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

Update to EC4 | 12/16/2020 | Complete project materials available www.energy.ri.gov/100percent/

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 20-01

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.

Project Team

Lead by

Office of Energy Resources

Supported by

Division of Public Utilities and Carriers

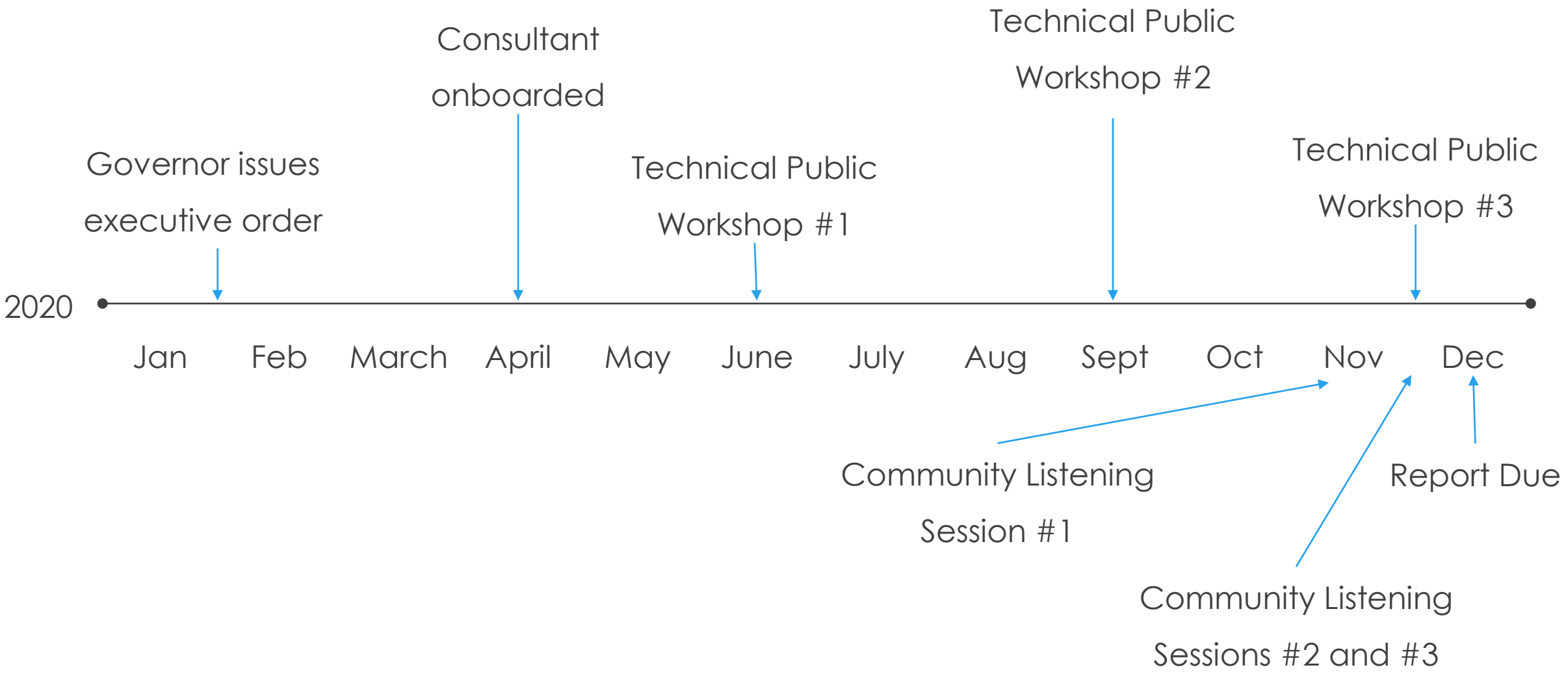
Public Utilities Commission

Department of Environmental Management

Project Consultants

The Brattle Group

Timeline

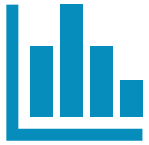


Project website: www.energy.ri.gov/100percent

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.

Guiding Principles for 100% Renewable Goal - Summary

Decarbonization Principles

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

Economic Principles

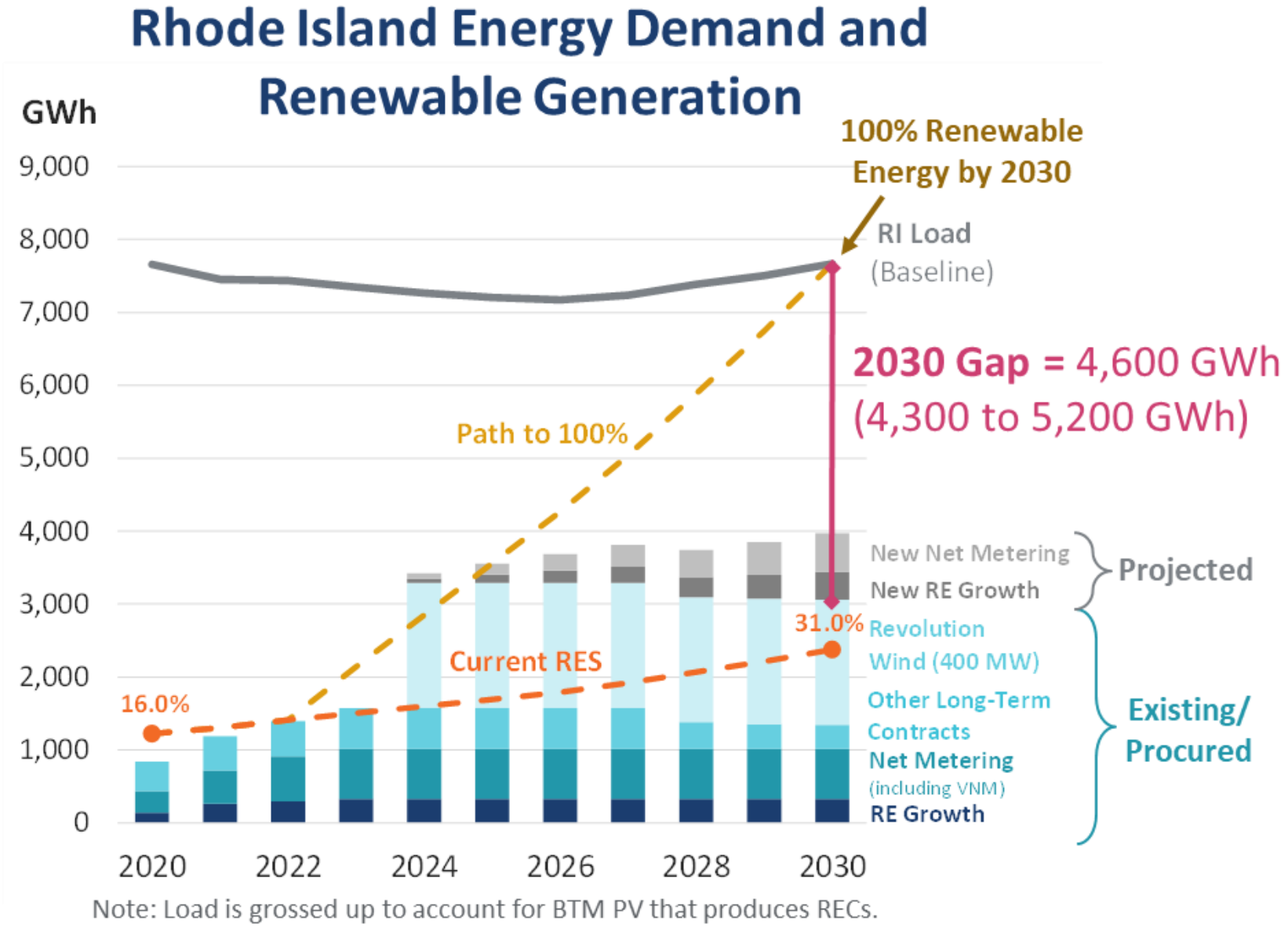
- Pursue cost-effective solutions
- Improve energy and environmental equity
- Create economic development opportunities

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

Estimating the Gap

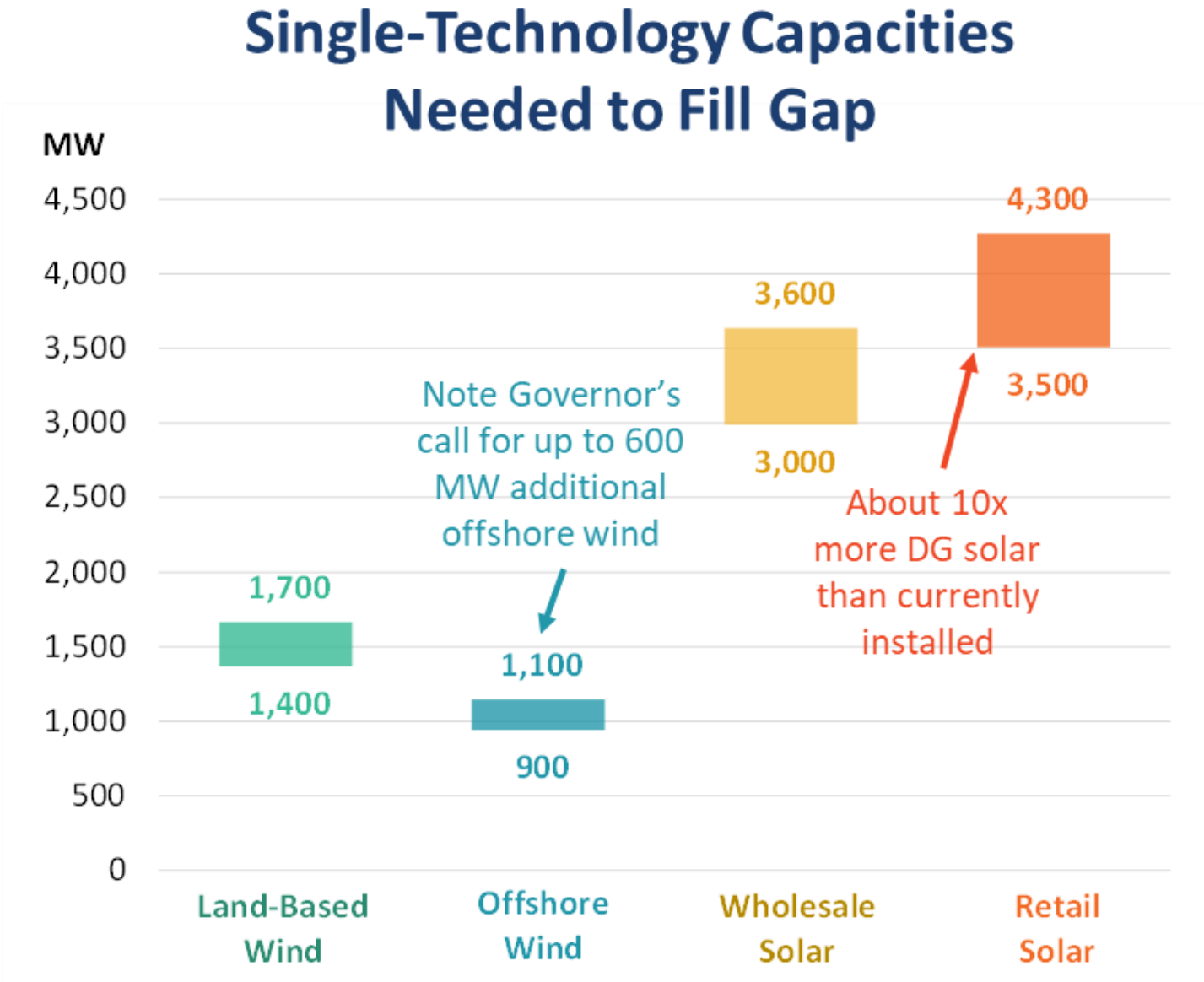
We will need to build or procure ~4,600 GWh of renewable energy by 2030



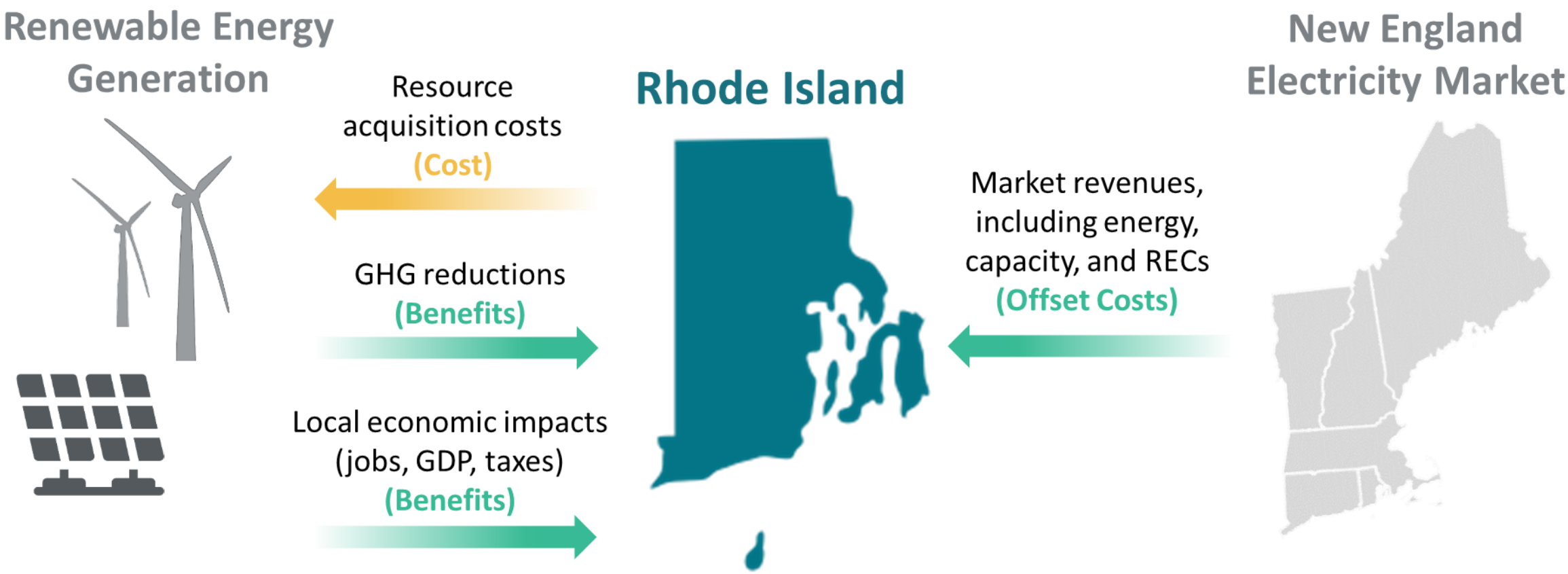
Note: Load is grossed up to account for BTM PV that produces RECs.

Filling the Gap

We consider four renewable energy resource types, first as "bookend" portfolios and then as pieces of mixed portfolios.



Pieces of the Model



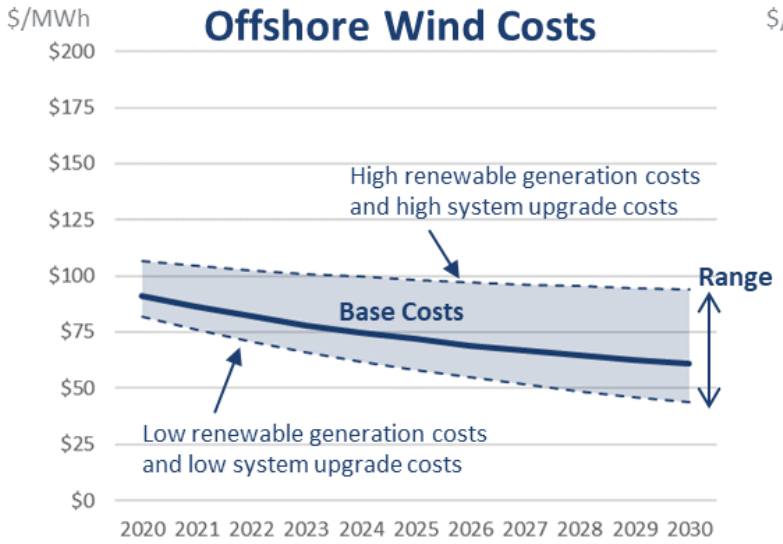
Net Cost to RI Ratepayers = Resource Acquisition Costs - Market Revenues

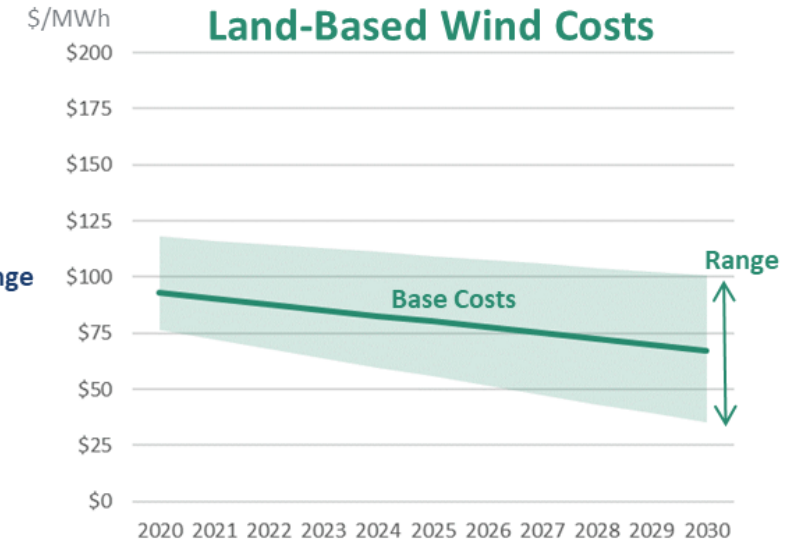
Economic Impacts: Local Development, GDP, Jobs

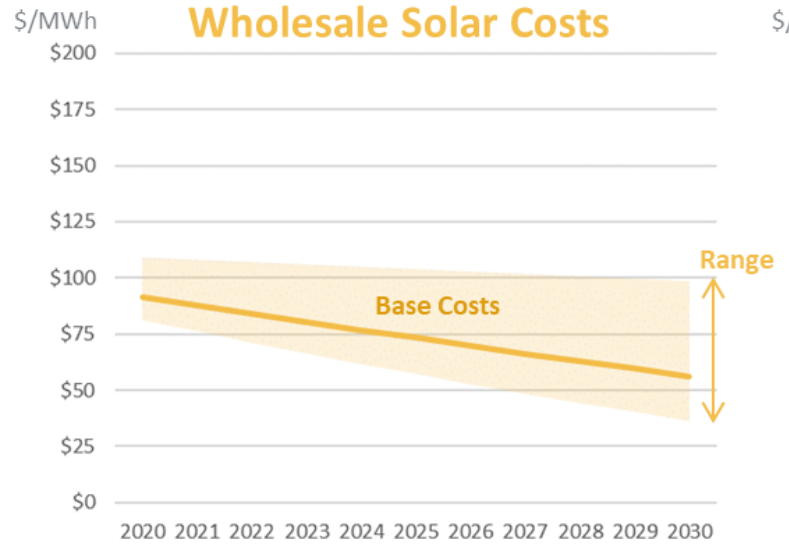
Other factors: Equity, Land Use, Additionality of GHG Abatement

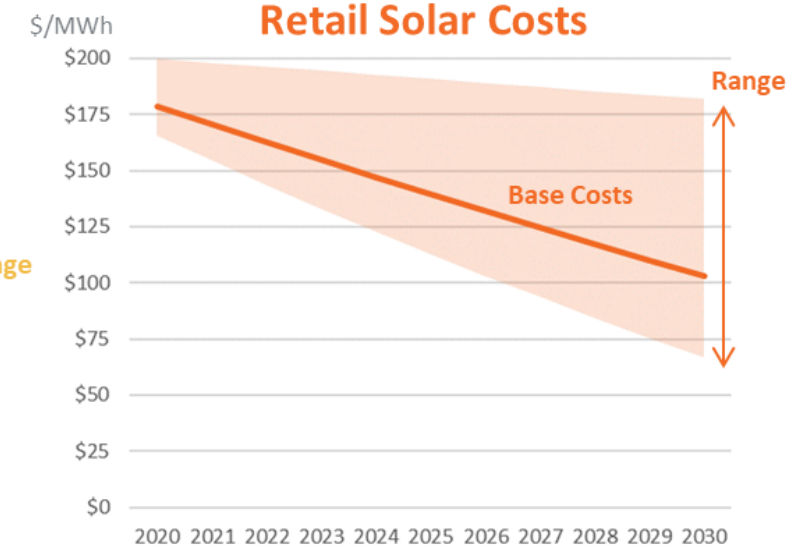
Resource Acquisition Costs

Using input from developers, market data, and cost trends developed by the National Renewable Energy Lab, we project costs to acquire each type of renewable energy resource.





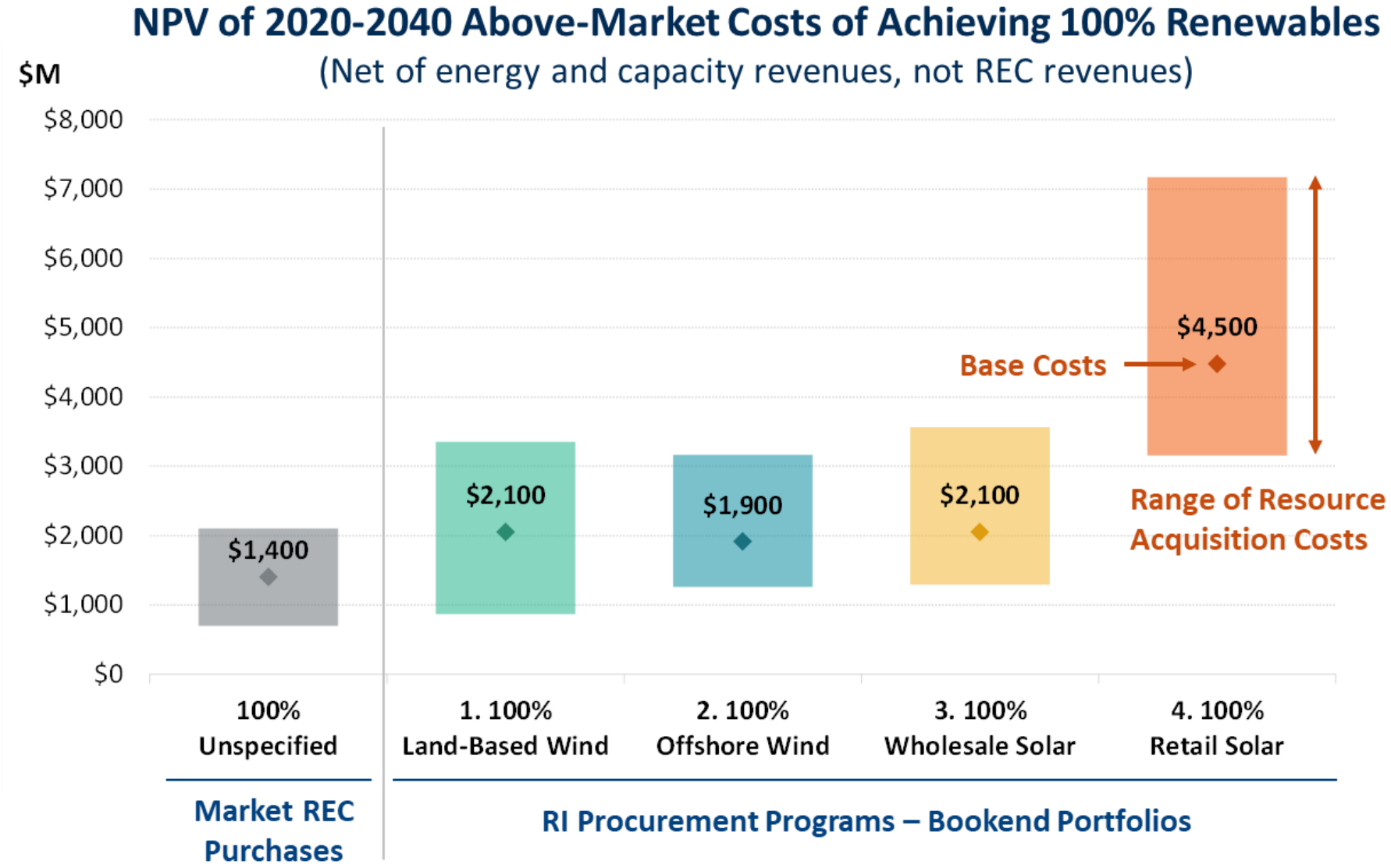




Notes: All monetary values in 2020 dollars. Total resource costs account PTC and ITC phaseout, maintaining 10% ITC for solar through 2030.

Portfolio Costs

These bars represent net costs, after accounting for market revenues, to achieve each portfolio. Bookend portfolio costs are compared to meeting the 100% goal by purchasing RECs in lieu of developing local renewable energy resources.

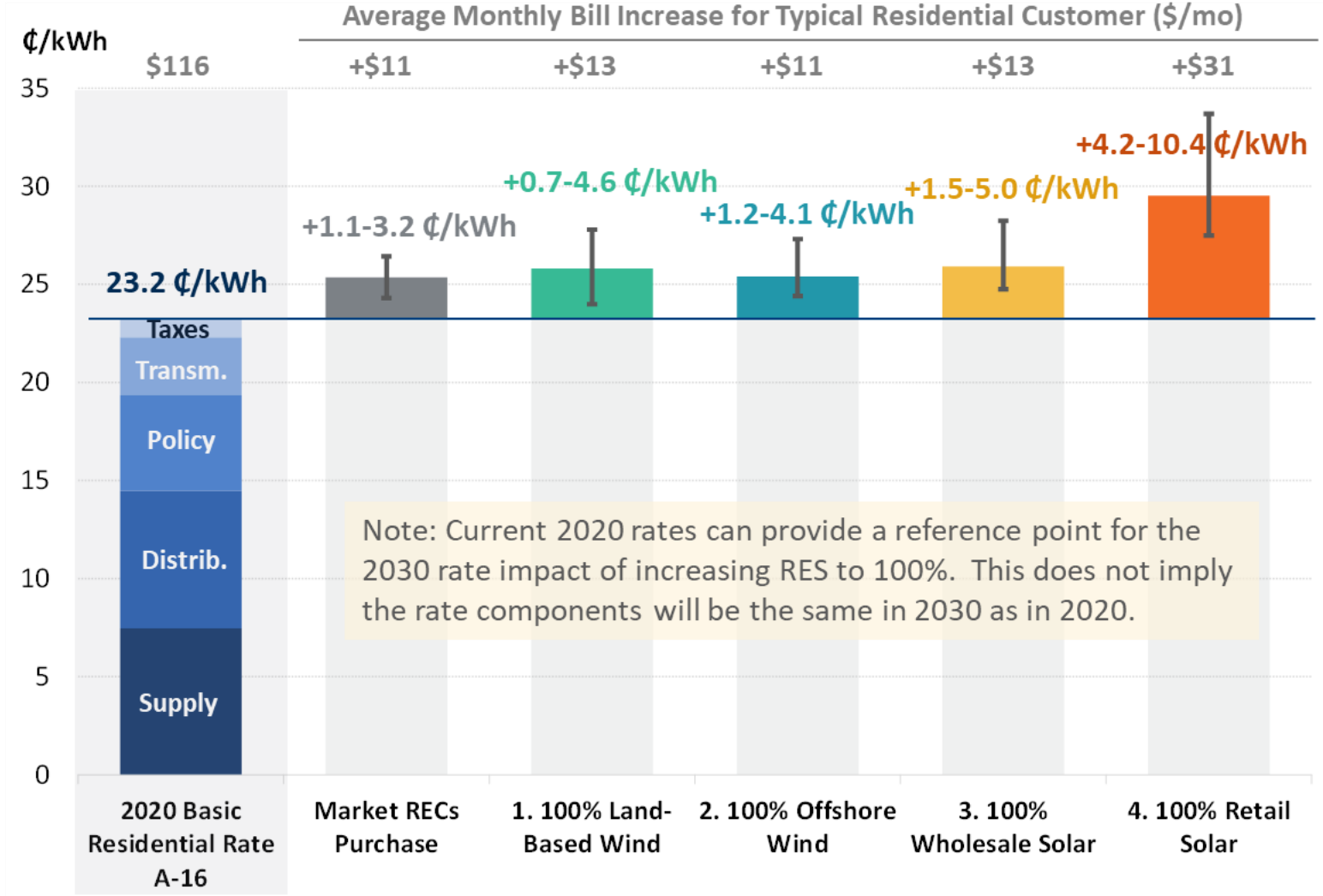


Note: All monetary values are in 2020 dollars. Ratepayer costs reflect the total incremental costs of achieving 100% net of energy and capacity revenues.

Ratepayer Costs

Portfolio costs will flow to ratepayers through electricity rates. Meeting 100% renewables will result in incremental costs relative to 2020 rates.

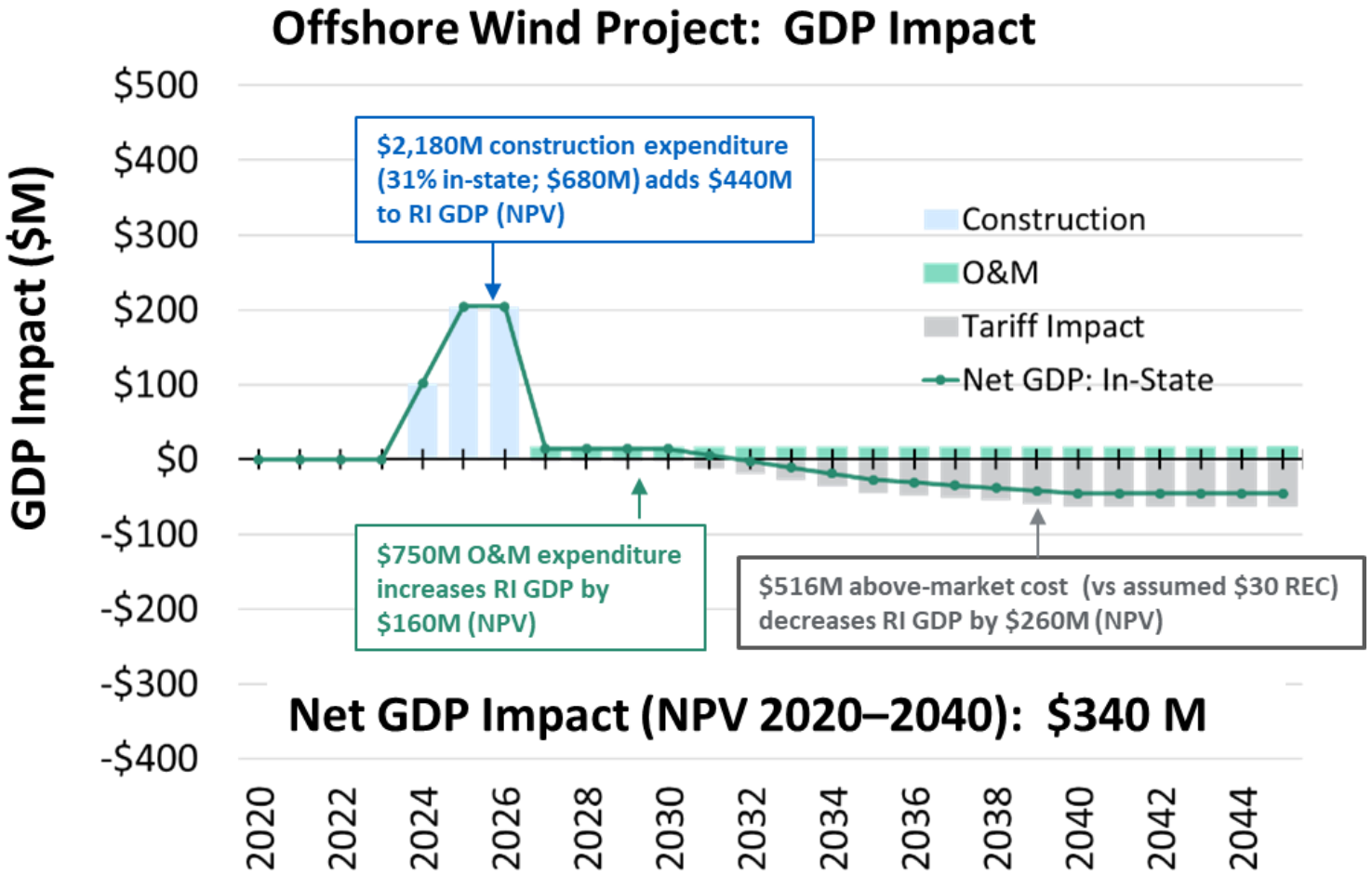
2030 Rate Impacts of 100% Renewable Energy



Sources and notes: All monetary values are shown in 2020 dollars. Assumes typical residential customer consumes 500 kWh/mo. Range reflects resource acquisition cost uncertainty.

Estimating Macroeconomic Impacts

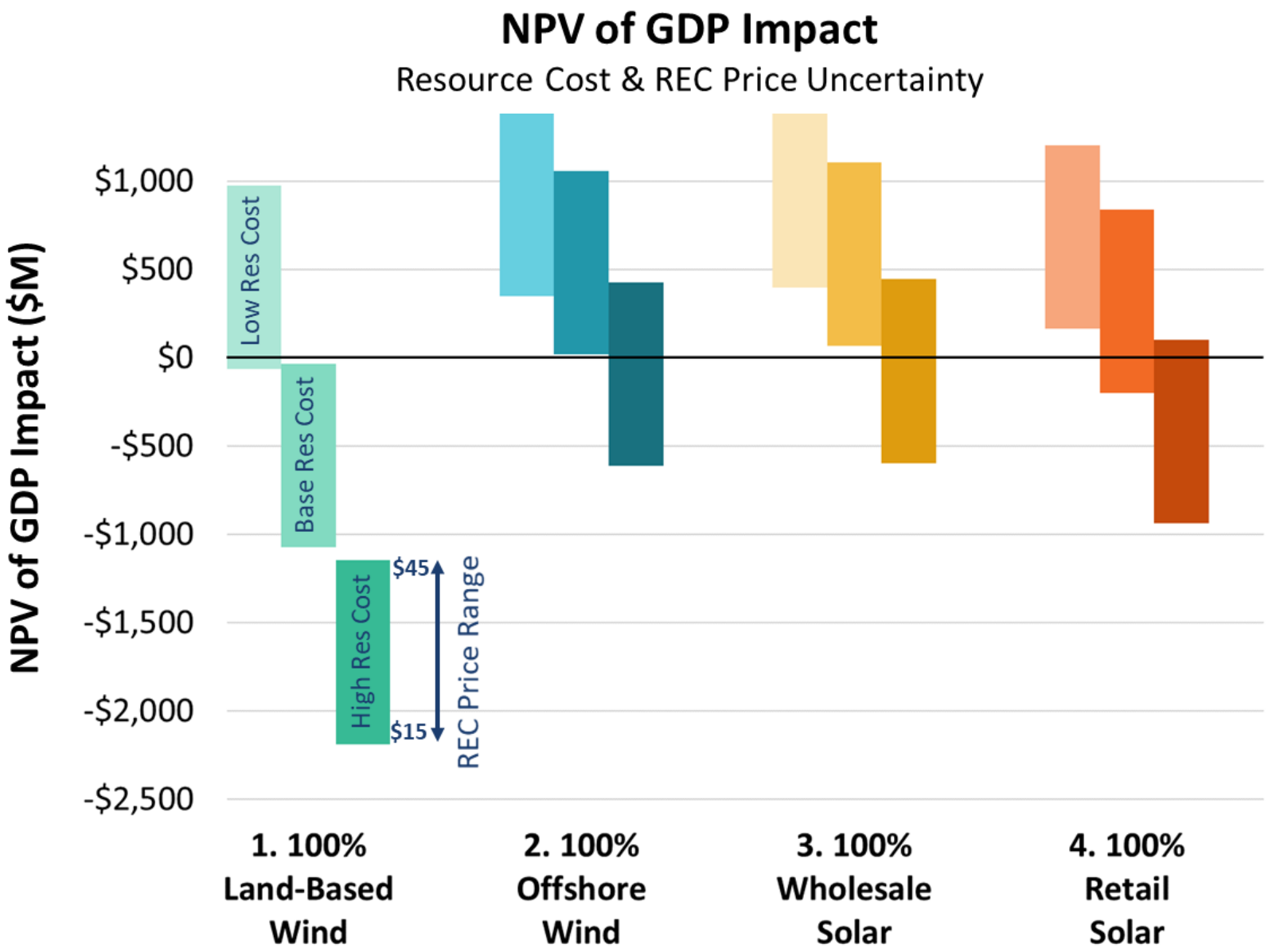
Annual GDP and job impacts were estimated for a single project using IMPLAN, a macroeconomic modeling tool. Then impacts of projects were layered together based on capacity required in each portfolio. In-state construction boosts GDP in beginning years, while O&M and tariffs drive impacts in later years.



CO2 Offset: 600 MW OSW produces 2.7 TWh, offsetting 1.2 million tons CO2/yr when online in 2027 (assuming 0.45tCO2/MWh system marginal emission rate) Valued at $75/tCO2 avoided, this is $93M/yr. Market REC purchases would yield similar CO2 offset benefit, if RECs create additional emissions reductions.

Macroeconomic Impact

Each renewable resource type will have a unique macroeconomic impact over the life of each project. Impacts are sensitive to REC prices and resource costs, among other parameters.

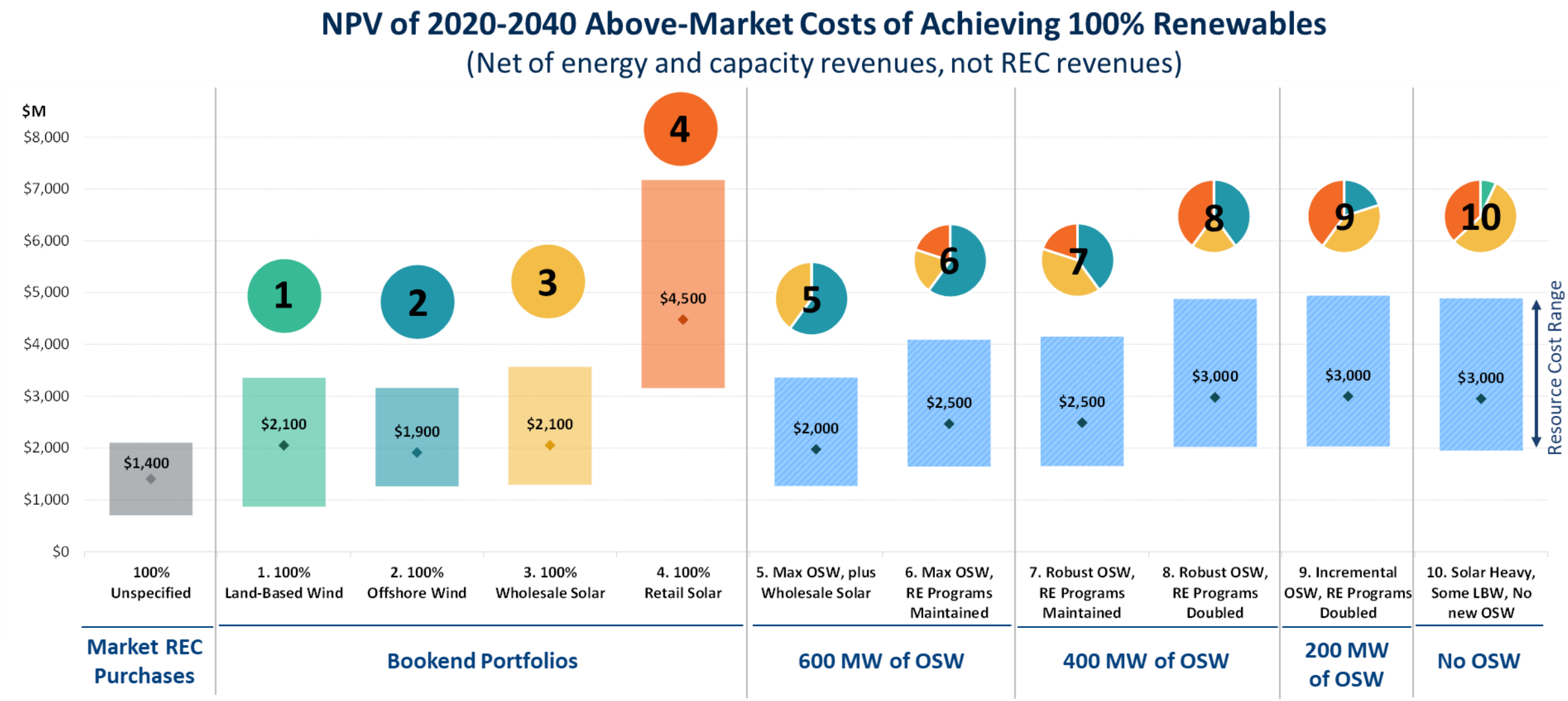


Building Mixed Portfolios

We constructed examples of mixed portfolios that attempted to balance resource diversity, affordability, and local economic development opportunities, in line with our guiding principles.

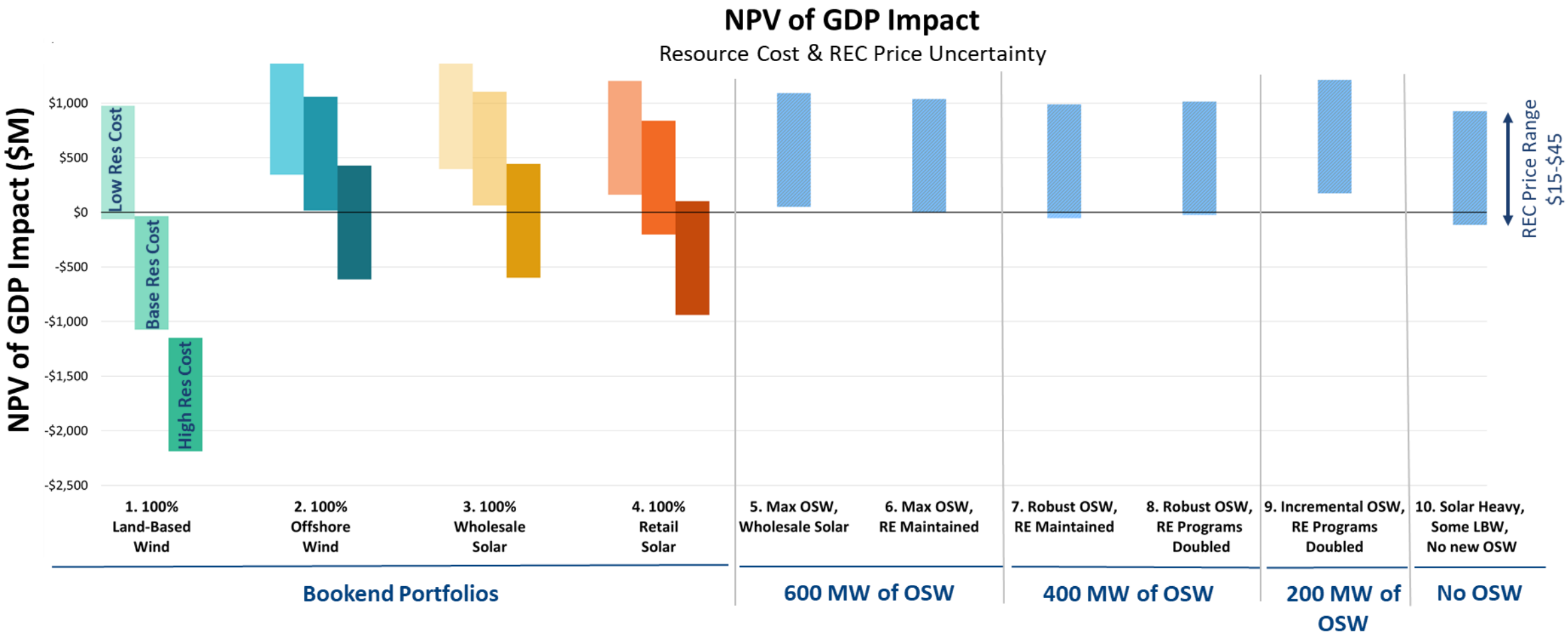
#	Description	Offshore Wind	Land-Based Wind	Retail Solar	Wholesale Solar
	Max OSW, plus Wholesale Solar	600 MW (2,700 GWh)	---	---	Fill remaining gap (1,900 GWh)
	Max OSW, RE Programs Maintained	600 MW (2,700 GWh)	---	Fill 50% of remaining gap (950 GWh)	Fill 50% of remaining gap (950 GWh)
	Robust OSW, RE Programs Maintained	400 MW (1,800 GWh)	---	Fill 33% of remaining gap (950 GWh)	Fill 66% of remaining gap (1,850 GWh)
	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)
	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)
	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)

Portfolio Cost Comparison



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

Portfolio Macroeconomic Impact Comparison



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.

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.

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.

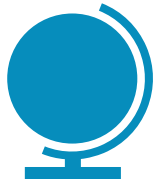
Planning and Enabling Recommendations

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 collborative, **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.

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.

Thank You!

www.energy.ri.gov/100percent

Energy.Resources@energy.ri.gov

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