Using Wholesale Electricity Prices to Distinguish Bulk Power Impacts of Resource Options

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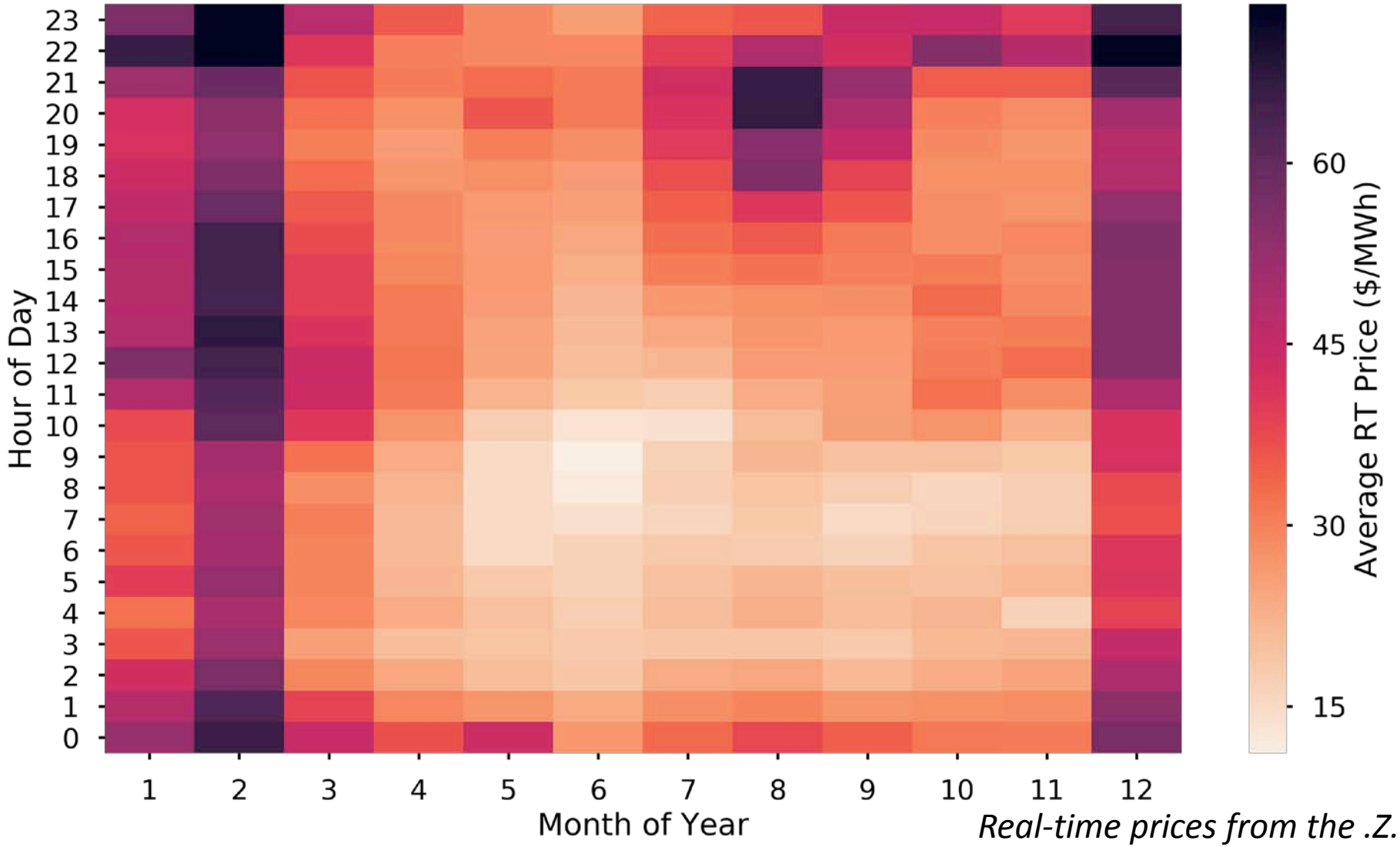
Overview

- Can wholesale prices inform the bulk power impacts of various resource options?
  - How do impacts vary with resource location and resource generating profile?
- Approach:
  - Use location-specific wholesale prices and generating profiles to calculate the wholesale value of wind, solar, and a flat block of power
  - Rank bids by their net cost: bid cost – wholesale value
    - Resources with favorable generating profiles and better locations will have a higher wholesale value, and therefore bigger reduction in the net cost metric
    - Resources in constrained regions or profiles that tend to generate power at times that are less helpful will have a lower wholesale value.

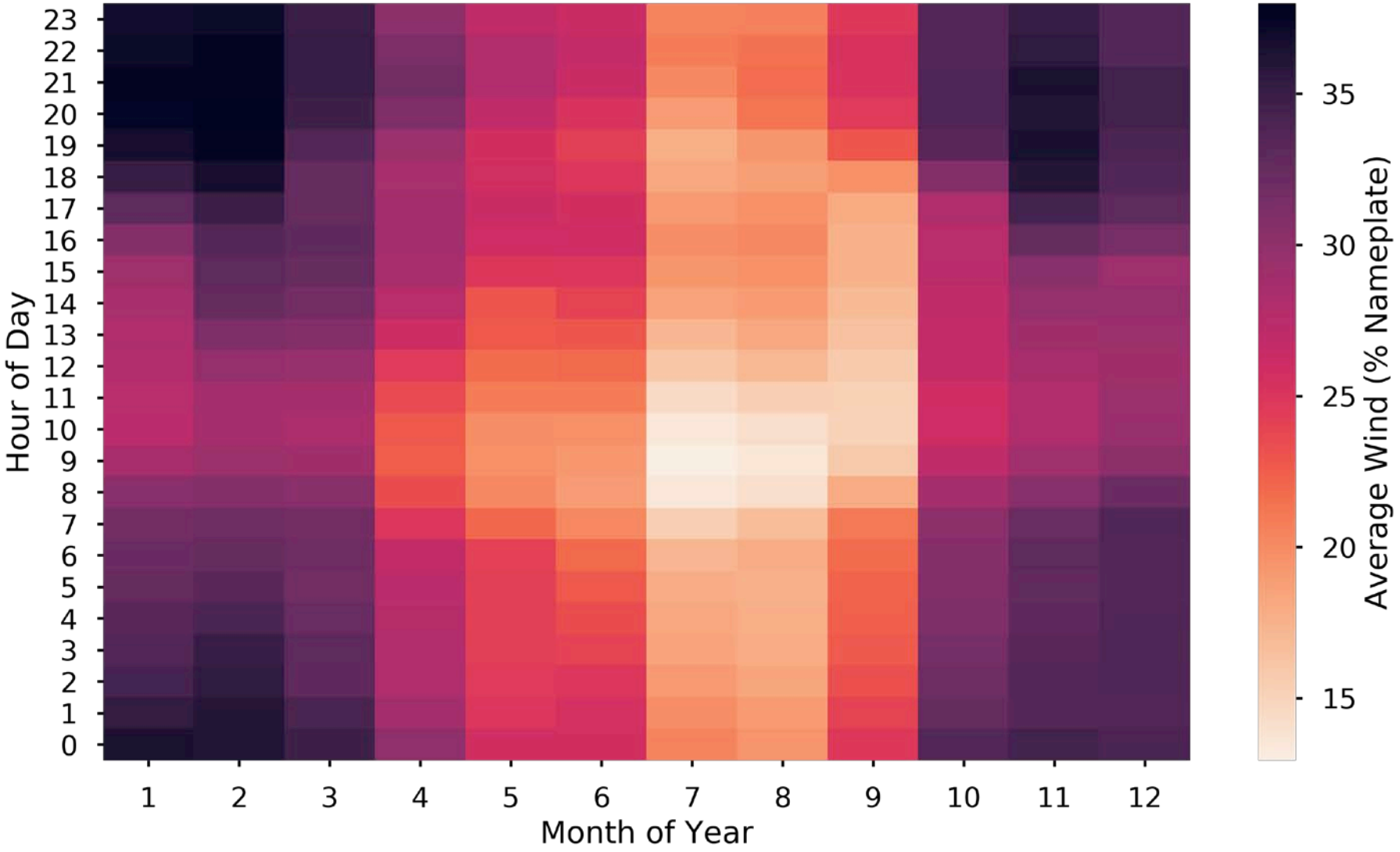
- Illustration of approach:
  - Use observed wholesale price data from 2015-2017
  - Real-time market prices from all nodes in Vermont
  - Forward capacity prices for the Vermont Zone
  - Wind profile from all wind aggregated across ISO-NE
  - Solar profile from all utility-scale solar tracked by ISO-NE
  - Capacity credit of the wind and solar for the forward capacity market based on production in winter and summer peak period

Wholesale Energy Prices are Highest in the Winter and at Night over 2015-2017

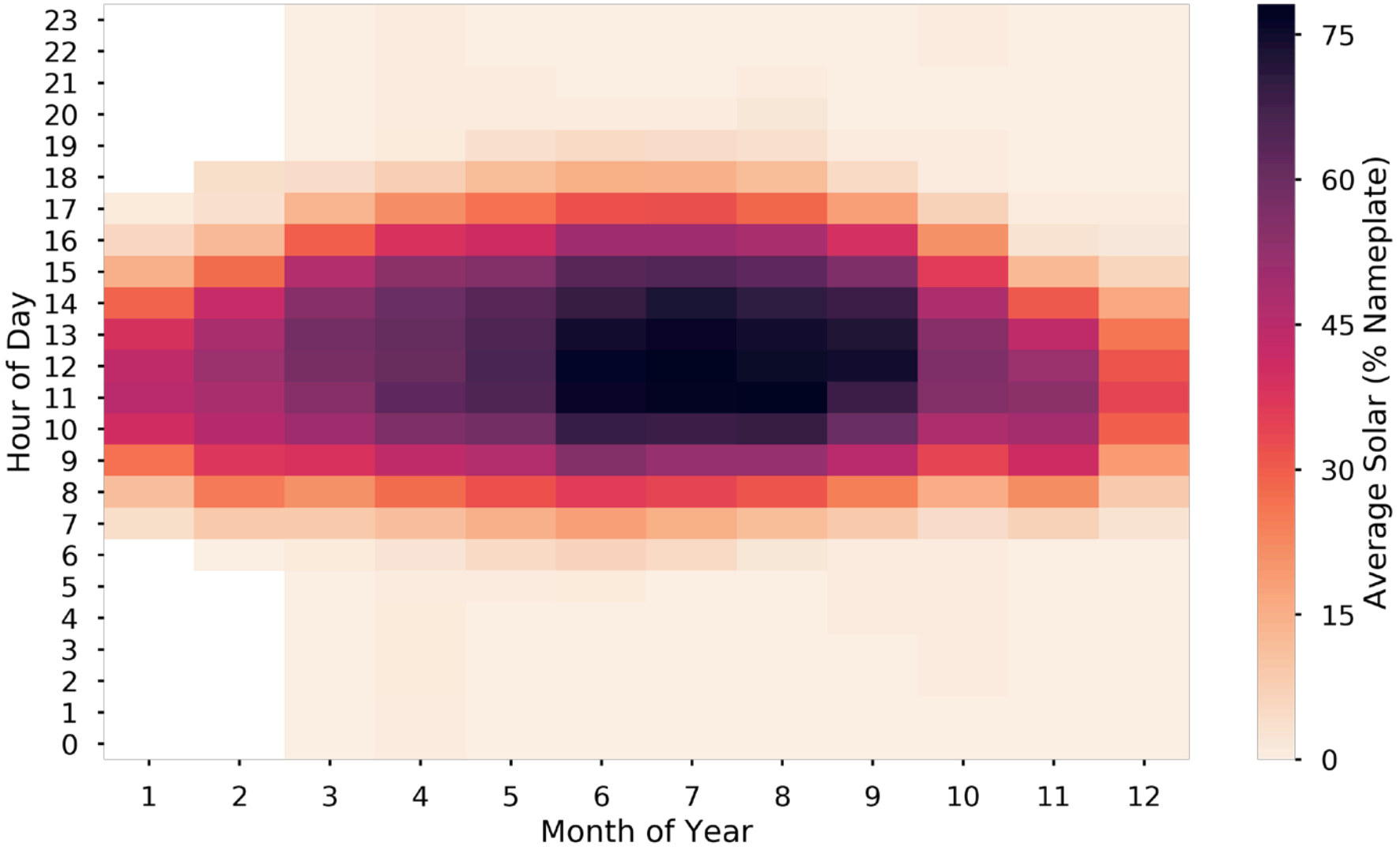


Real-time prices from the .Z.VERMONT Hub

ISO-NE Wind Production is Highest in the Winter Over 2015-2017



ISO-NE Solar Production is Highest in the Summer Day and Lowest in the Winter over 2015-2017

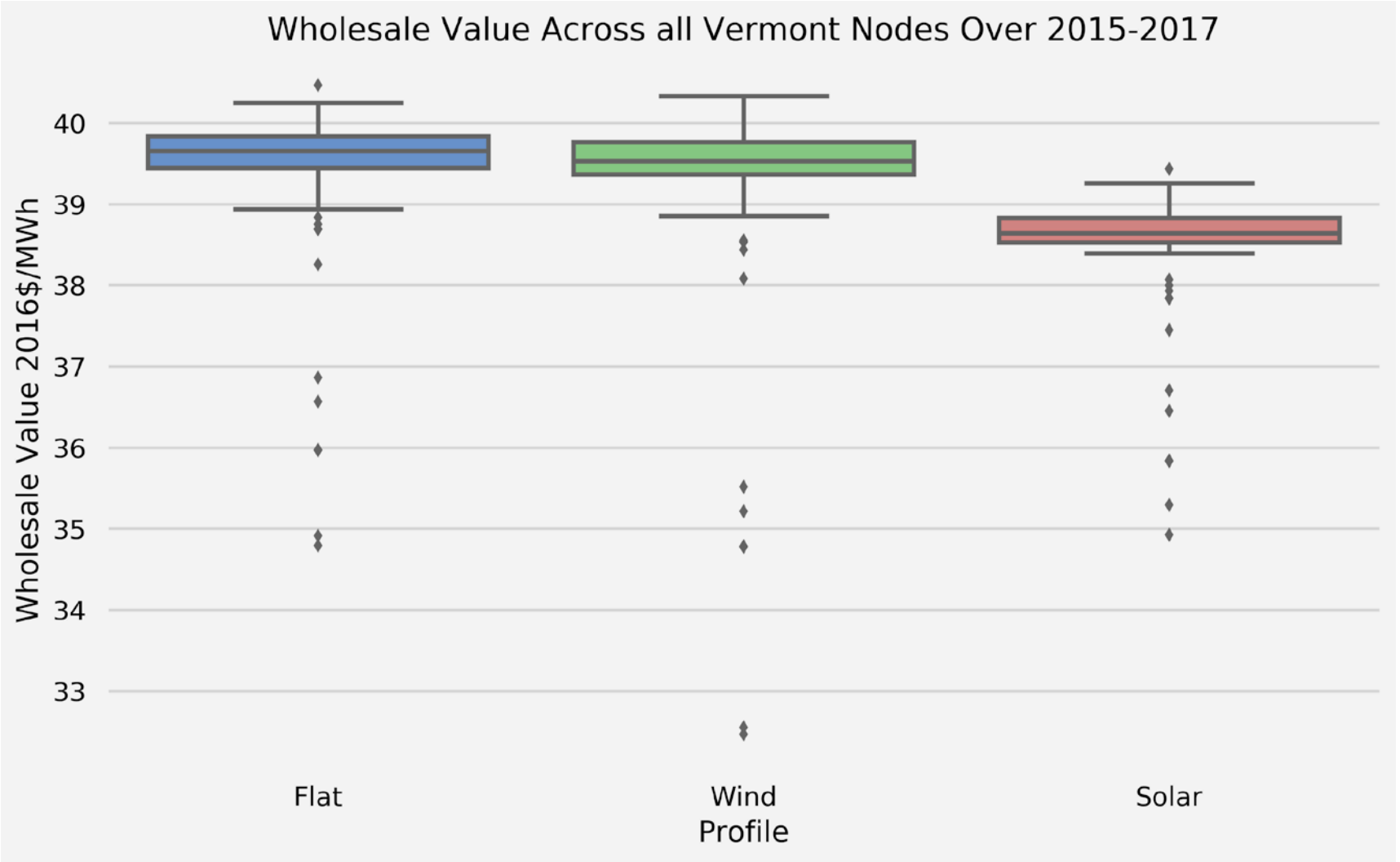


Wholesale Value

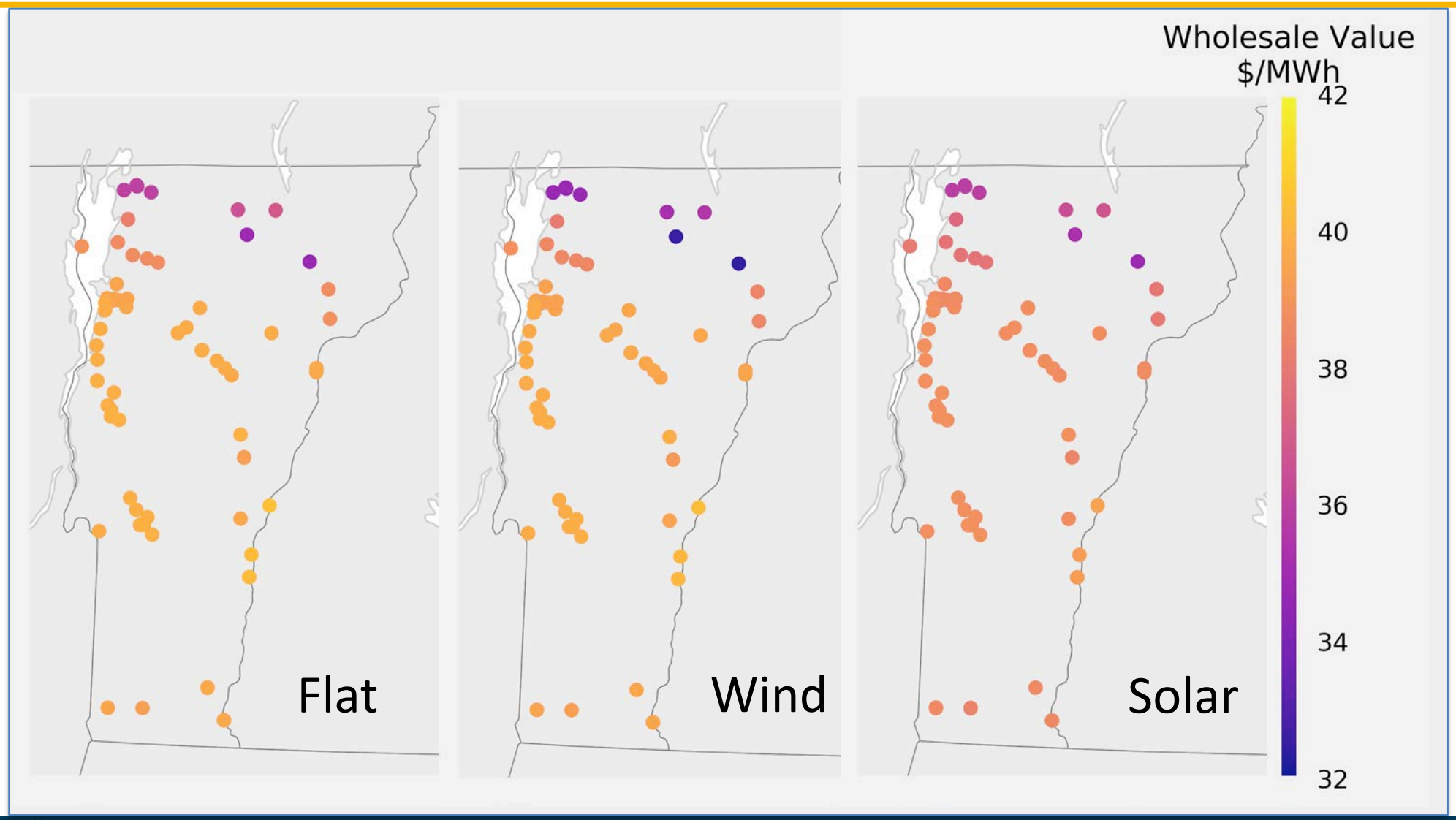
Wholesale value ($/MWh) = Energy Value ($/MWh) + Capacity Value ($/MWh)

- Energy Value: Sum the hourly generation profile of a technology multiplied by the hourly energy price at a specific node (hourly LMP), divided by all energy generated
- Capacity Value: Capacity credit times the zonal capacity price, divided by all energy generated

Wholesale Value of Wind is Similar to a Flat Profile and Higher than the Value of Solar Over 2015-2017



Variation in Wholesale Value by Location and Generation Profile Shows Value is Lowest in the North



Ranking Bids Using the Net Cost Approach

- Consider two solar projects that each bid a price of $75/MWh into the SO program, one in Southern Vermont (South) and the other in Northern Vermont (North)
- The wholesale value of the South solar project is ~$38/MWh over 2015-2017.
- The wholesale value of the North solar project is lower due to the transmission constraints that lead to lower LMPs. The lowest would be ~$35/MWh.
- Based on these results, the South project would be more attractive. The North project could become the higher ranked project if its bid price were at least $3/MWh less than the bid price of the South project (i.e. no more than $72/MWh).

Discussion

- These preliminary results illustrate the approach using actual generation data and observed wholesale energy and capacity prices from 2015-2017
- Generation located in the far north has a lower wholesale value than generation in other locations (up to ~$7/MWh lower). Wholesale value varies by technology too.
- Potential Refinements:
  - Site-specific generation profiles rather than ISO-NE aggregate profiles
  - Adjust results based on region-specific curtailment estimates
  - Projections of future wholesale prices based on standard scenarios
    - Allows consideration of increased share of different generation types or changing load profiles
    - Allows for recognition of planned transmission investments that may alter LMP patterns

Questions?

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