GOVERNOR'S
Energy Office

Maine Renewable Energy Market Assessment

March 09, 2021


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Energy Office
Dan Burgess, Director

GOVERNOR'S ENERGY OFFICE

Renewable Energy Goals Market Assessment

MAINE CLIMATE COUNCIL

Bold emissions reductions: Develop plan to meet state greenhouse gas emissions reduction targets

Mitigation: Strategies for all sectors of the economy, with a focus on Maine's transportation, electricity, and buildings sectors

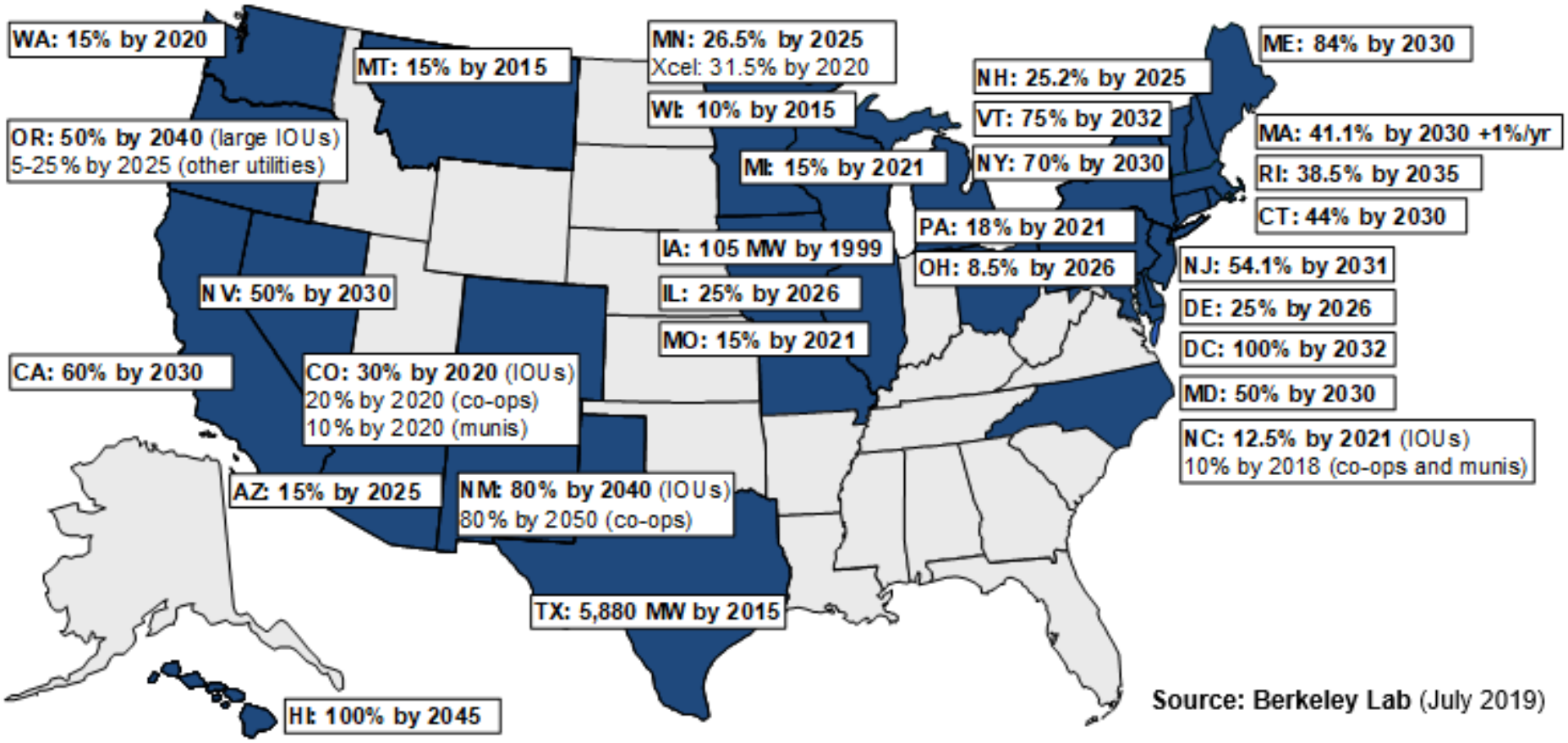
Resilience: Develop strategies that will make Maine people, industries, and communities resilient to the impacts of climate change

Clean Energy Economy: Plan to grow good paying jobs in the transition to a lower carbon economy

Transition: Ensure Maine's rural, low-income and elderly populations are not adversely impacted in the shift to a low-carbon economy, while also delivering benefits like lower heating bills

Equity: Encourage diversity, inclusion, and equity of all Maine people and communities

Renewable Portfolio Standards by State



Source: Berkeley Lab (July 2019)

LD 1494 - An Act To Reform Maine's Renewable Portfolio Standard

Enacted and Signed on June 26, 2019

Increased Maine's RPS to 80% by 2030, up from 40%, with a goal of 100% by 2050

Required Maine PUC to **procure 14%** of Maine load via long-term contracts; **70%** ratepayer benefits & **30%** economic benefit

Tranche 1 Bid Selections (17 renewable projects ~9.5% of State electric load)

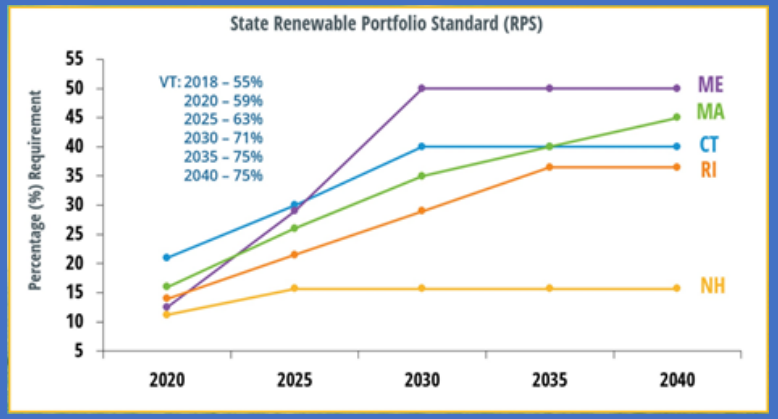
Resulted in commitment of:

- 546 MW of procured capacity in round 1
  - Technology: solar, wind, biomass, hydro
- 450+ full-time equivalent (FTE) jobs during construction
- Initial capital spending of $145+ million
- Additional spending of $3 million annually
- Tax payments averaging $4.7 million annually

Tranche 2

- Issued January 15, 2021
- Roughly 4.5% of State electric load
- Bids due March 18, 2021

RENEWABLE PORTFOLIO STANDARD [RPS]



RENEWABLE ENERGY GOALS MARKET ASSESSMENT

LD 1494 – An Act To Reform Maine's Renewable Portfolio Standards (RPS)
Enacted and Signed on June 26, 2019

Legislation required the Governor's Energy Office and Governor's Office of Policy Innovation and the Future to **conduct a 10-year Renewable Energy Goals Market Assessment to inform how the state meets its clean energy requirements.**

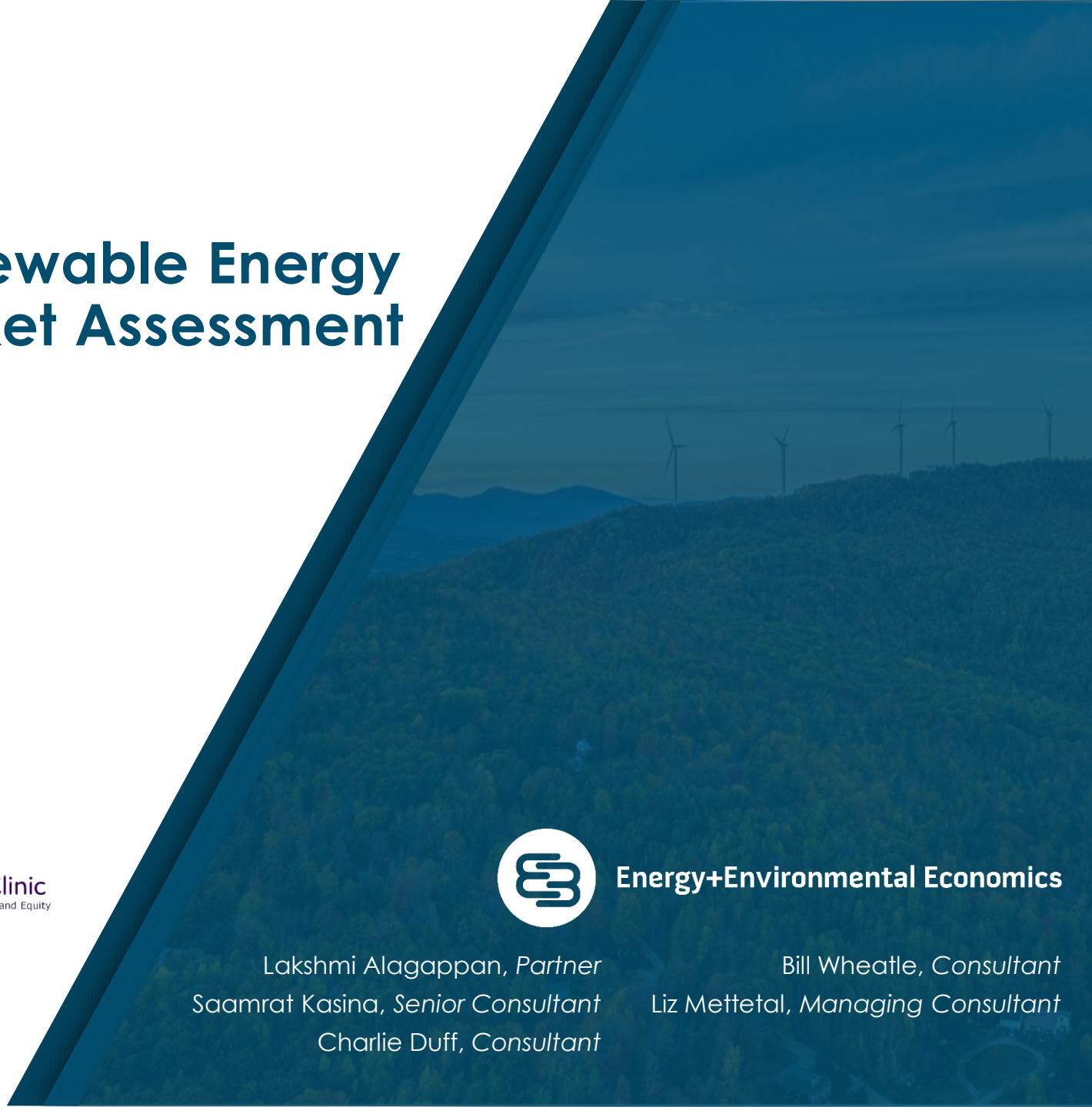
This study:

- Provides review and analysis of energy and REC need for 2030 RPS target;
- Identifies available technology and scenarios for meeting these targets;
- Analyzes policy and regulatory options to best achieve RPS targets.

GEO retained Energy & Environmental Economics (E3) and Applied Economics Clinic (AEC) to develop this assessment.

Maine Renewable Energy Goals Market Assessment

March 09, 2021



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Economic and Policy Analysis of Energy, Environment and Equity

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Energy+Environmental Economics

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Agenda

1 Introductions

2 Modeling Analysis

- Study Objectives
- Scenario Design, Modeling Approach, and Assumptions
- Scenario Results

3 Key Findings and Policy Conclusions

- Scenario Conclusions
- Policy Implications

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Introductions

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About E3

- Founded in 1989, E3 is a leading consultancy in the electric power sector – offices in Boston, New York, San Francisco, and Calgary
- E3 consults extensively for utilities, developers, government agencies, and environmental groups on clean energy issues
- Our experts provide critical thought leadership, publishing regularly in peer reviewed journals and leading industry publications
- We have conducted 100% Clean Energy Studies across the U.S., including:
  - **US wide:** United Nations
  - **New York:** NYSERDA
  - **New England:** Calpine
  - **PJM:** Electric Power Supply Association
  - **Upper Midwest:** Xcel Energy
  - **California:** CPUC, CEC, SMUD, LADWP, The Nature Conservancy, Environmental Defense Fund
  - **Hawaii:** HECO
  - **Pacific Northwest:** numerous utilities

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Study Objectives

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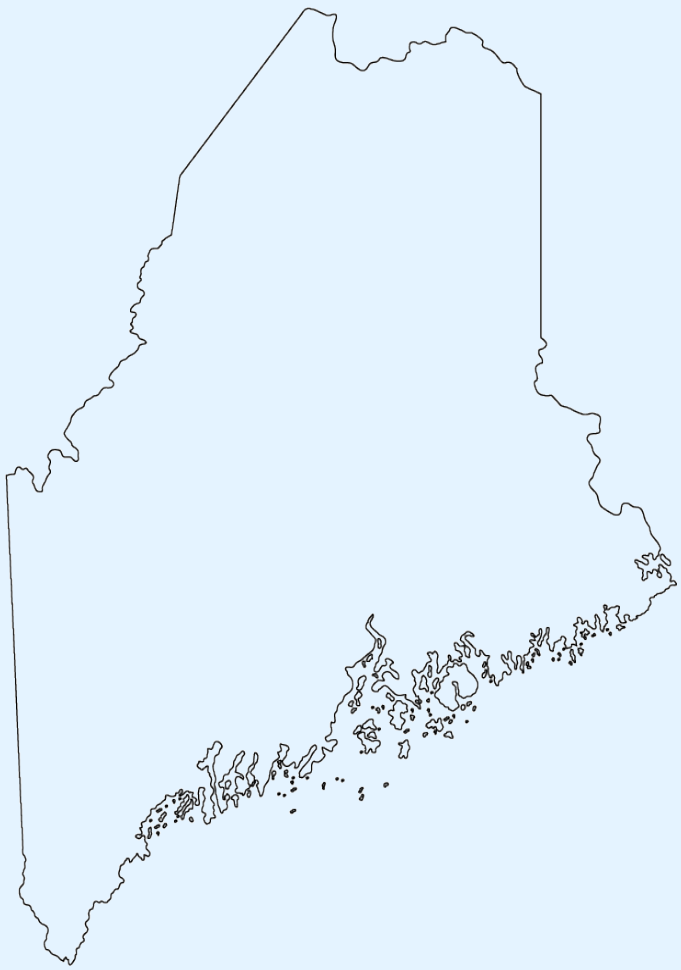
Study Objectives and Approach

- The primary purpose of this study was to provide:
  - Estimates of renewable energy needed to meet Maine's 80% by 2030 RPS requirement
  - Analysis of generation resources and transmission that could meet this requirement
  - The cost, equity, and policy considerations associated with different portfolios
  - Portfolios that set Maine on track to meet 100% renewable by 2050 goal
    - Illustrative results showing impacts through 2040 will be presented
- To achieve this goal, E3 created a spreadsheet model that utilizes a scenario approach to develop multiple futures of renewable energy development
  - Considers several variables including resource economics, energy policy, and land use impacts

Key Findings

- Maine has multiple pathways to meet its RPS goals
  - Maine is on track to meet its near-term RPS goals through 2026; new resources will need to be online to meet increasing goals thereafter
  - Transmission will be a key driver of renewable development
  - Storage paired with solar provides value to Maine's grid
- A technologically diverse portfolio helps lower risk
- Regional coordination on building transmission can help lower the costs of meeting Maine's RPS
- Energy equity benefits and challenges cut across four dimensions: resource diversity, customer-sited resources, geographic resource distribution, and cost.



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Scenario Design

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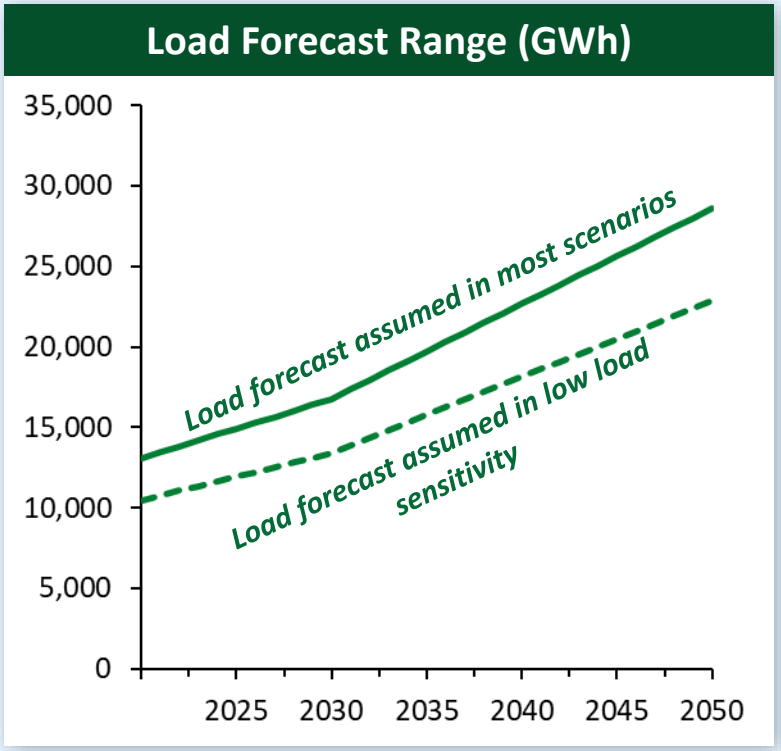
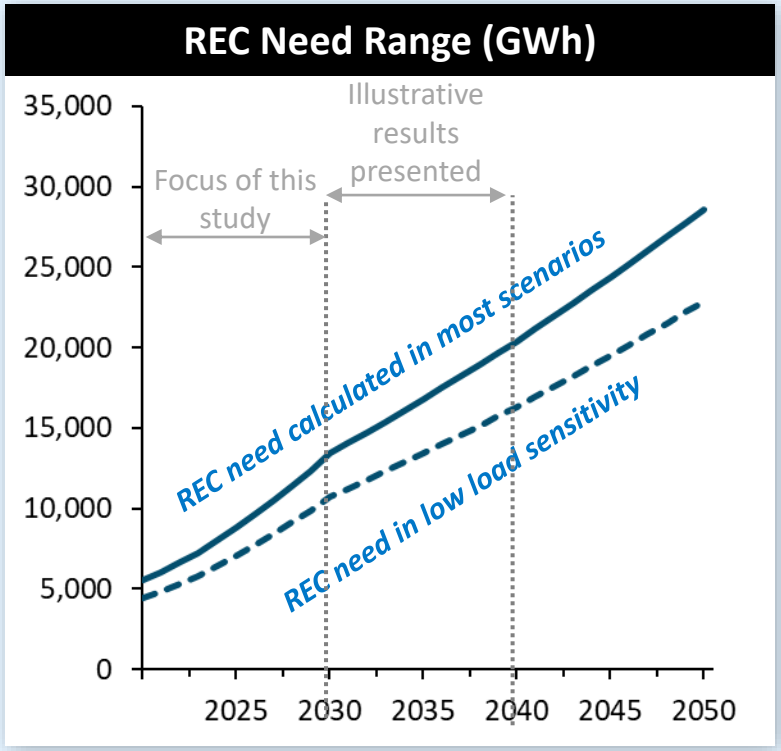
Impact of Load Forecast on Renewable Energy Requirement

- Load forecasts for Maine were derived from Climate Council/Synapse work (November 2020)
- Renewable Energy Credits (RECs) are used by load serving entities to comply with their RPS obligations



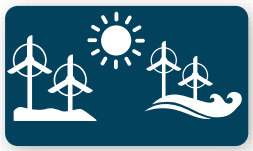


Scenario Descriptions

Scenario	Description
Base Case	Current trends through 2025 and then meets need with **least cost resources**. Includes additional land use screens
Unconstrained Land Use	Base Case, but **without additional land-use** restrictions
Offshore Wind	**Offshore wind focused** future which adds 1 GW of OSW by 2030
Existing Transmission Only	Recognizes the **difficulty of building onshore transmission** in the state
Regional Coordination	Coordination with other entities on **transmission cost-sharing**
Diverse Portfolio	Evaluating a **portfolio of diverse resources** along with cost-sharing of transmission







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Modeling Approach and Assumptions

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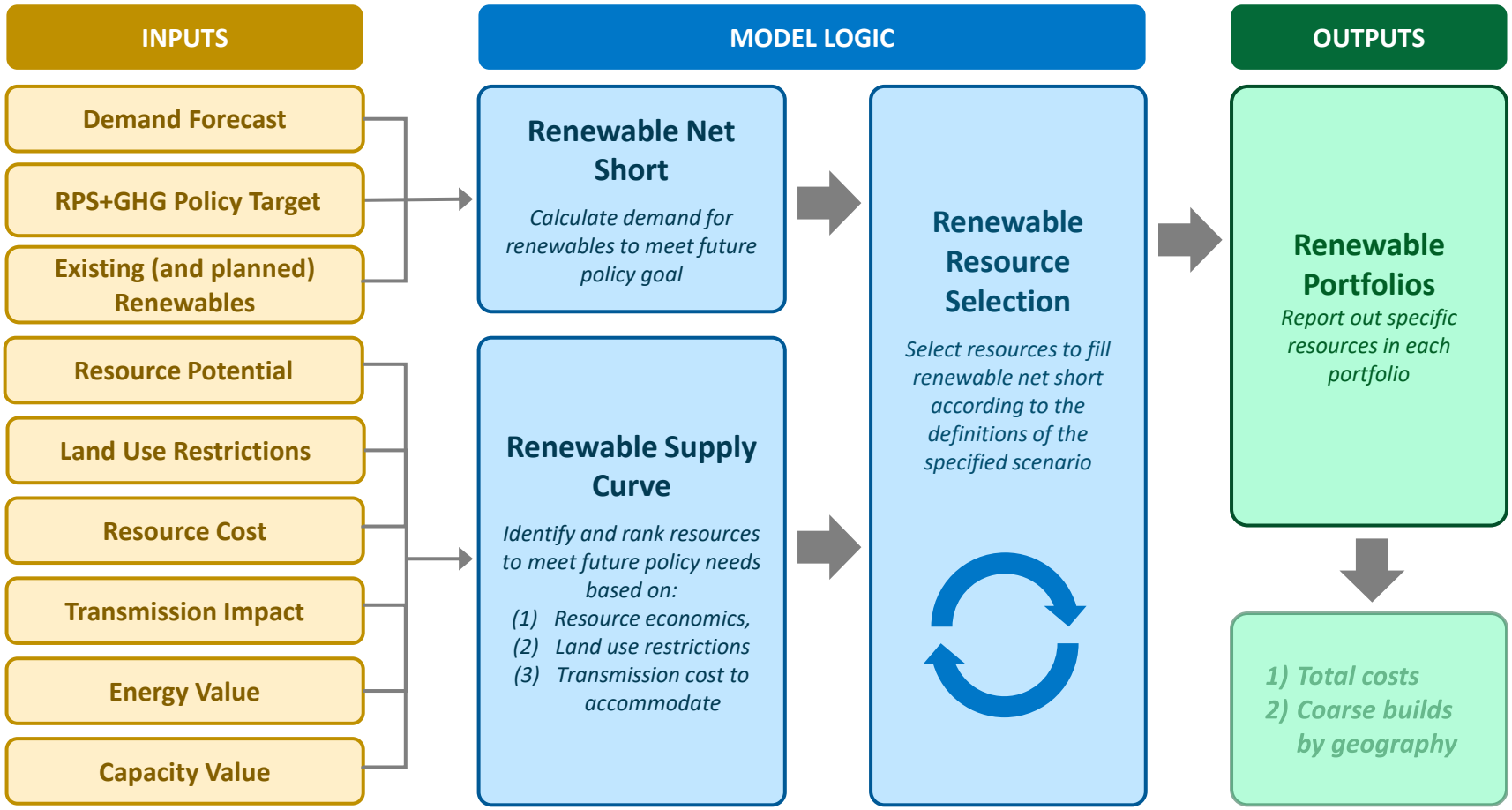
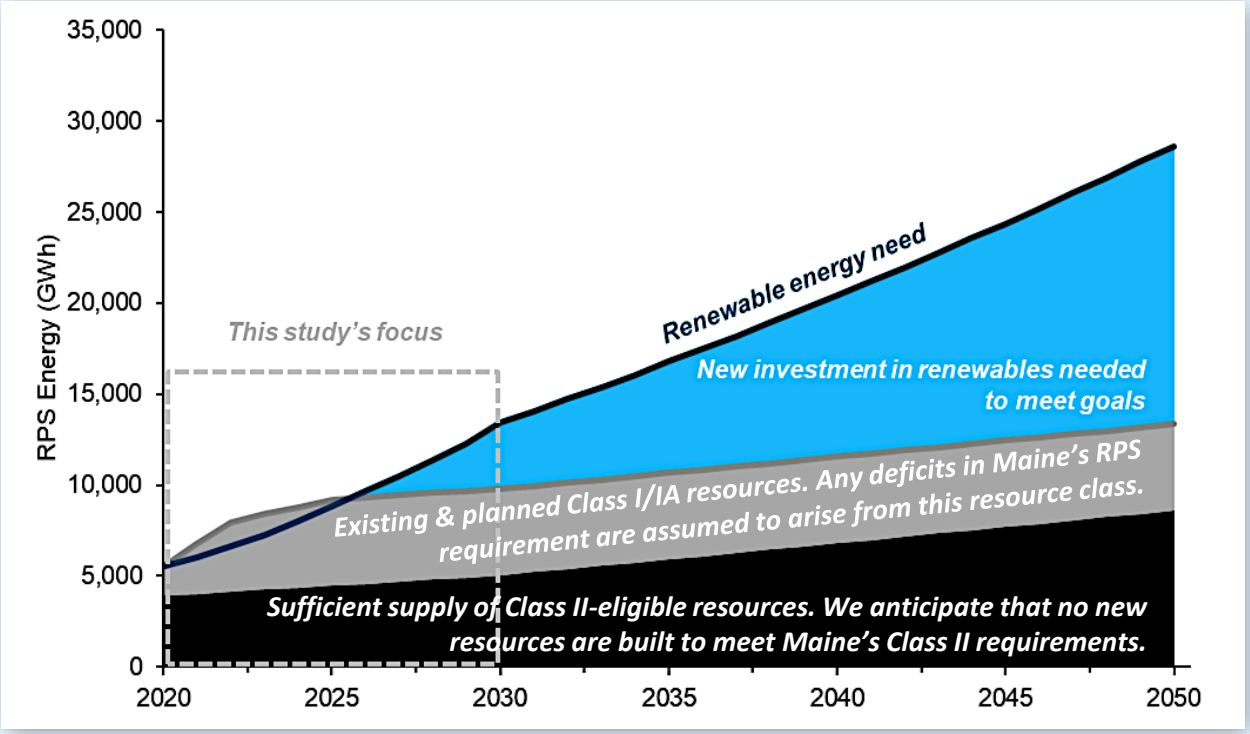
Overview of E3 RPS Planning Tool

E3's RPS Planning Tool generated RPS portfolios for Maine over the next decade under different sets of planning assumptions



Determining REC Need

- Maine needs new resources online and generating RECs starting in 2026 to meet its RPS:
  - Renewable Net Short = Gross REC need minus Existing and Planned Renewables (Class I/IA and II resources)
  - Maine has sufficient Class I/IA and II RECs through 2025 to meet policy goals; Class I/IA deficit starts in 2026



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Scenario Results

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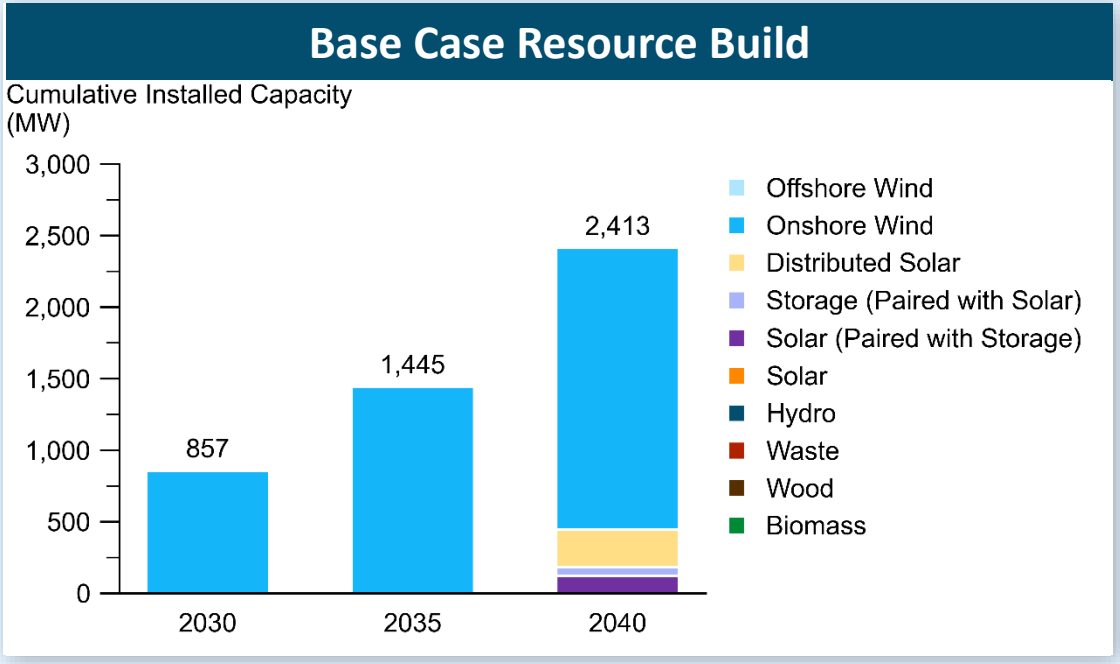
Results: Base Case

- Base case shows the least-cost portfolio of resources to meet RPS goals which follow current market and policy trends
- Onshore wind in the West and North is chosen by 2030 (some of this needs to be online by 2026) and requires new transmission upgrades
- PV+Storage and Distributed Generation are chosen post-2035



**Note: Although the focus of this study is through 2030, results are presented through 2040*

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Portfolio Comparisons

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Portfolio Comparison: 2030 Resources

- The scenarios highlight a diversity of approaches to allow Maine to meet its renewable energy requirements by 2030

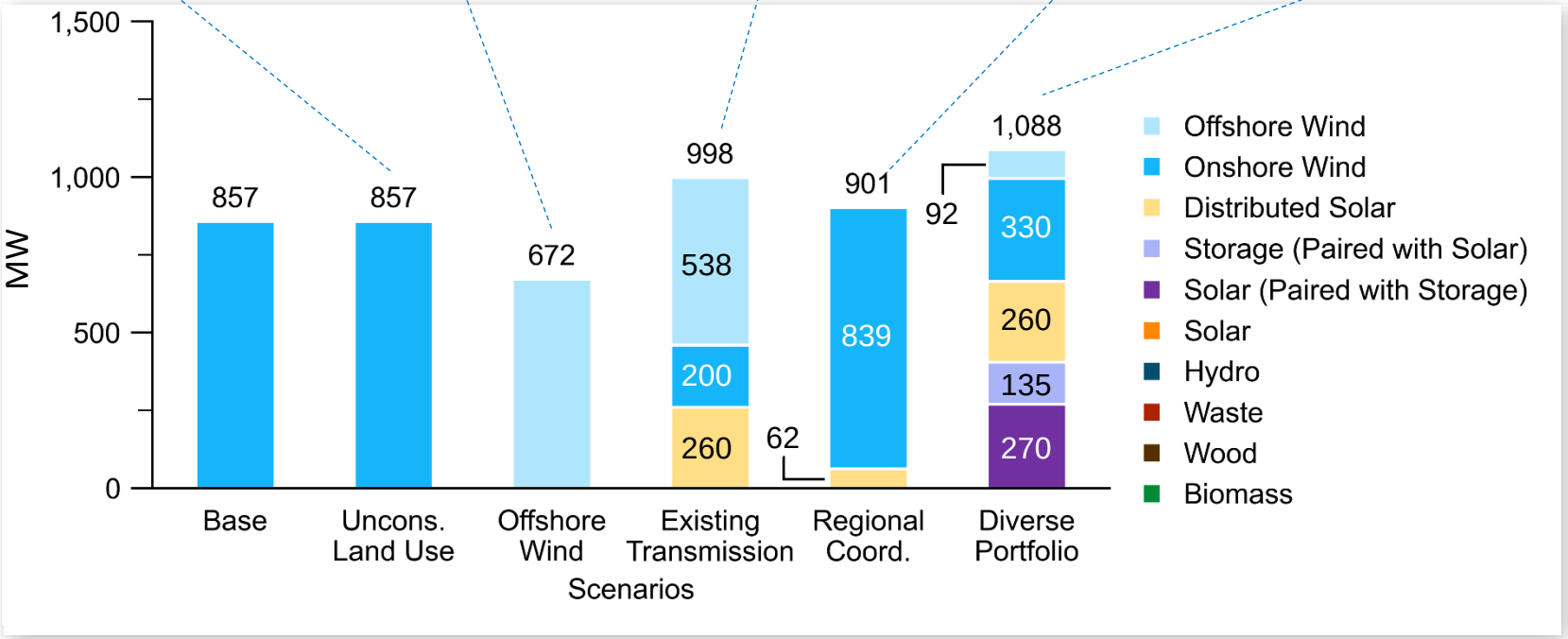
Transmission costs typically bind before land-use constraints in 2030

Offshore wind alone can be enough to meet 2030 RPS goals

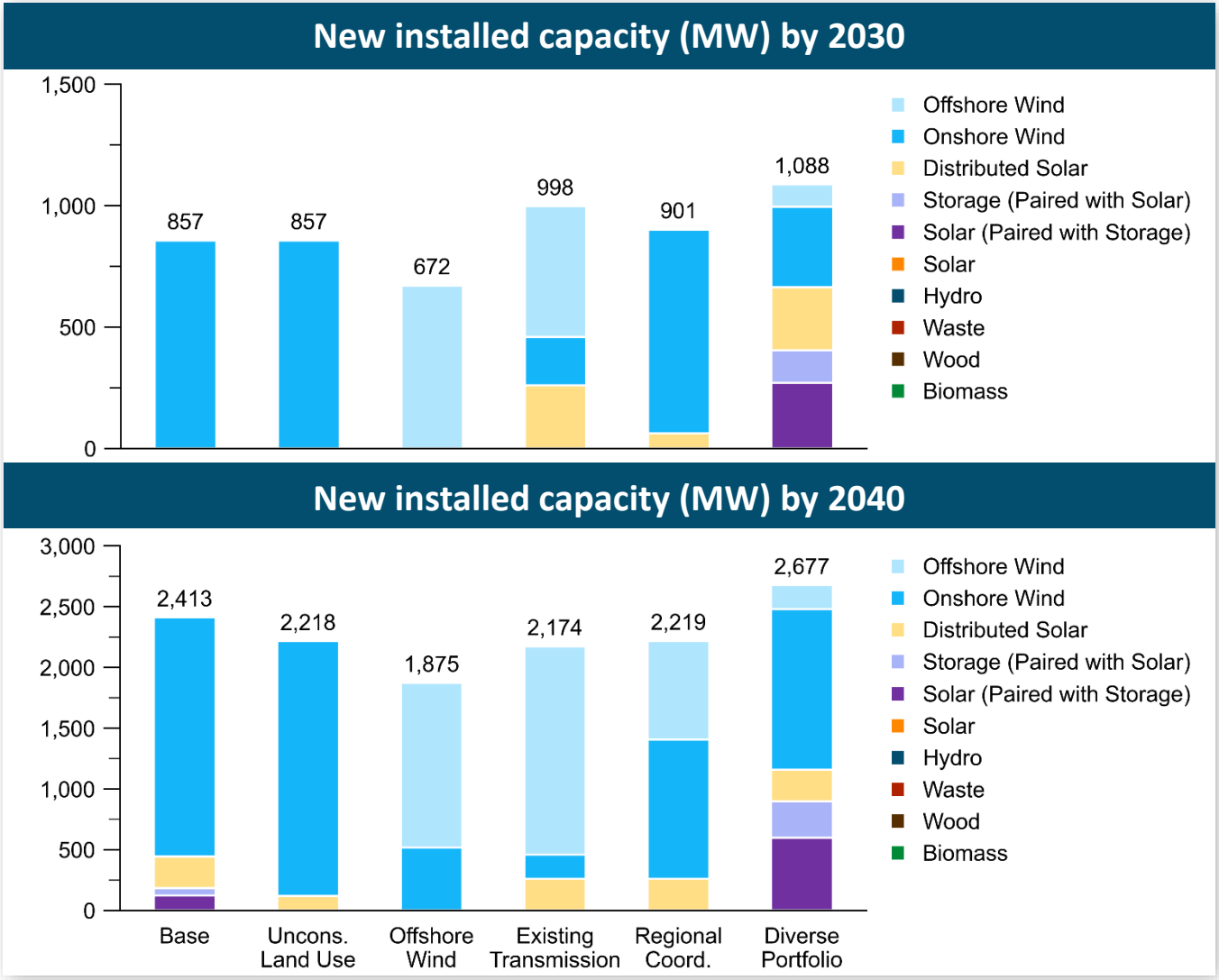
No new onshore transmission results in a combination of DG and Offshore wind

Cost-sharing of new transmission upgrades results in onshore wind and DG builds

Building a diverse set of resources could provide Maine with flexibility at a lower cost



Portfolio Comparison: Resources



Onshore wind shows up across scenarios and increases in capacity between 2030 and 2040

Significant transmission capacity is required to integrate large amounts of onshore renewables – both onshore wind and solar

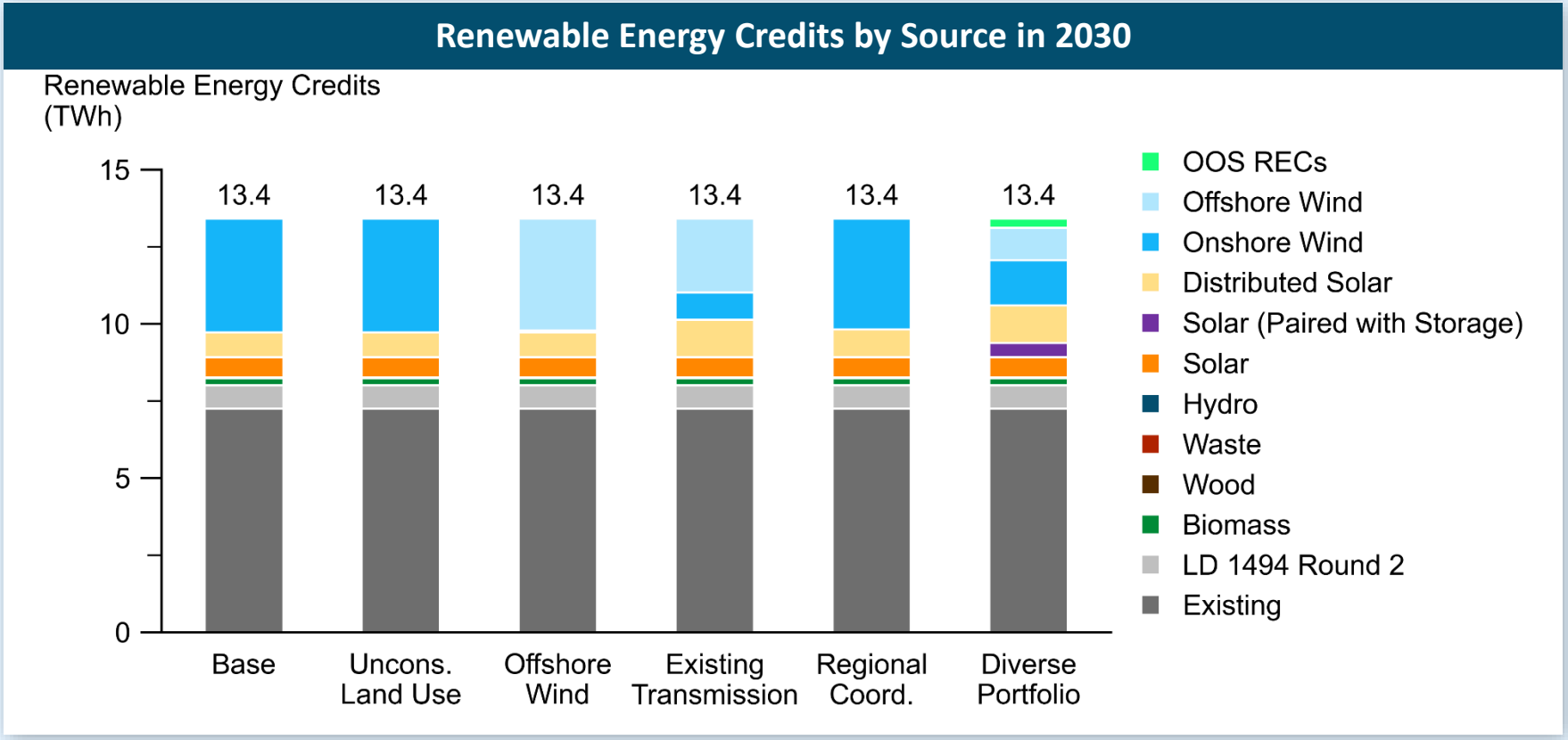
Offshore wind can provide value, especially post 2030 as its costs continue to decline

DG is chosen across multiple scenarios, especially if it does not trigger significant transmission upgrades

Solar exhibits strong synergies with storage

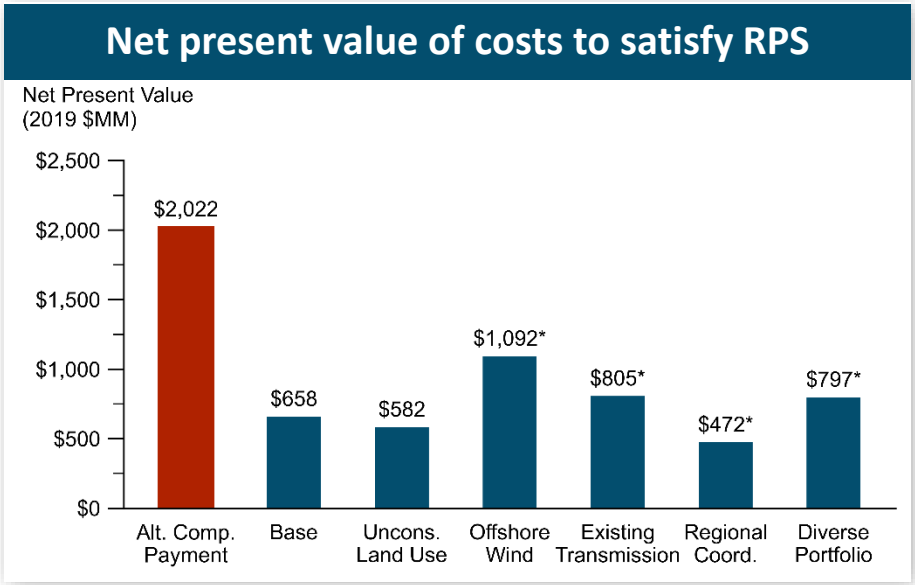
Portfolio Comparison: 2030 RECs

- Baseline RECs include all existing and planned Class I/IA/II RECs
- In most cases investigated, onshore wind provides most *new* RECs



Portfolio Comparison: Resource Costs

- **Costs include the renewable resource and transmission costs required to meet the RPS targets**
  - As a counterfactual, the cost to meet REC needs via the Alternative Compliance Payment (ACP) mechanism is shown
- **Scenario comparisons**
  - The Offshore Wind and Existing Transmission scenarios rely on offshore wind build*
  - The Regional Coordination scenario shows that sharing transmission costs with other New England States or Canadian provinces can reduce the overall cost to meeting Maine's RPS requirement
  - The Diverse Portfolio scenario takes advantage of available additional RECs from out of state, cost-sharing of new transmission, and deferral of onshore transmission build by building offshore wind and distributed generation



- **Note**: This is not a full cost-benefit analysis and does not calculate ratepayer impact. This slide only shows resource costs.

**These costs could be higher given transmission needed to connect more than 200 MW of offshore wind. More analysis is needed to understand the onshore transmission implications of offshore wind.*

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Key Findings & Policy Implications

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Key Findings

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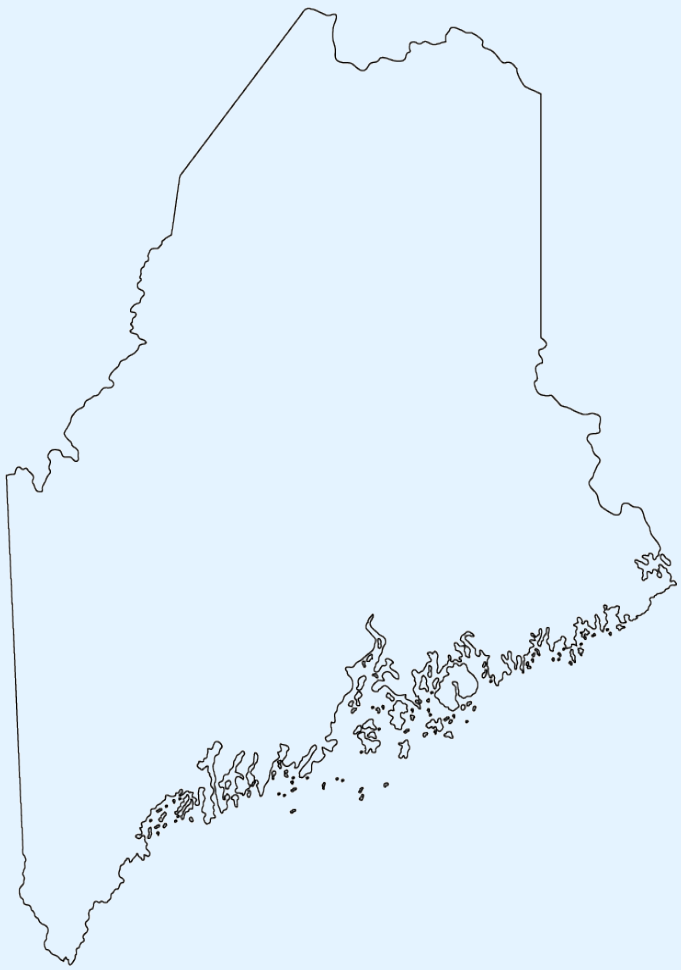

Policy Implications

- The analysis suggests that there are several policy pathways that could support timely and cost-effective renewable development to meet Maine's RPS goals
- **Planning and Resource Additions**: Ensuring clarity to developers and evaluating all value streams for projects would ensure the best value for Maine
- **Transmission**: Proactive transmission development will help develop in-state renewables
- **Regional Coordination**: Coordinating infrastructure development (e.g., transmission, offshore wind) across the region could lower costs of meeting Maine's RPS
- **Renewable Resources**: Specific technologies require additional analysis to fully understand their value in meeting Maine's RPS
  - Efforts to align incentives for DG with their value to the system (compensation could be based on location and timing of output) would ensure efficient DG development
  - Analysis is required to understand the onshore transmission impacts of significant offshore wind builds
  - Solar exhibits strong synergies with storage in Maine. More analysis is required to understand all the value streams storage can capture

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Thank You

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