Emerging Wind Energy Policy Landscape: Interconnection

Abigail Krich
President, Boreas Renewables LLC
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Interconnection in New England

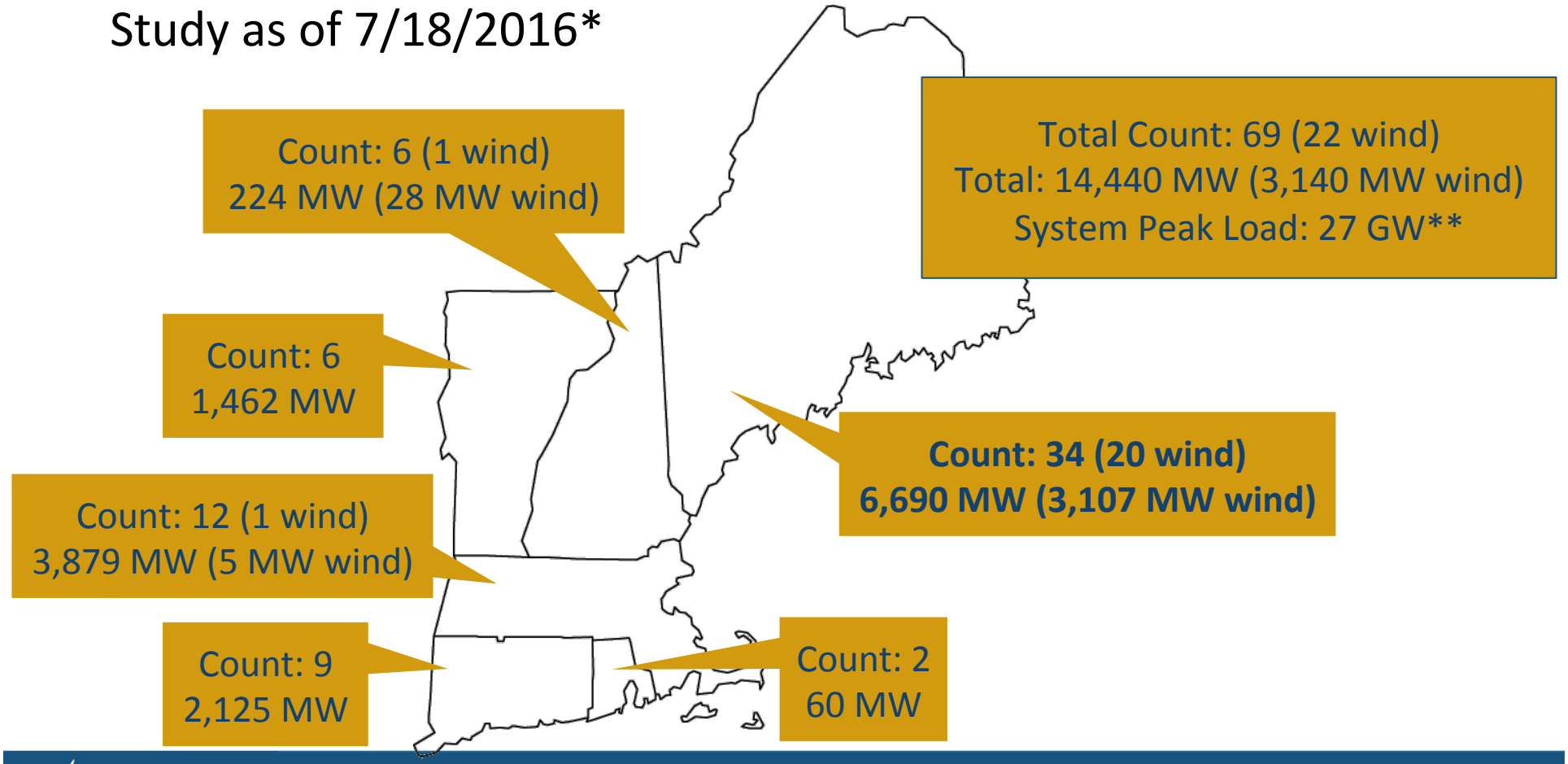
- ISO New England is the only ISO/RTO that uses a serial interconnection study process for generation in the same electrical area
- All others have changed to a group or cluster study process
- In many parts of New England, the serial process is working fine
- When there is an area with both geographic concentration of interconnection requests and longer study timelines, backlogs develop and grow

Conditions for Backlog: Extended Study Durations

- A number of factors can extend study durations
  - Additional study scope required
    - Individual determination of voltage support requirement
    - PSCAD study
  - Lengthened study time
    - Model troubleshooting
    - Project modifications
    - Restudies for earlier projects changing/dropping out
    - Extensive upgrades required
- All of these have been typical for wind connecting in weaker parts of the transmission system

Conditions for Backlogs: Geographic Concentration

- Interconnection Requests without a completed System Impact Study as of 7/18/2016*

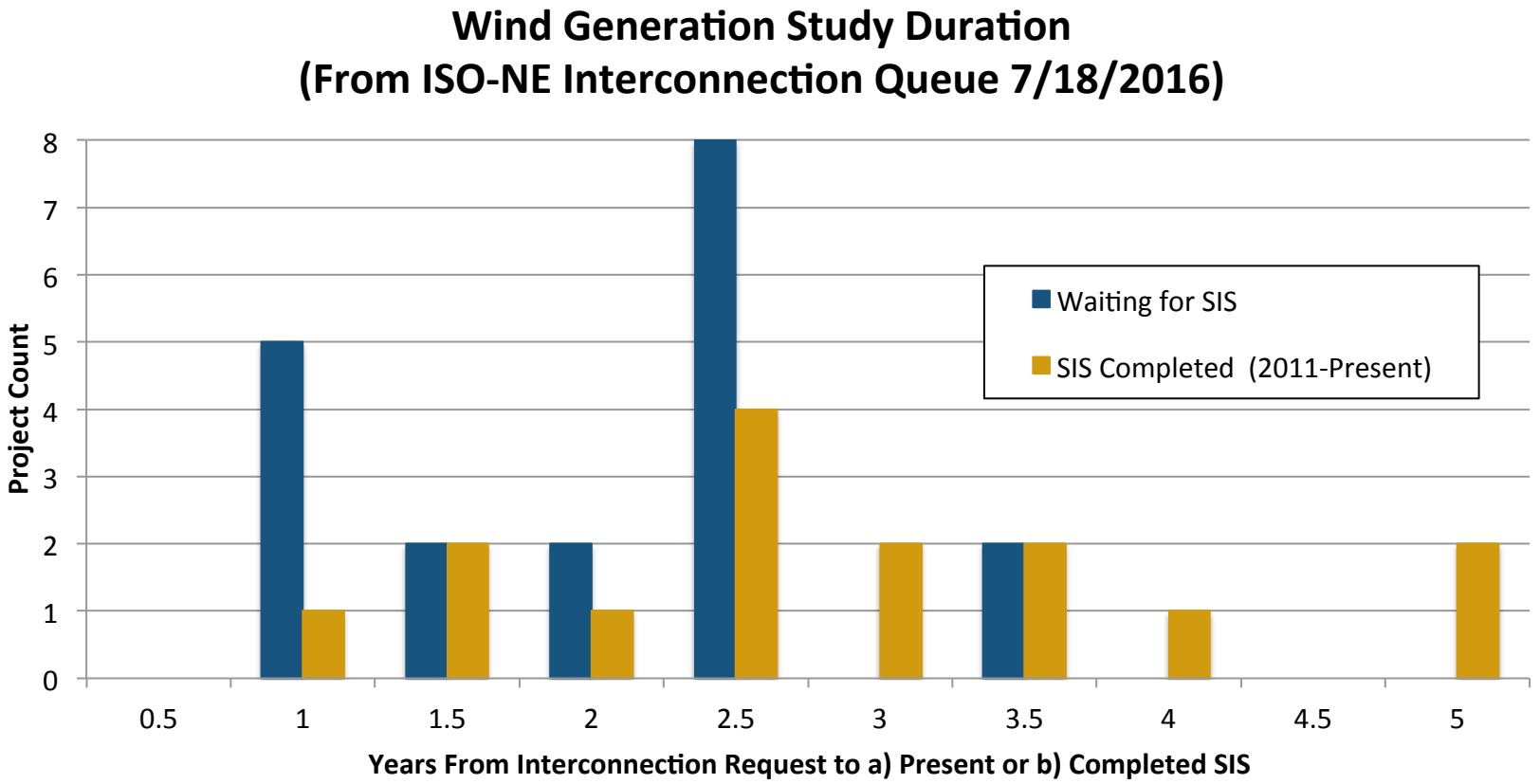


* Includes both generation and elective transmission upgrades
** Peak load after reductions for behind the meter PV and passive demand response

Backlogs in New England

- Maine
  - Has both geographic concentration and extended study durations
  - Has a very long backlog
- Northern NH and northern VT
  - Extended study durations
  - If multiple new requests are made in these area (geographic concentration), a backlog would develop just like in Maine
- Offshore
  - Shorter study durations seen due to connections to stronger parts of the system

Wind Interconnection Study Durations



- New requests in Maine are being told to expect a multi-year delay before their study can begin (likely optimistic)

Interconnection Process Improvements April 2016

- Aimed at reducing study durations
- Particularly for inverter-based generators
  - Increased information available to developers
  - Increased expectations for developers' design and evaluation efforts
  - More stringent generator model requirements

Interconnection Process Improvements April 2016

- Developers have easier access to system base case for their own evaluation prior to ISO study
- Wind-specific interconnection request data form created
- Standard reactive power capability requirement
- Wind developer must propose plant voltage design
- Standard PSS/E library models required for all studies that begin after Jan 1, 2017
- Increased model documentation and benchmarking required

Interconnection Process Improvements April 2016

- Alternative "screening" Feasibility Study scope available at developer's option
- Modify and clarify material modification rules
  - Prior to SIS: Easier to make modifications
  - After SIS: Very limited changes allowed
    - Developer study effort prior to request can make approval more likely

Cluster Study Process Discussion

- The Maine backlog is so severe that simply shaving time off of the serial study process will not result in reasonable interconnection study timelines
- ISO and stakeholders appear to agree on need for some kind of cluster process
- Cautious about not breaking ISO-NE process where it works
- ISO and stakeholders in ongoing discussion of cluster study approaches

Cluster Study Process Discussion

- ISO surveyed cluster study processes in NYISO, CAISO, MISO, PJM, and SPP
  - Presented to the Planning Advisory Committee in March and May
  - Not creating an endless restudy loop is a primary concern
  - Cost allocation and caps for transmission upgrades vary in each region. Some of the processes used elsewhere would be difficult to replicate with New England's longstanding cost allocation rules.

Cluster Study Process Discussion

- New England cluster process straw proposal to be brought to Transmission Committee by early fall
  - New England market participants may engage in that forum to shape the region's proposal

Major Transmission Buildout Needs

- To integrate the thousands of MWs of wind proposed in Maine, major transmission buildout is needed
- This is unlikely to be solved through interconnection upgrades alone, even with a cluster study process
- Region is still exploring how this transmission can be developed
  - First Market Efficiency Transmission Upgrade in many years to be studied this year
  - Tri-state RFP included Elective Transmission Upgrade proposals, with bid evaluation scheduled to go through July 26
- With sufficiently robust transmission, interconnection studies would become simpler and faster, but region does not currently have a clear path to achieving this

Questions?

Abigail Krich

Boreas Renewables

www.BoreasRenewables.com

Krich@BoreasRenewables.com