

# Cluster study requirement



Operating  
Committee meeting  
June 17, 2021

# Final 2021 PV Forecast (ISO-NE)

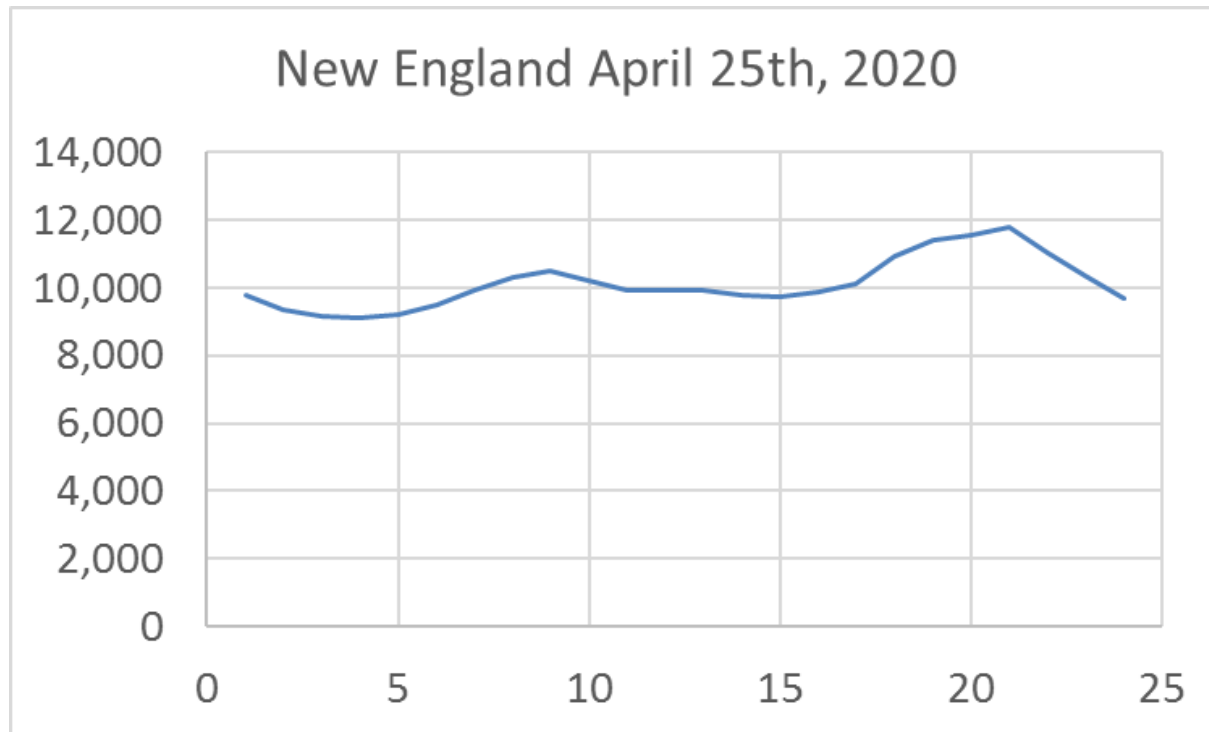
*Nameplate Capacity, MW<sub>ac</sub>*

States	Annual Total MW (AC nameplate rating)											Totals
	Thru 2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	
CT	682.3	108.1	131.6	147.6	91.1	91.1	91.1	91.1	83.2	55.4	53.6	1,626.0
MA	2502.3	454.3	430.4	406.5	406.5	406.5	358.7	232.1	225.1	218.0	211.0	5,851.5
ME	68.8	138.8	199.0	209.2	201.7	97.8	12.8	12.8	12.8	12.8	12.8	979.1
NH	125.3	19.1	18.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	17.1	299.4
RI	223.8	49.1	46.5	42.4	42.4	42.4	42.4	42.4	42.4	42.4	42.4	658.5
VT	393.5	24.7	23.4	22.1	22.1	22.1	22.1	22.1	22.1	22.1	22.1	618.4
Regional - Annual (MW)	3995.9	794.1	849.1	844.9	781.0	677.0	544.1	417.5	402.6	367.8	358.9	10,032.9
Regional - Cumulative (MW)	3995.9	4790.0	5639.1	6484.0	7264.9	7941.9	8486.1	8903.6	9306.2	9674.0	10032.9	10,032.9

## Notes:

- (1) Forecast values include FCM Resources, non-FCM Energy Only Generators, and behind-the-meter PV resources
- (2) The forecast values are net of the effects of discount factors applied to reflect a degree of uncertainty in the policy-based forecast
- (3) All values represent end-of-year installed capacities
- (4) Forecast does not include forward-looking PV projects > 5MW in nameplate capacity

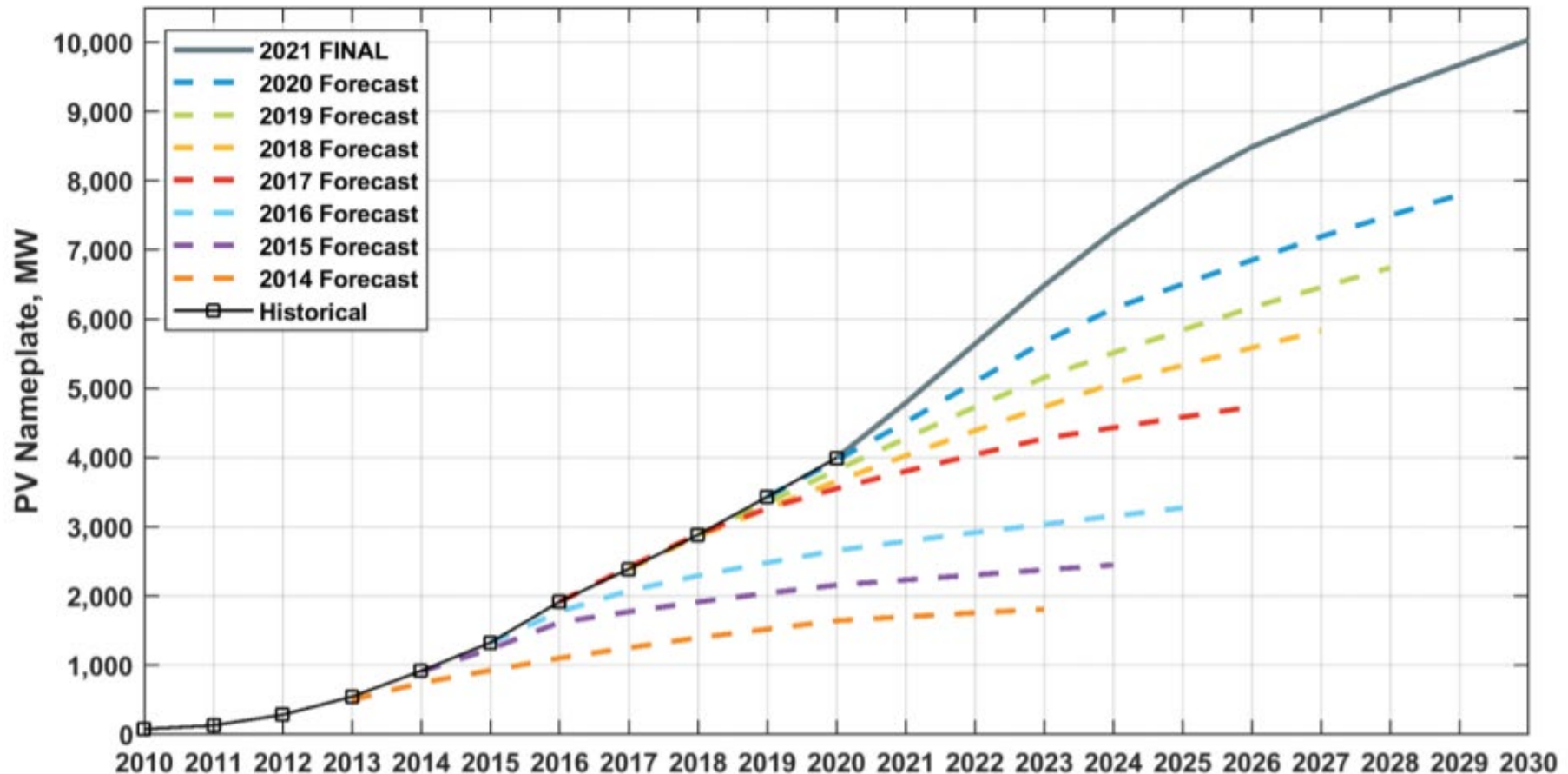
# Net loads projected to drop below 4,000 MW



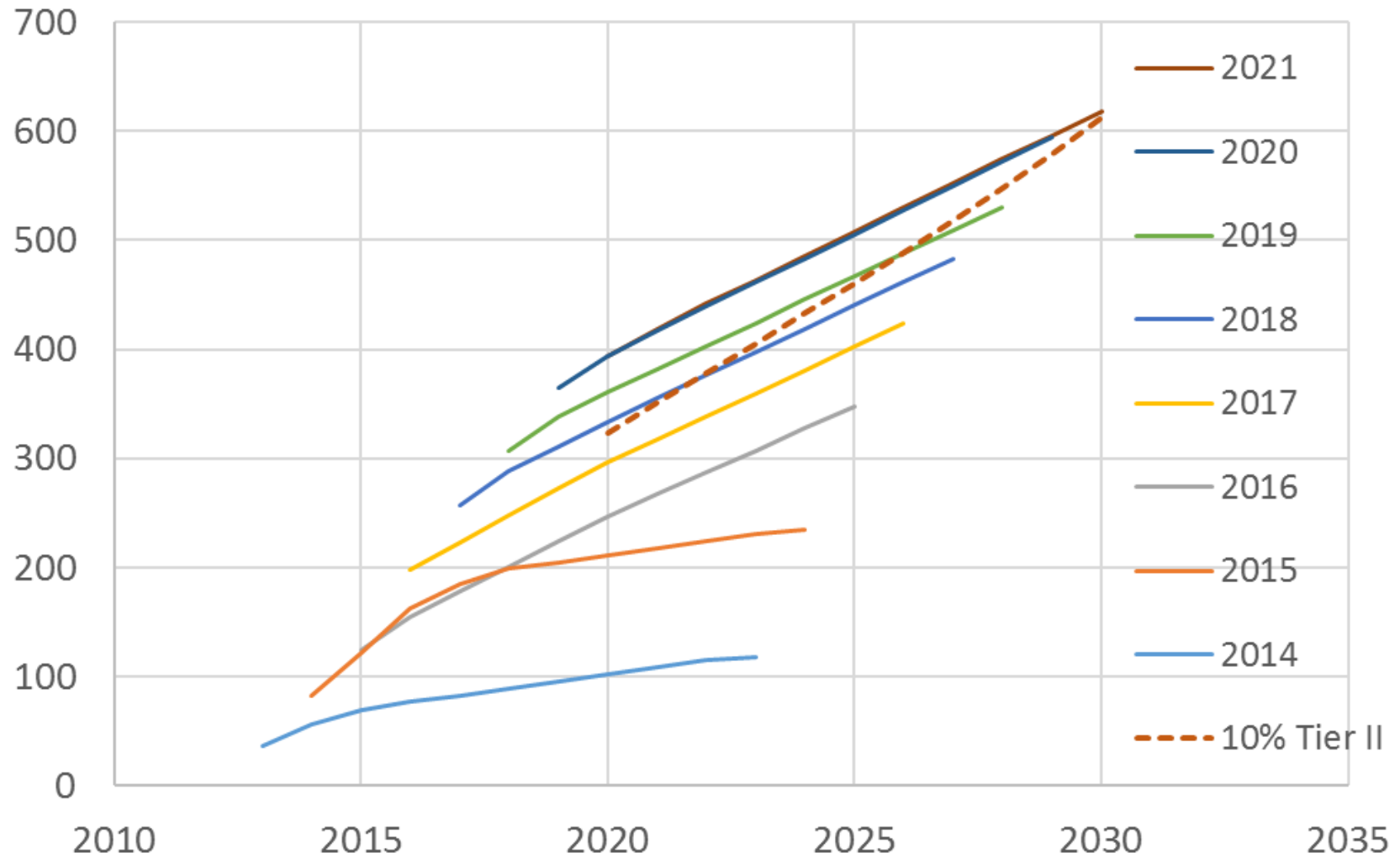
- ISO-NE under forecasts solar PV
- Forecast does not account for other types of DG
- Forecast does not account for solar PV sized 5 MW or more

# Total PV Nameplate Capacity Growth

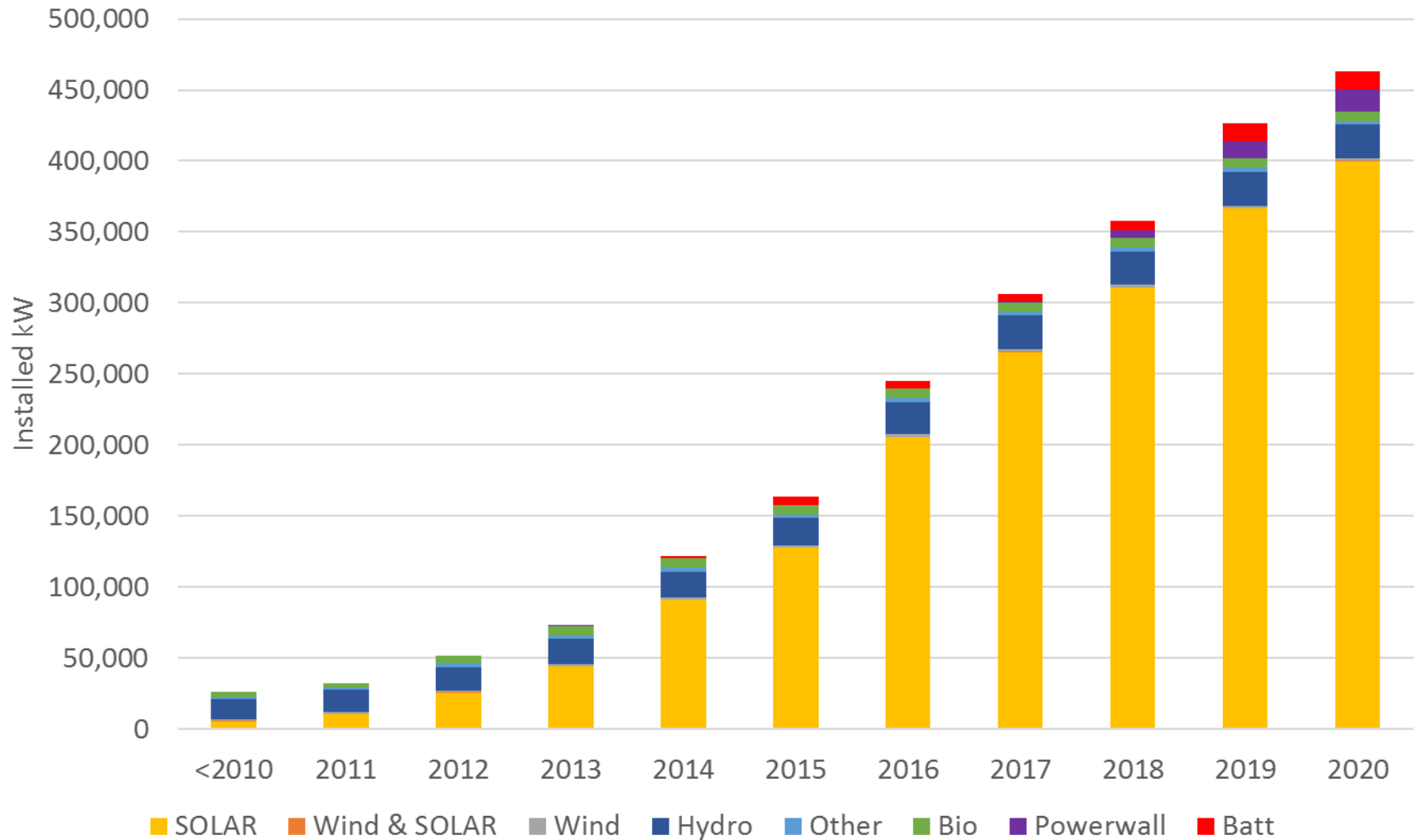
*Reported Historical vs. Forecast (FCM+EOR+BTM), MW<sub>ac</sub>*



## ISO-NE annual solar PV forecasts for VT

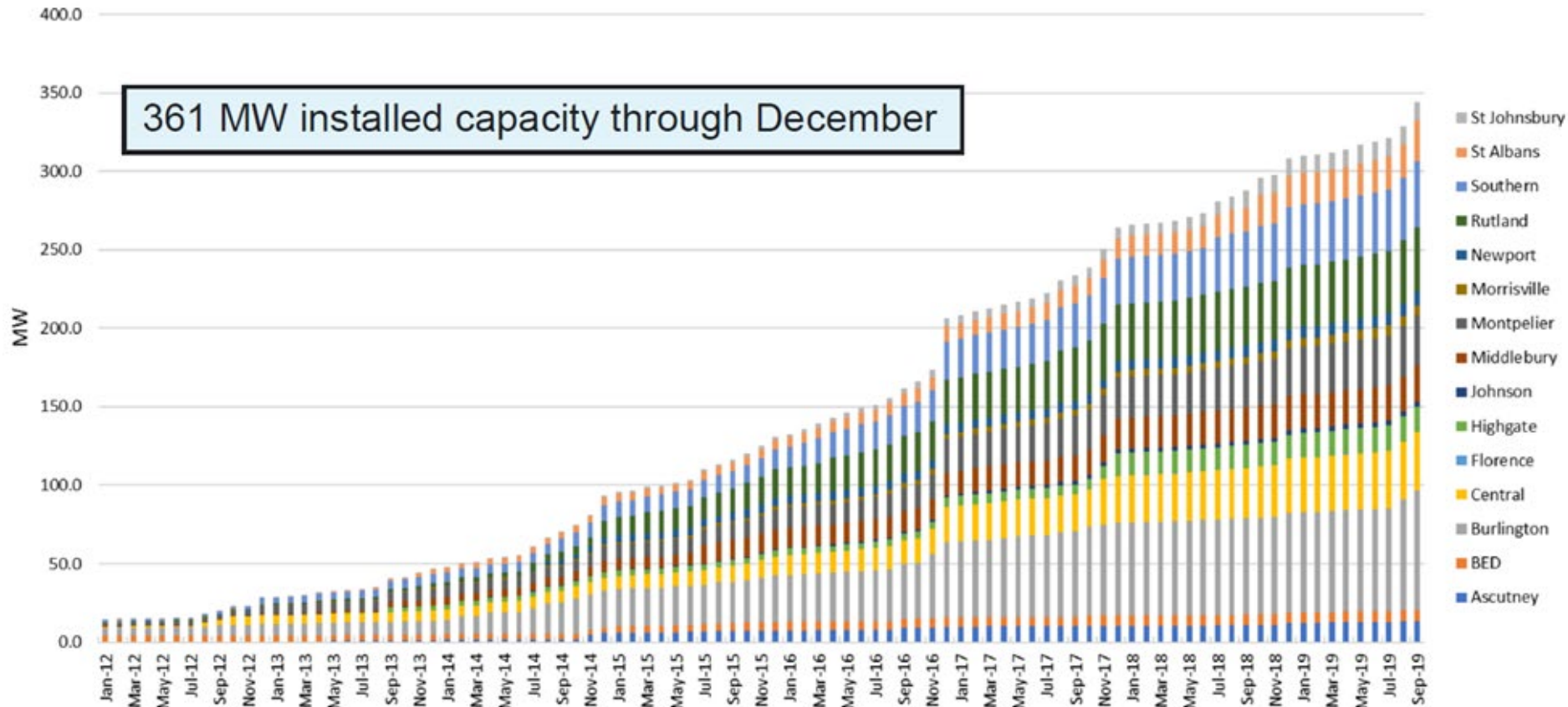


## VT Behind-the-Meter Installations

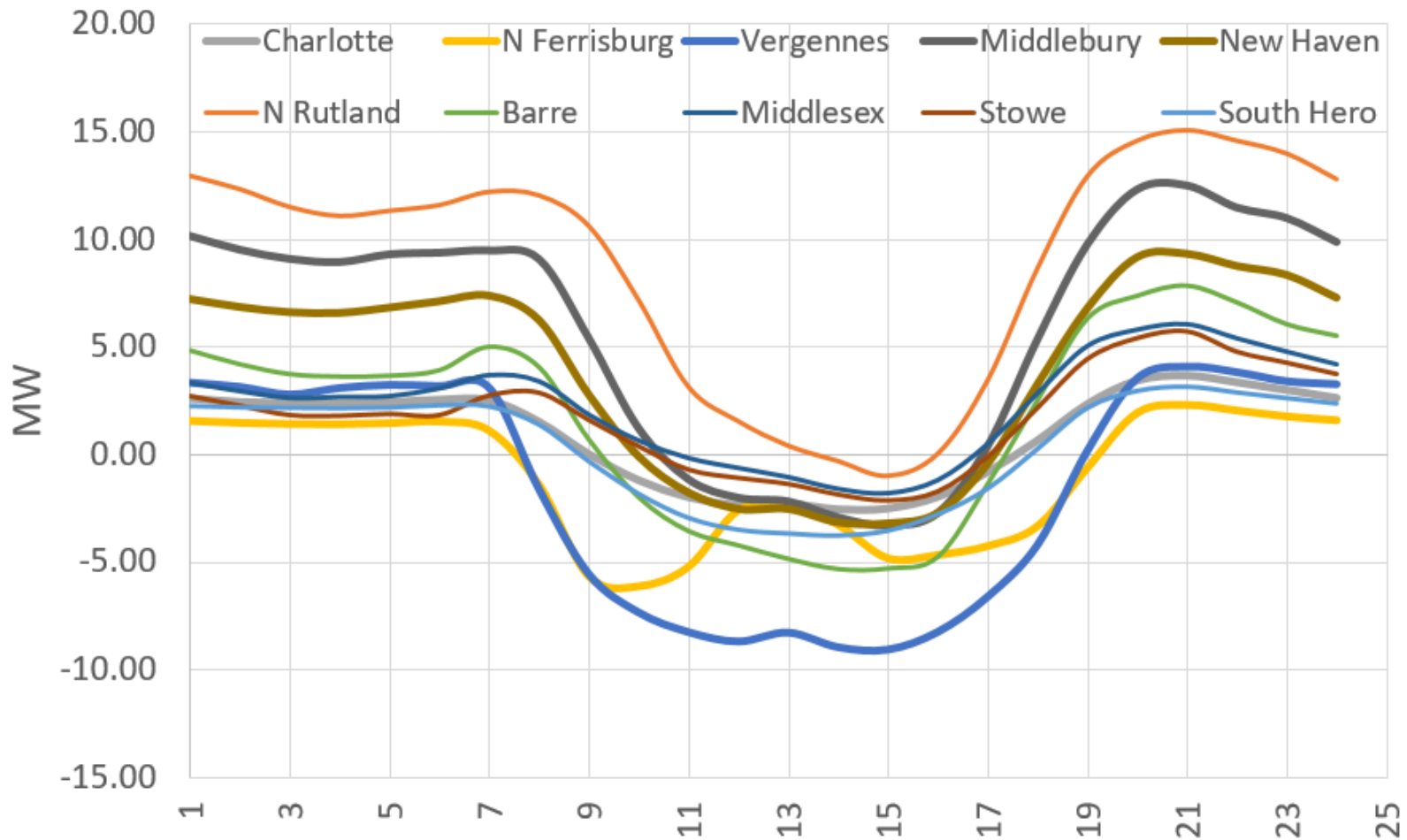




# Solar PV by zone as of 2019

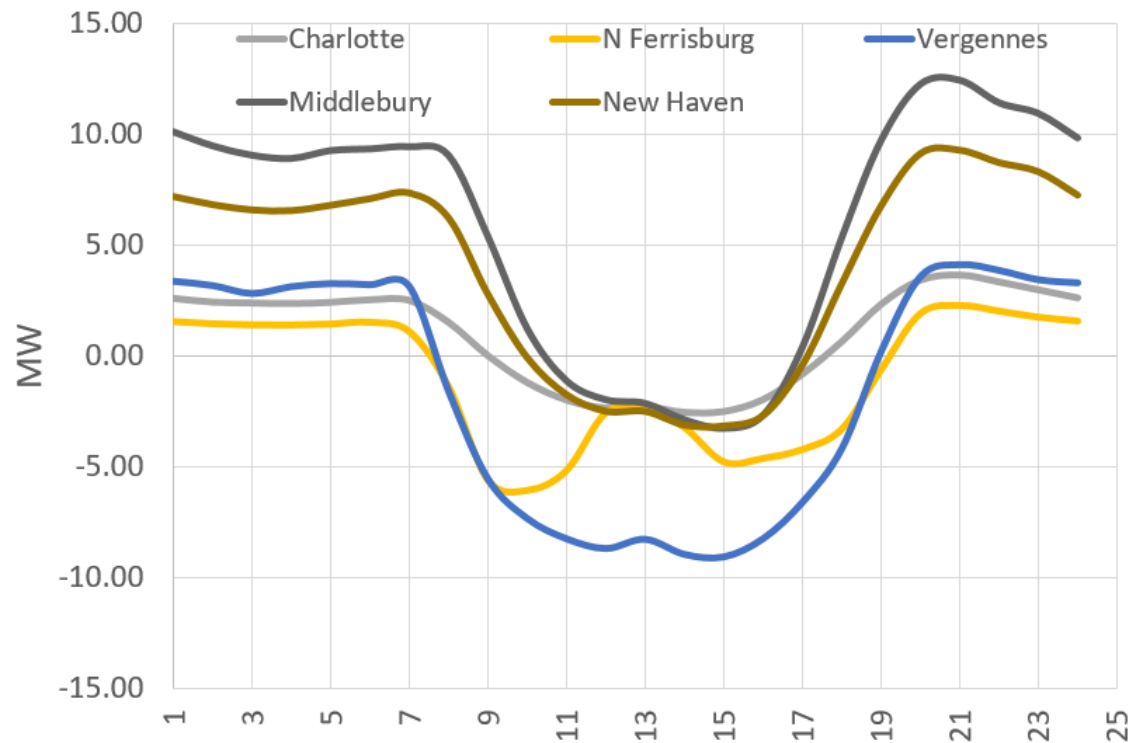
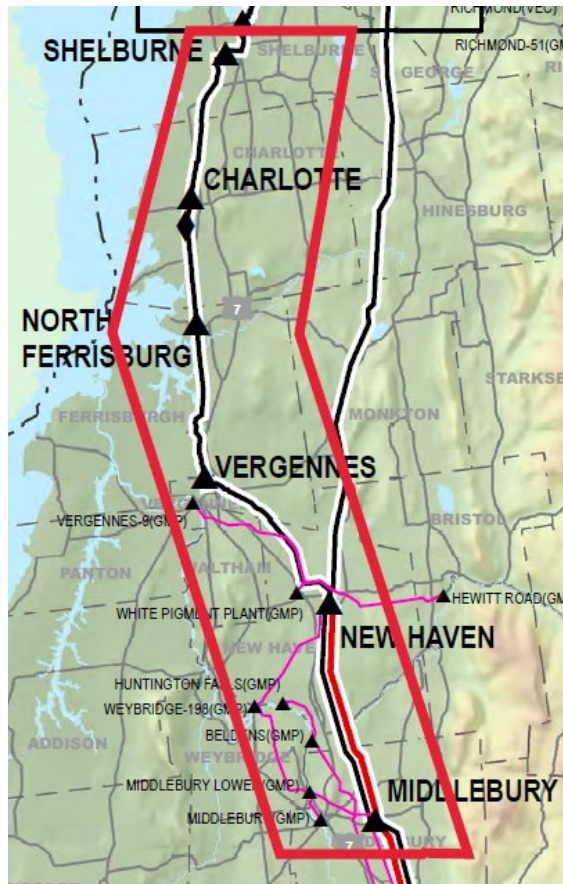


# Top 10 reverse power transmission substations





# DG affecting substation clusters



# ISO-NE concerned about cumulative impacts

- Ride-through, impacts on other generators, local and system wide impacts
- Projects  $\leq 1$  MW
  - Do not notify ISO-NE, who models DG as negative load based on ISO-NE solar PV forecast and bus load ratio share
- Projects  $\geq 5$  MW
  - Need study and approval – modeled as individual generator
- Projects  $> 1$  MW and  $< 5$  MW
  - Typical process is to notify ISO-NE of the project and model each project as an individual negative load
  - If total of 5 MW of DG collect up to an individual substation
    - Confirm no-adverse impact before submitting notification form
  - If total of 20 MW of DG collect up to an individual substation or a cluster
    - Model as generator and perform steady state, short circuit and stability studies – possibly PSCAD as well

# ISO-NE Planning Procedure 5-1

## 2.1 Generation Additions or Changes in Net Station Output

The following table describes the Proposed Plan Application requirements for all new generation or changes in station output that meet the defined conditions.

Generation Change <sup>234</sup>	Proposed Plan Application Required?	Study and Performance Requirements	Modeling Requirements
New or Increased Generation $\geq 5\text{MW}^5$	Yes	Requirements of Planning Procedure 5-6 and 5-3	Requirements of Planning Procedure 5-6
$\geq 5$ MVAR Unit or $\geq 10$ MVAR Station Change in Reactive Capability <sup>6</sup>	Yes	Requirements of Planning Procedure 5-6 and 5-3	Requirements of Planning Procedure 5-6
New or Increased Generation $>1\text{MW}$ and $< 5 \text{ MW}$	No. Notification Form only is Required – Unless the ISO identifies that a PPA is required	None, unless the ISO identifies that a PPA is required, in which case Requirements of Planning Procedure 5-6 and 5-3	None, unless the ISO identifies that a PPA is required, in which case Requirements of Planning Procedure 5-6
New or Increased Generation $\leq 1\text{MW}$	No	None	None

# ISO-NE clarified process in a memo

- Applies to projects  $> 1$  MW and  $< 5$  MW where the ISO has determined such projects will have a cumulative impact on the transmission system (Impact of new and existing DG)
- The transmission owner is responsible for scoping and conducting the study, in coordination with ISO-NE
  - The transmission owner should coordinate with ISO-NE early to determine if a transmission study is required
- ISO-NE communicates whether a study is required and what level of study is required
  - Level 1 (steady state transfer analysis) for 5 MW cumulative impact at a transmission substation
  - Level 3 (steady state, short circuit, stability, PSCAD for 20 MW cumulative impact at a transmission substation or cluster
- ISO-NE does not decide how DG projects are clustered or prioritized for study

[https://www.iso-ne.com/static-assets/documents/2019/10/iso\\_new\\_england\\_interconnection\\_review\\_process\\_information\\_resource\\_october\\_2019\\_final.pdf](https://www.iso-ne.com/static-assets/documents/2019/10/iso_new_england_interconnection_review_process_information_resource_october_2019_final.pdf)

[https://www.iso-ne.com/static-assets/documents/2019/10/iso-ne\\_presentation\\_ma\\_dpu\\_docket\\_19\\_55\\_technical\\_conference\\_october\\_3\\_2019\\_final.pdf](https://www.iso-ne.com/static-assets/documents/2019/10/iso-ne_presentation_ma_dpu_docket_19_55_technical_conference_october_3_2019_final.pdf)

**Notification of study requirements From:** Hantz Presume

**Sent:** Tuesday, September 17, 2019 3:40 PM

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**Subject:** Requirements for resource additions greater than 1MW



# Total existing DG > 1 MW at transmission substations

5 MW threshold exceeded in red

Substation totals	MW
Ascutney	3.175
Barre	13.415
Bellows Falls	1.79
Bennington	6.36
Charlotte	2
Cold River	8.06
Comerford	1.318
East Avenue	2.5
East Fairfax	1.5
Essex	18.6
Georgia	6.896
Hartford	11.79
Highgate	3.3
Irasburg	4.09
Middlebury	4

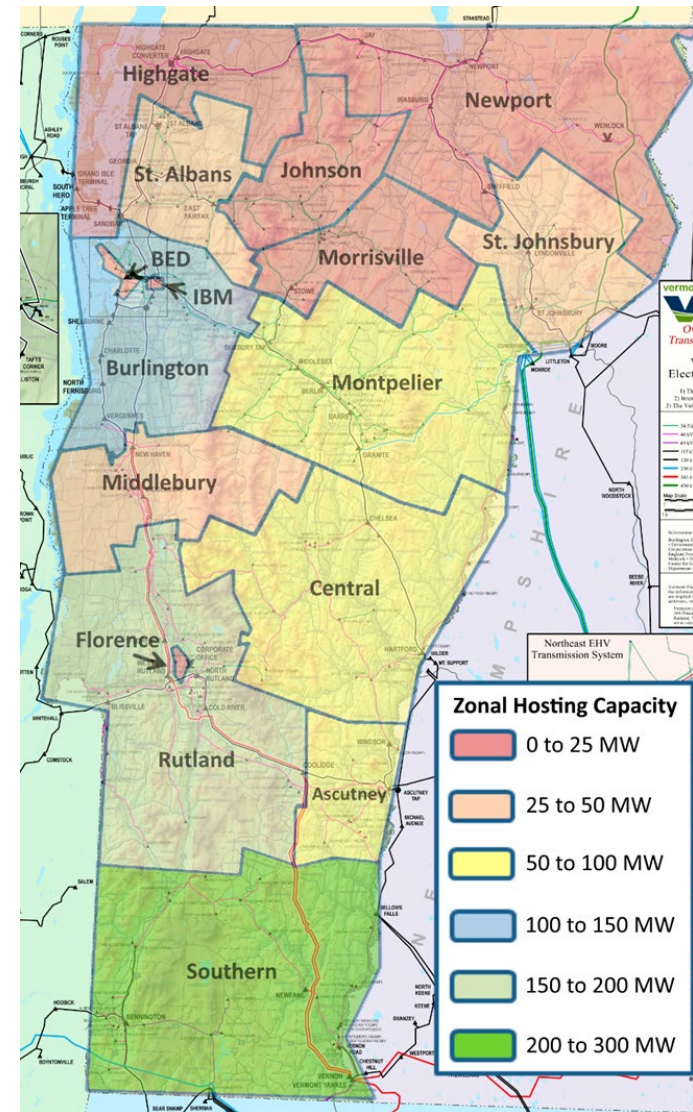
Substation totals	MW
New Haven	4.2
Newfane	4.356
North Ferrisburg	7
North Rutland	5.678
Queen City	1.55
Shelburne	2.12
South Hero	4.98
St Albans	6.9
St Johnsbury	2.1
Stowe	2
Tafts Corner	6.36
Vergennes	6.86
Vernon Road	6.98
Wilder or Hartford	2.17



# Total existing DG > 1 MW by zone

Proposed 1<sup>st</sup> cluster grouping in red

Zone totals	MW
St Johnsbury	2.1
Newport	4.1
Highgate	8.2
St Albans	15.3
Johnson	0
BED	2.5
Burlington	47
IBM	0
Morrisville	2
Montpelier	13.4
Middlebury	8.2
Florence	0
Rutland	15.6
Central	14.3
Ascutney	3.2
Southern	19.5



# Questions/considerations

- Process for determining when to start each cluster study
- Process for selecting which projects are in the cluster
- Process for requesting and verifying generator data
- Need to update Rule 5.500 to include cluster study requirement
- Need to update utility interconnection agreements to not allow connection without completion of cluster study
- Need a statewide cluster study agreement
  - Cost allocation of study cost – deposit – what happens when projects drop out
  - Cost allocation of system upgrades – what happens when projects drop out
  - What happens when there is a material project modification like a different inverter
  - Describe how we coordinate cluster study (DU, VELCO, ISO-NE, consultant)
- Proposal for DU generation queues to be transparent
- Proposal for the cluster to be large enough (20 projects or more) to reduce the per-project study cost
- How and when do we bring the Department into the discussion