



# MMU Review of 2021-2040 System & Resource Outlook

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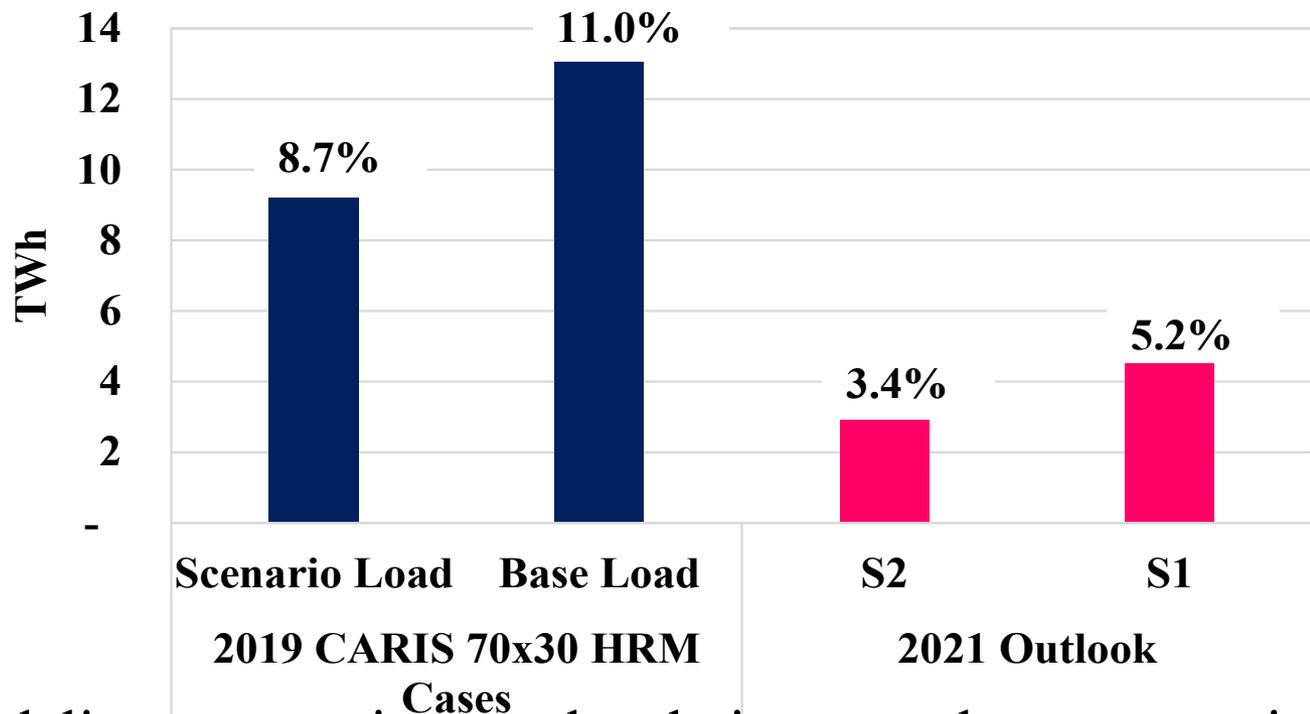


## Introduction

- The MMU performed a review of the 2021-2040 System & Resource Outlook (“Outlook”) as required by the Tariff.
  - ✓ The Outlook is the NYISO’s primary economic planning study.
- Our review highlights how NYISO markets facilitate more efficient clean energy investments and reduce curtailment.
  - ✓ We used data from Outlook policy cases to examine incentives for renewable and storage investment.
- **Additional detail and explanation is in our full memo, posted with this meeting’s materials.**

# Comparison to Prior Planning Study

## Projected Renewable Curtailment in 2030



- Modeling assumptions and techniques such as economic capacity expansion have large impact on congestion and curtailment



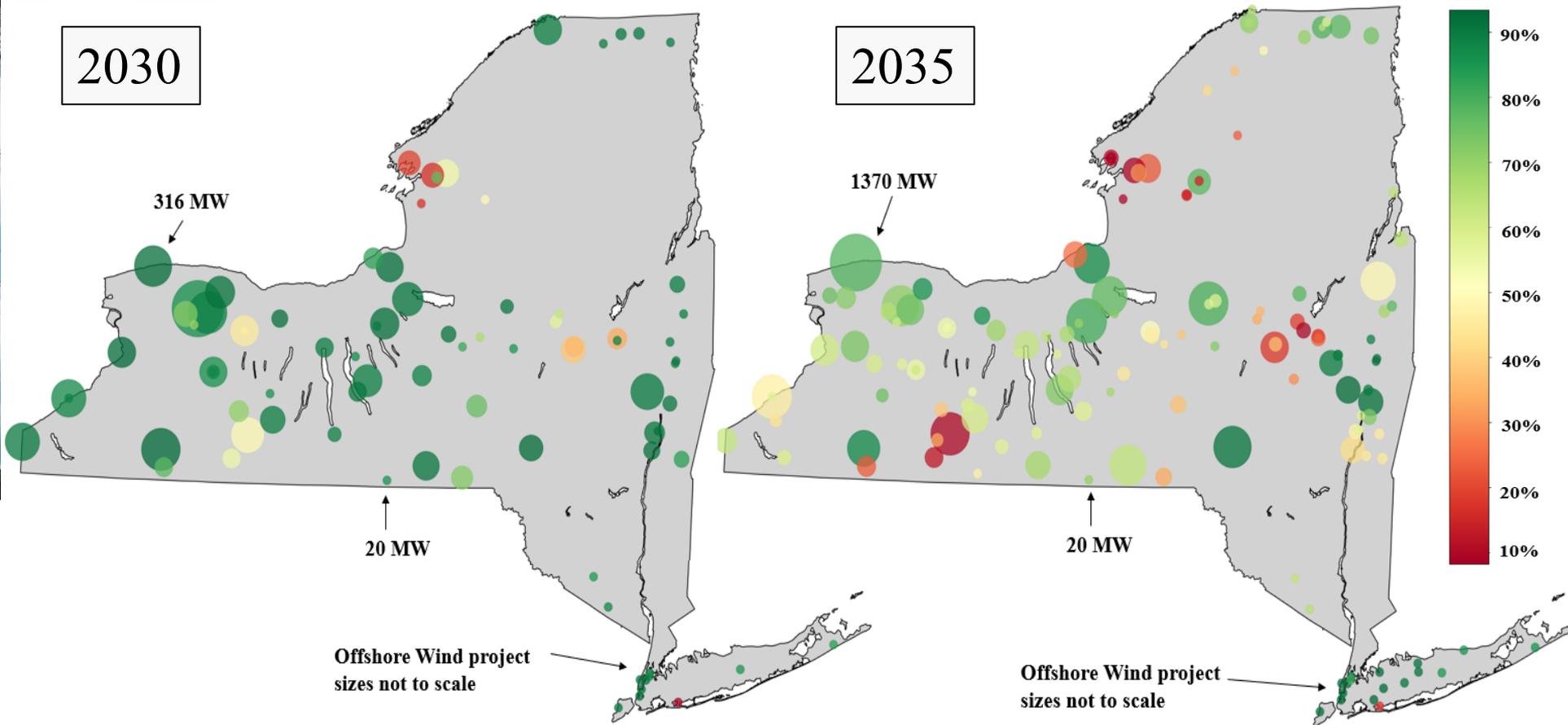
## Key Terms for Analysis of Outlook Results

- **Renewable Deliverability Ratio** – share of an incremental resource's output that would not cause curtailment.
- **Renewable Deliverability Impact** – MWhs of renewable energy that an incremental MW of generation, storage or transmission capacity makes deliverable to load.
- **Implied Net REC Cost** – Net cost of increasing renewable energy deliveries through an investment in generation, storage or transmission.

These concepts allow us to compare the efficiency of increasing renewable deliveries through investments in different technologies and locations.



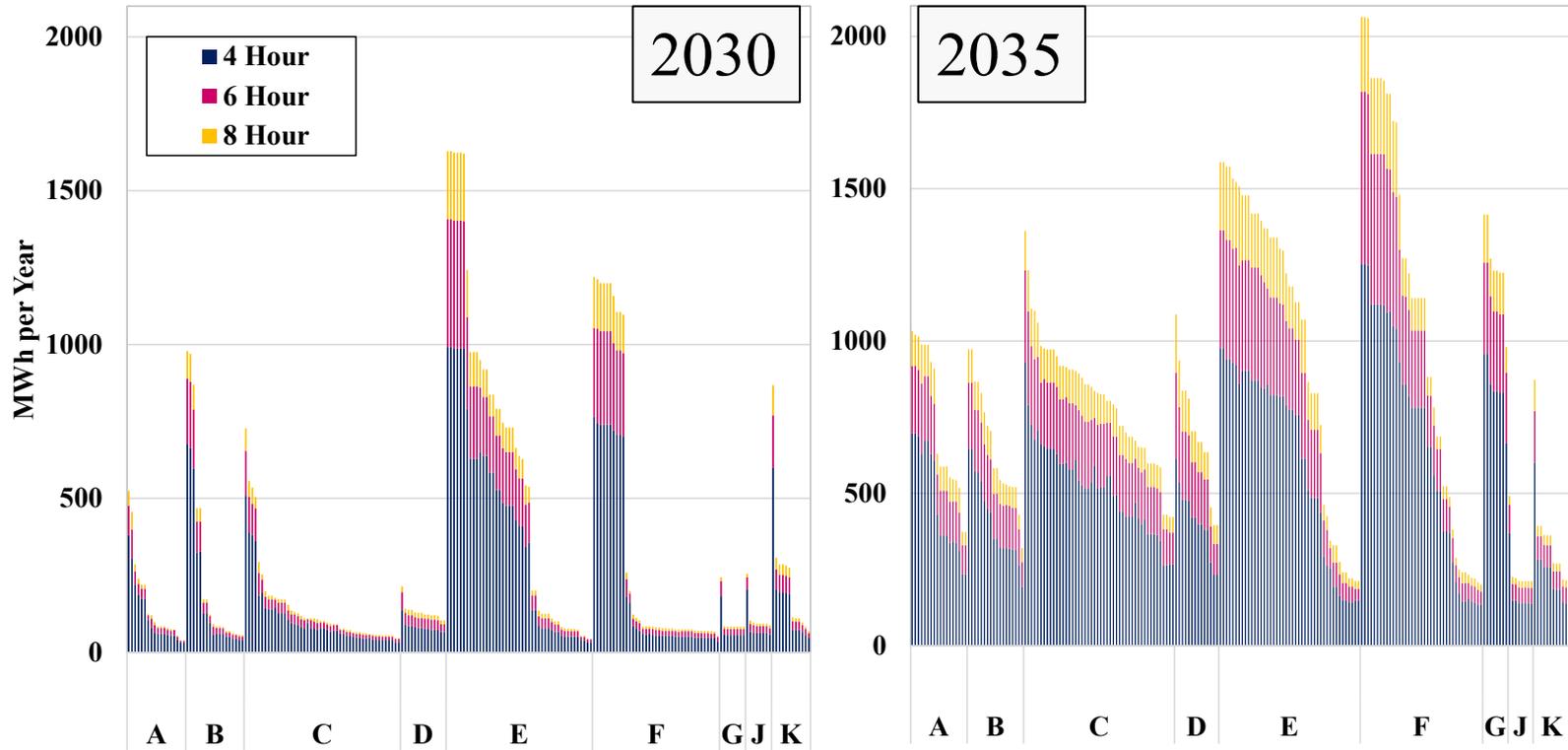
# Renewable Deliverability Ratio 2030 and 2035 S2 Cases



- Incremental deliverability of renewable generation varies widely by location in the Outlook policy cases.



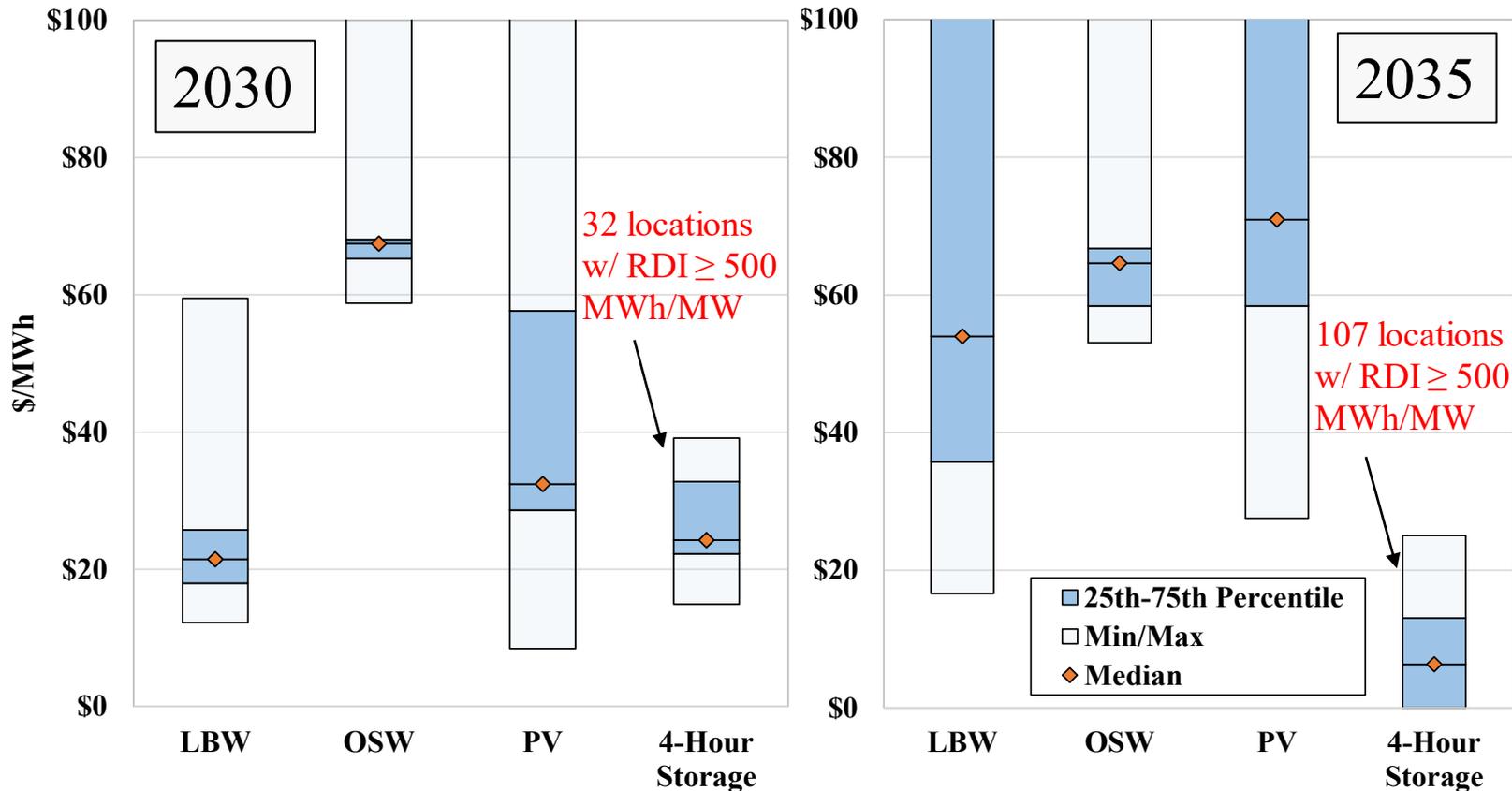
# Storage Renewable Deliverability Impact (“RDI”) S2 Case Wind and Solar Locations



- Incremental storage would make large amounts of curtailed renewable energy deliverable at some locations in 2030 and many locations in 2035.

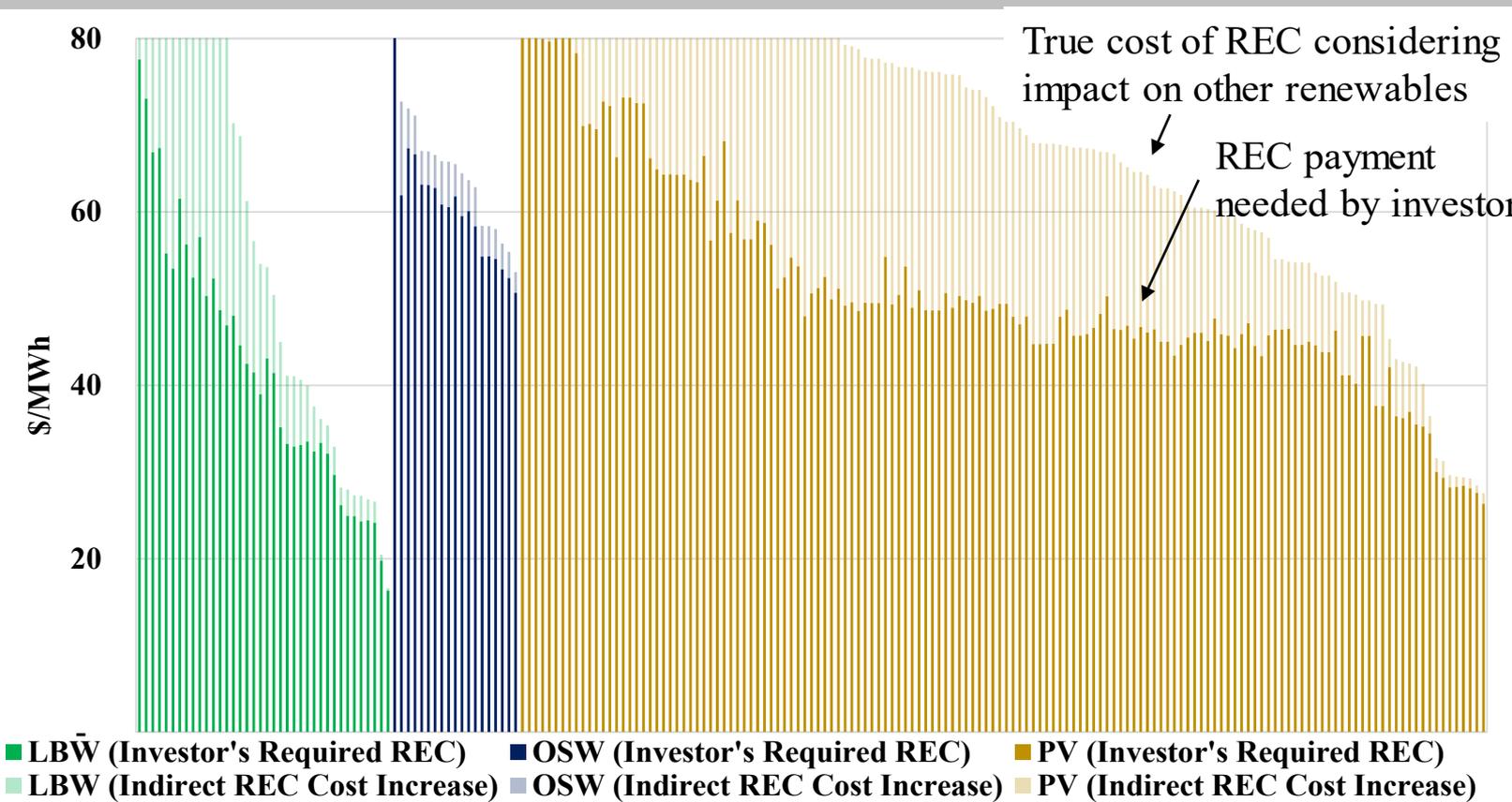


# Implied Net REC Costs 2030 and 2035 S2 Case



- Wide range of Implied Net REC Cost within and between technologies. Storage is very cost-effective by 2035.

# Implied Net REC Cost of Renewables 2035 S2 Case



- ‘Cannibalization’ of existing projects’ RECs by new projects occurs due to negative bidding when projects receive different REC payments.



## Key Observations

- **Markets provide incentives to reduce curtailment**
  - ✓ Discourage renewable projects with poor deliverability
  - ✓ Very strong incentives for merchant storage to reduce curtailment – underrepresented in Outlook models
- **Uniform pricing of clean energy would improve market and planning outcomes**
  - ✓ Inconsistent pricing of RECs leads to market inefficiency
    - Distorts apparent costs and benefits of renewable, storage and transmission investments
  - ✓ Incentives for new renewables to ‘cannibalize’ RECs of other projects create risk for earlier entrants



## Recommendations

- **Recommendations for Future Outlook Modeling Enhancements**

1. Model ancillary services procurements considering how future needs will be driven by resource mix changes.
2. Perform an ‘optimized’ production cost model sensitivity case with new renewables relocated to more deliverable sites.
3. Improve modeling of energy storage in capacity expansion and production cost models.
4. Include options for 2-, 6- and 8-hour storage in the capacity expansion model.



## Recommendations

- **Recommendations for Transmission Planners**

5. Estimate the Implied Net REC cost of regulated transmission projects and compare it to alternatives including merchant battery storage and renewables.
6. Exercise caution when evaluating benefits of transmission projects whose value is strongly linked to uncertain long-term generator siting decisions.

- **Recommendations for State Policymakers**

7. Price incremental clean energy from new and existing renewables in a uniform manner so that environmental goals can be satisfied cost-effectively.