistent with other RI priorities and policies

Planning and Enabling

Build out a strategic role for energy storage technologies

- Energy storage technology will become increasingly critical to match renewable generation with demand and build grid flexibility. Energy storage also provides important co-benefits, like enhanced resilience.
  - REF Energy Storage Adder Pilot Program launched in 2020 with $1.5M in RGGI funding.
  - Energy storage is an eligible technology to participate in National Grid's demand response program.
  - Two energy storage demonstration projects are in progress through National Grid's power sector transformation proposal.

- Action Item: develop a Rhode Island-centric strategic plan for the role of energy storage as renewable deployment increases through 2030 and beyond:
  - Update interconnection protocols for paired and stand-alone systems
  - Explore the role of programs and incentives in achieving optimal, cost-effective storage penetration at beneficial locations on the grid
  - Estimate optimal, cost-effective penetration of local storage resources
  - Assess market conditions, gaps and barriers that may prevent RI from reaching optimal penetration of storage
  - Work with municipalities to accommodate energy storage in local zoning ordinances

Planning and Enabling

Build out a strategic role for energy storage technologies

- Maps to Guiding Principles:
  - Exemplify climate leadership
  - Create incremental power sector decarbonization
  - Facilitate broader decarbonization
  - Pursue cost-effective solutions
  - Create economic development opportunities
  - Ensure solutions are robust and sustainable beyond 2030
  - Be consistent with other RI priorities and policies

- Analytical Insights:
  - Renewable generation profiles do not align with timing of electricity demand within the day and throughout the year
  - Rhode Island can rely on the regional system for balancing in the short term, but as the rest of New England decarbonizes, will need to participate in developing solutions for balancing the system
  - Balancing intermittent, non-dispatchable generation with demand will require storage resources, load flexibility, or increased curtailments
  - Long-term, seasonal storage is likely to present the most significant challenges to balancing a highly renewable generation portfolio

Planning and Enabling

Continued Regional Collaboration on Markets & Transmission

- Continue regional collaboration and coordination with New England states to align wholesale market and transmission planning processes to achieve shared clean energy goals.
- Governor Raimondo has called for New England's Regional Wholesale Electricity Markets and Organizational Structures to Evolve for 21st Century Clean Energy Future.
  - Governors' Statement is available at: http://nescoe.com/resource-center/govstmt-reforms-oct2020/.
  - Detailed Vision Statement available at: http://nescoe.com/resource-center/vision-stmt-oct2020/.
  - A series of regional technical sessions on these issues are now being developed and will be accessible to stakeholders/public.
- Identify and implement wholesale market mechanisms that:
  - Fully account for the value of existing and future state-level investments in renewable resources (e.g., avoid rules that require double-procurement of capacity).
  - Meet states' decarbonization mandates and maintain resource adequacy at the lowest possible cost
- Coordinate with other New England states on transmission planning processes to better facilitate energy system transformation and the integration of large-scale resources and DERs across the region.

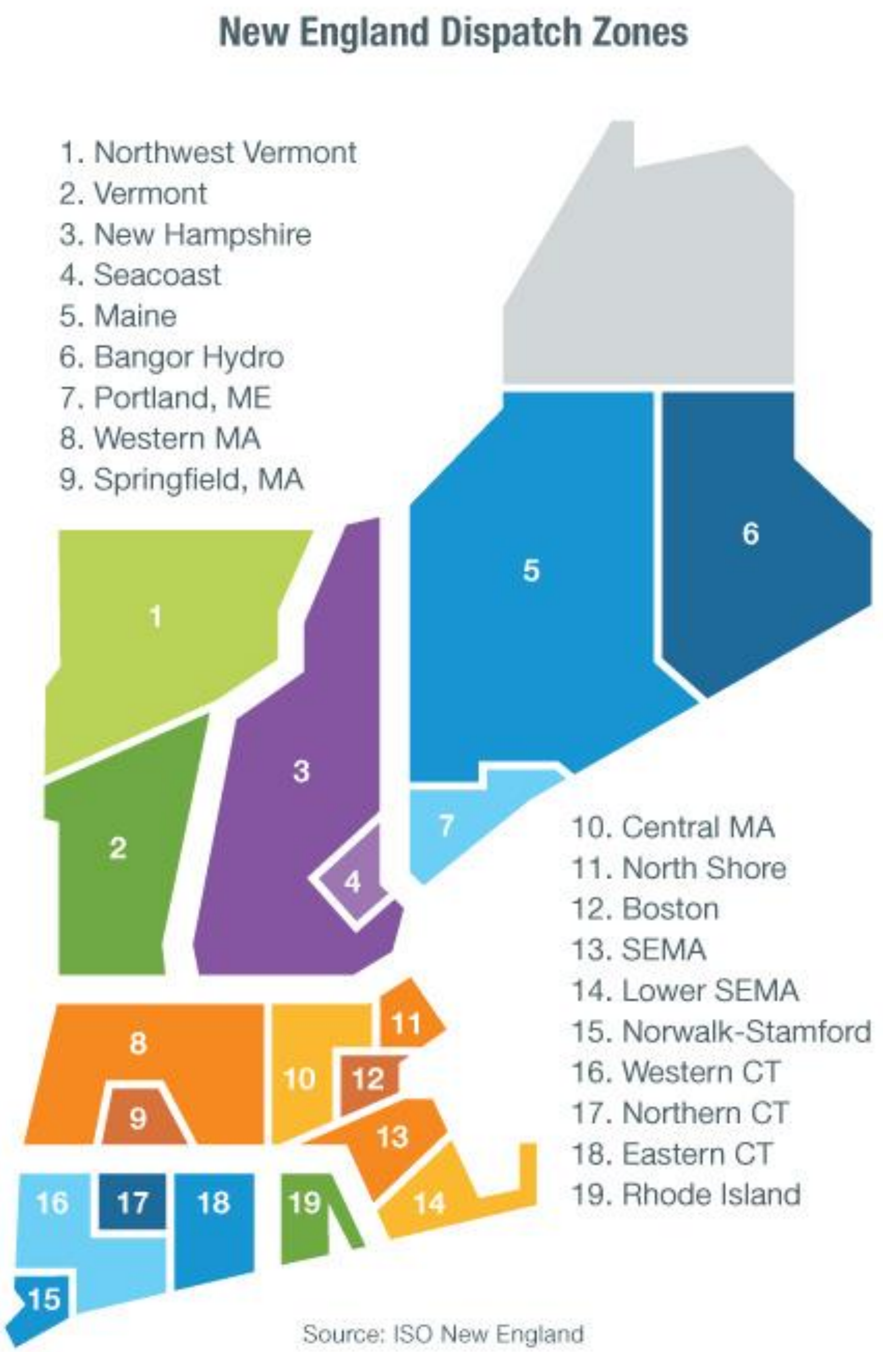
Planning and Enabling

Continued Regional Collaboration on Markets & Transmission

- Action Item: Continue coordination with other New England states on wholesale market designs and transmission planning processes that facilitate energy decarbonization and renewable resource integration across the region.

- Maps to Guiding Principles:
  - Exemplify climate leadership
  - Create incremental power sector decarbonization
  - Facilitate broader decarbonization
  - Pursue cost-effective solutions
  - Improve energy and environmental equity
  - Ensure solutions are robust and sustainable beyond 2030
  - Be consistent with other RI priorities and policies

- Analytical Insights:
  - As the grid decarbonizes and electrification proceeds, the need for system upgrades and updated market designs will accelerate



Equity Recommendations

Equity Recommendations

We must center **equity** and include community engagement in program design to improve access to clean energy benefits for all Rhode Islanders. Throughout this effort, we will identify and address systemic racism and historic inequities.

Partner with trusted community organizations to listen, learn, support, and establish foundational definitions.

Based on foundational definitions, develop **equity metrics** with the community to track and monitor progress towards equitable outcomes.

Improve **outcomes** identified and prioritized by commuities through rate design, program adjustments, and policy.

#6 - How would you define equitable outcomes?

Equity Recommendations

Partner and Listen

- **Partner**: Listen to and work with frontline communities and community organizations to center their needs
  - Leverage existing forums (e.g. EC4) as appropriate to identify partners, facilitate conversations, and derive guidance for future directions related to equity metrics, desired outcomes, and action items
  - Improve accessibility and inclusivity of public meetings
  - Provide access to expert consultation as needed for communities to meaningfully engage in energy discussions and decision making
  - Listening sessions to increase accessibility to and understanding of energy system basics
  - Integrate equity considerations into energy efficiency plans and program development
- **Workforce Development**: Target community-based training efforts to support in-demand clean energy jobs
  - Explore other state models related to workforce development programs focused on underserved communities
- **External Education**: Provide education about energy programs, including comparative costs and benefits.
- **Internal Education**: Improve understanding of energy and environmental equity for decision-makers.

Equity Recommendations

Equity Metrics

- **Define**: Community engagement will drive defining equity, benefits, and outcomes in this context.

- **Evaluate**: Community engagement will drive development of qualitative and quantitative equity measures that can inform program design and track progress. Potential equity metrics include, but are not limited to:
  - Energy burden, demographic information, workforce diversity, etc.
  - Metrics related to use of the low-income rate, bill pay assistance and payment plans, etc.
  - Renter status and non-participation as tracked through energy efficiency programs
  - Low- and moderate-income customer participation in programs
  - Workforce diversity through annual Clean Energy Jobs Report
  - Who is in the room and who isn't during public workshops and decision-making processes

- Identify and track metrics focused on addressing systemic racism and historic inequities

Equity Recommendations

Access To:

If, through collaboration, education, and consultation, stakeholders prioritize improved access as a desired means to provide equity, then we recommend the following:

- **Prioritize ease**: Program participation should be made as easy as possible. Barriers to participation should be reduced through effective and culturally competent program design and delivery.
  - Materials need to be prepared in multiple languages that represent areas being served
  - Streamline eligibility to reduce customer burden for proving income or need
- **Reduce Financial Burdens**: Programs should aim to reduce financial burdens and provide support for low- and moderate-income households and frontline communities beyond installing technology, including structures for aiding with upkeep and services.
- **Protect consumers**: Programs should carefully consider consumer protection for all customers and determine whether additional protections for underserved customers may be needed.
  - For example, conduct heating system safety checks for households coupled with energy efficiency program service delivery.

Equity Recommendations

Benefit From:

If, through collaboration, education, and consultation, stakeholders prioritize improved programmatic benefits as a desired means to provide equity, then we recommend the following:

- **Efficiency First**: Programs and planning should ensure that low- and moderate-income households and frontline communities can access energy efficiency benefits as an important step for reducing energy burdens and increasing household comfort and health.
- **Equitable benefits**: All benefits, not just bill savings – e.g. pollution reduction, increase in home comfort and health, etc. – should be equitably distributed.
  - We want to serve populations beyond economic status
- **Equitable costs**: Explore equitable distribution of costs
  - Achieving 100% renewables will increase costs to drive long-term energy, economic, and environmental benefits – this requires careful consideration.
- **Beyond Carveouts**: Carveouts can be the first step, but they cannot be the final step, to ensuring more deserving communities can benefit from programs

Equity Recommendations

- Action Items:
  - Leverage existing forums (e.g. EC4) as appropriate to identify partners, facilitate conversations, and derive guidance for future directions related to equity metrics, desired outcomes, and action items.
  - Meet with the community to define equity, benefits, outcomes, and metrics. These partnerships should be ongoing.
  - Develop rules for equitable engagement and a framework for more inclusive and accessible public meetings across the energy and environmental space.
  - Work with National Grid and other stakeholders to establish an Energy Efficiency Equity Working Group by 2021.

- Equity Recommendations Map to Guiding Principles:
  - Exemplify climate leadership
  - Pursue cost-effective solutions
  - Improve energy and environmental equity
  - Create economic development opportunities
  - Build upon RI’s existing renewable energy mechanisms
  - Be consistent with other RI priorities and policies

The Road to 100%

Q&A

Post-Workshop Survey

We invite all attendees to respond to a short survey via PollEverywhere at PollEV.com/eresources411. All responses will be anonymous. Thanks in advance for your responses!

Thank You

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We invite you to attend, contribute, and help shape pathways to a clean, reliable and affordable electricity future!

Glossary

Decarbonize	reduce carbon emissions (greenhouse gases, or GHGs) by substituting non-fossil energy sources for electricity or in other sectors
Energy	electric energy that is actually produced and delivered to end users
Capacity	the ability to produce energy on demand, traditionally required to meet peak loads
Heat Pump	reversible electric heating/cooling equipment that uses technology similar to an air conditioner; can heat in winter as well as cool in summer
Renewable Energy Standard (RES)	RI 2004 legislation requires that renewable energy meet a minimum percentage of electric load, currently 16%, growing 1.5%/year; other NE states have similar RES
Renewable Energy Credit (REC)	represents the renewable attribute of 1 MWh of renewable generation; RECs are tradeable, and used to meet the RES requirement
Renewable Energy Growth Program	program to solicit and support smaller scale renewable projects in RI, primarily solar and wind
Renewable Energy Fund	program of grants and loans for renewable energy technologies in RI; also direct funding for residential and commercial installations
Competitive Procurement	Competitive process used to acquire long-term contracts for renewable energy (e.g., the 400 MW Revolution Wind offshore wind project)

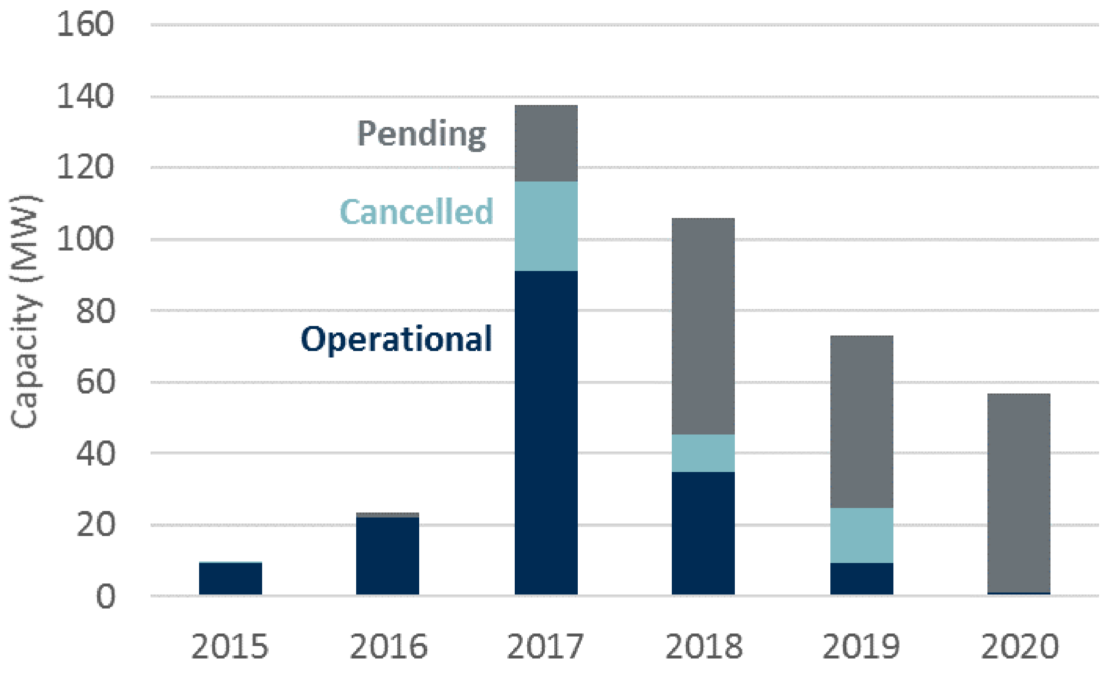
Appendix

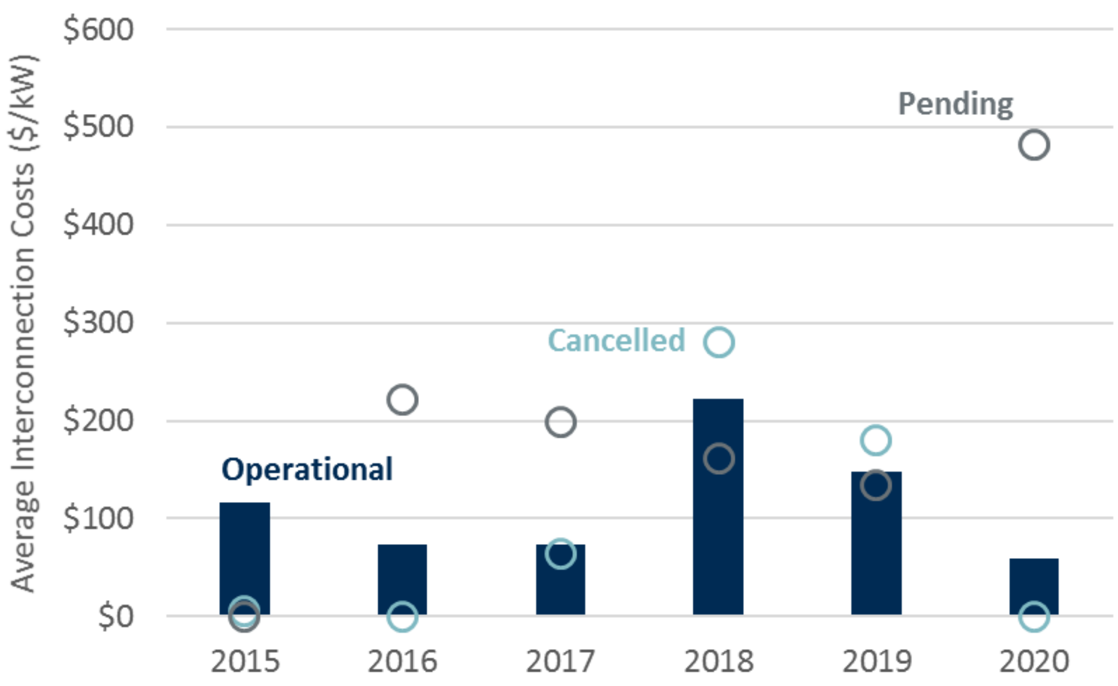
Incremental System Upgrades

System Upgrades	Offshore Wind	Land-Based Wind	Solar
Current Projects	$8-14/MWh based on ISO-NE Feasibility Study upgrade costs and assuming 10% of total capital costs for offshore transmission	$3/MWh based on assumed $100/kW of local upgrades to interconnect to existing network	$12/MWh based on 2018-2019 average costs of $207/kW from National Grid costs
Future Projects	$24-28/MWh based on estimated $3.9-4.4B to interconnect the next 3.6 GW, or $1,100-1,200/kW (Anbaric)	$20-39/MWh based on $750-1,500/kW from ISO-NE studies of accessing Maine wind	$23-34/MWh based on range of 2020 projected costs of $400 – 600/kW
Increased Costs (Future – Current)	$10 – 15/MWh	$17-37/MWh	$11-22/MWh

Sources: Pfeifenberger, et al., Offshore Transmission in New England: The Benefits of a Better Planned Grid, Prepared for Anbaric, May 2020; ISO-NE, Second Maine Resource Integration Study: Results, November 2019; ISO-NE, 2016/2017 Maine Resource Integration Study, March 2018.

Historical Solar Interconnection Costs





Source: National Grid.