



# New Generation Curtailment Analysis – Pilot Study Preliminary Results

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*Planning Advisory Committee*

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SYSTEM PLANNING



# Summary

- The ISO has been conducting a pilot study to analyze the potential curtailments that could be experienced by proposed new generation
  - Where large amounts of new intermittent generation are proposed in the same part of the system
- The pilot study has focused on the addition of offshore wind on Cape Cod and at Brayton Point
- This presentation provides preliminary results and allows for discussion before finalizing the pilot study



# Purpose of the Study

- The purpose of the study is to provide information
  - To allow Market Participants to assess the impacts of the operating characteristics and availability criteria of proposed incremental resources
- No resulting changes to the interconnection standards or criteria are proposed at this time
  - Whether, or not, changes to the interconnection standards or criteria are warranted, can be discussed with the Planning Advisory Committee and with NEPOOL after a review of the results of the pilot study



# Background

- The Network Capability Interconnection Standard identifies the upgrades needed for a new project to operate at the full output
  - However, the standard allows for other generation to be dispatched-down in the analysis
- The Capacity Capability Interconnection Standard identifies the upgrades needed for all capacity resources to operate at their capacity capabilities
  - The capacity capability of intermittent resources is based on the median output over certain reliability hours
    - In summer, approximately 30-35% of the full nameplate capability for offshore wind
- However, there may be many instances where the wind farms are producing more than 35% of their combined output
  - Neither standard analyzes all of the new intermittent resources operating at up-to full output



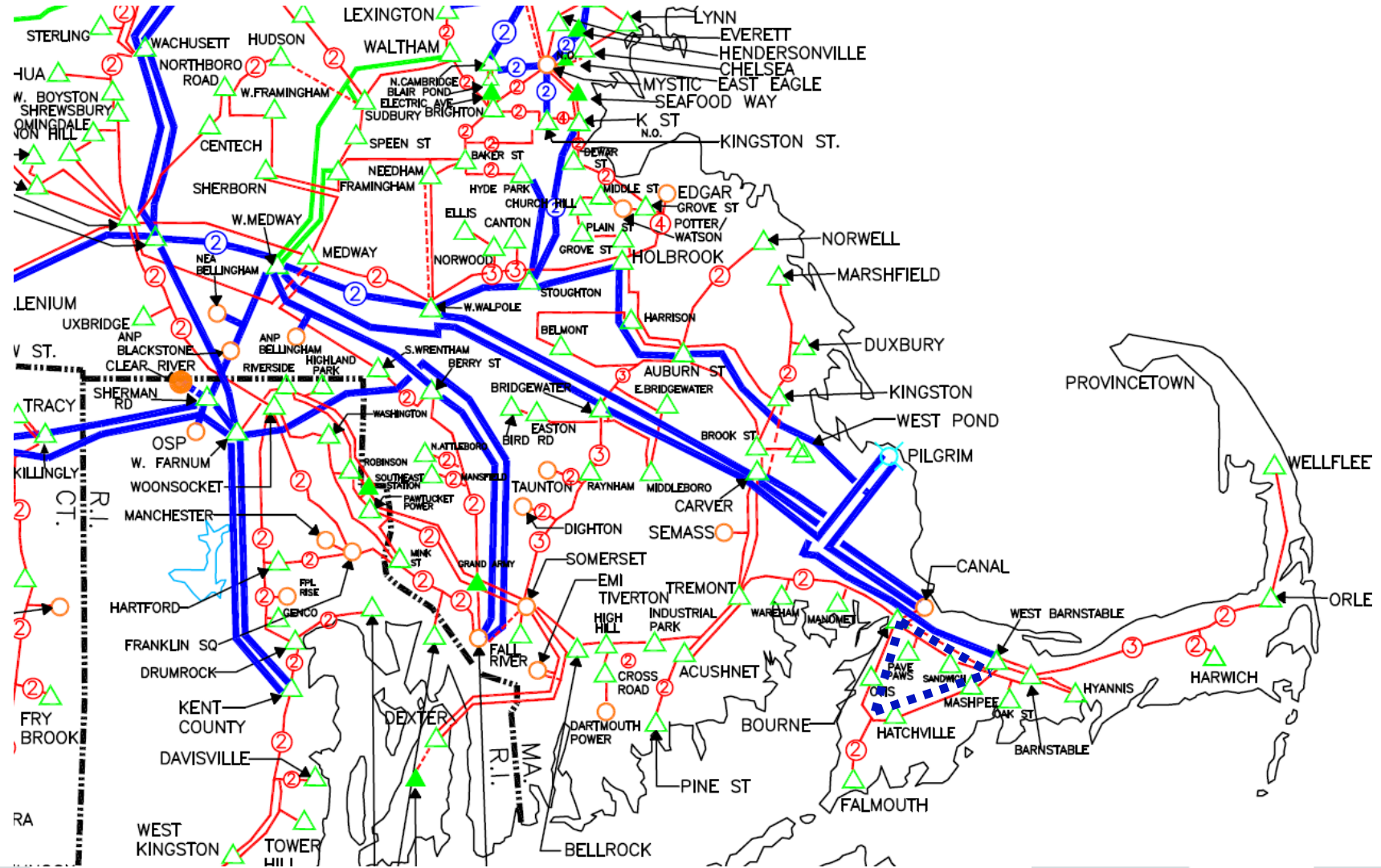
# CURTAILMENT ANALYSIS PILOT STUDY

## *Approach and Assumptions*

# Curtailment Analysis Pilot Study: Approach

- Considered year-round hourly load levels
  - 2025 study year including solar forecast
  - Net load in Southeast Massachusetts (SEMA) and Cape Cod continues to be offset by solar additions and is highly seasonal
- Was simplistic from a production cost perspective
  - Curtailment analysis focused on new offshore wind competing with other new offshore wind and increasing levels of solar
  - Dispatch order: solar was dispatched on first, then offshore wind, then other generation
  - The key metric in the study is curtailed MW and MWh of offshore wind
  - PROBE software was used
- Considered transmission outages
  - Simulated forced and planned outages of transmission caused reductions in the ability of the generation to run

# Study Area: Southeast Massachusetts

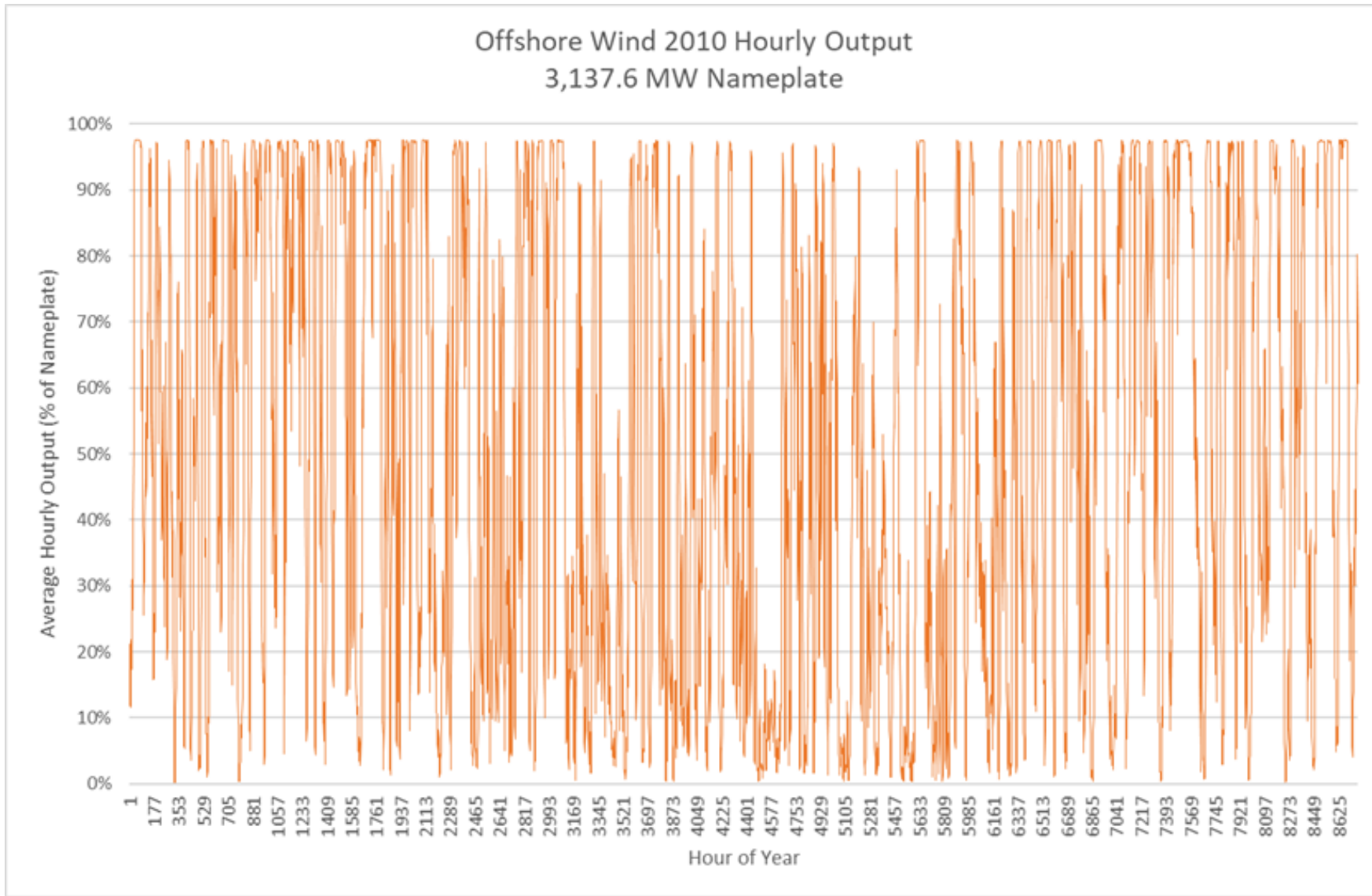


# Generation Injections

- Offshore wind:
  - Up-to 3,200 MW into the Cape Cod area
    - With injection points consistent with the Cape Cod cluster studies
  - Up-to 2,000 MW into Brayton Point
- Hourly offshore wind production profiles

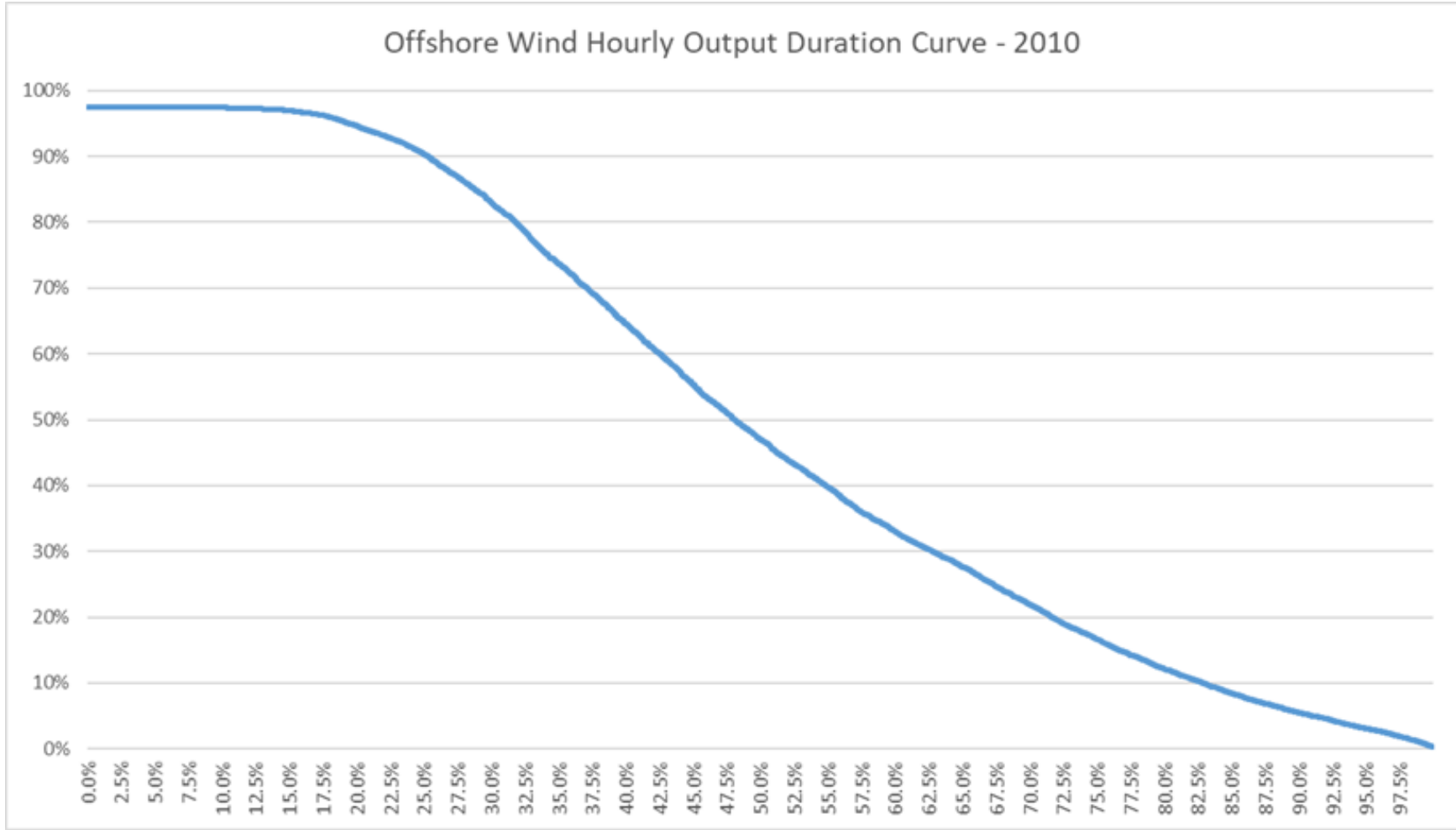






Illustrative





Illustrative



# Transmission Upgrades Included

- All SEMA/RI Project reliability upgrades
- All upgrades identified in completed interconnection system impact studies for the relevant offshore wind projects and all upgrades anticipated for the first Cape Cod cluster system impact study



# Contingencies, Transmission Outages and Maintenance

- Operating Contingencies
- N-1 and N-1-1 simulation
- Some illustrative maintenance outages of major 345 kV lines in Spring and Fall were also tested

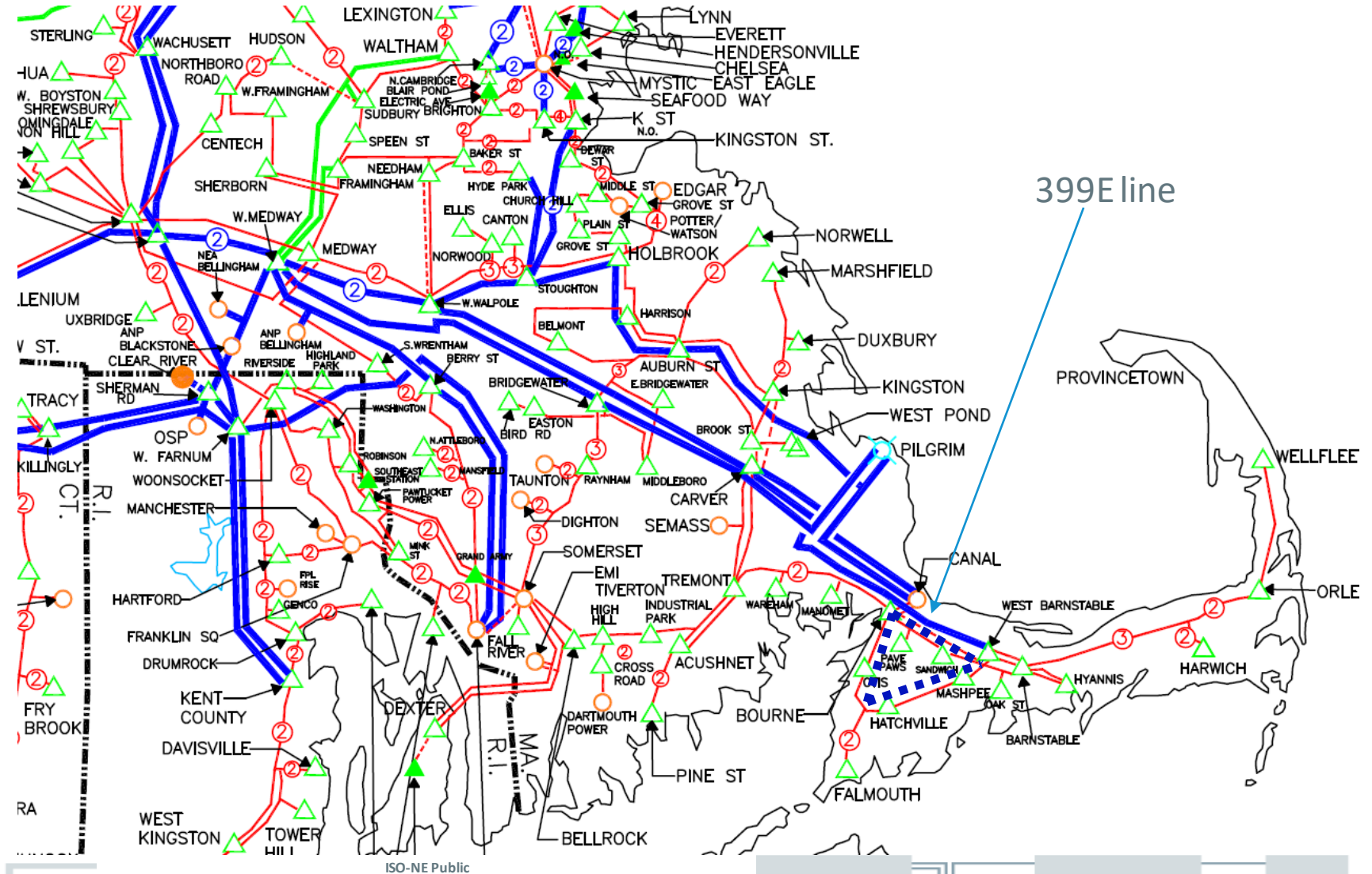


# CURTAILMENT ANALYSIS PILOT STUDY

*Preliminary Results*

# Study Area: Southeast Massachusetts

- A number of lines in the area have the potential to be binding and cause curtailment
- The 399E 345 kV line from West Barnstable to Bourne was the most limiting for injections on Cape Cod

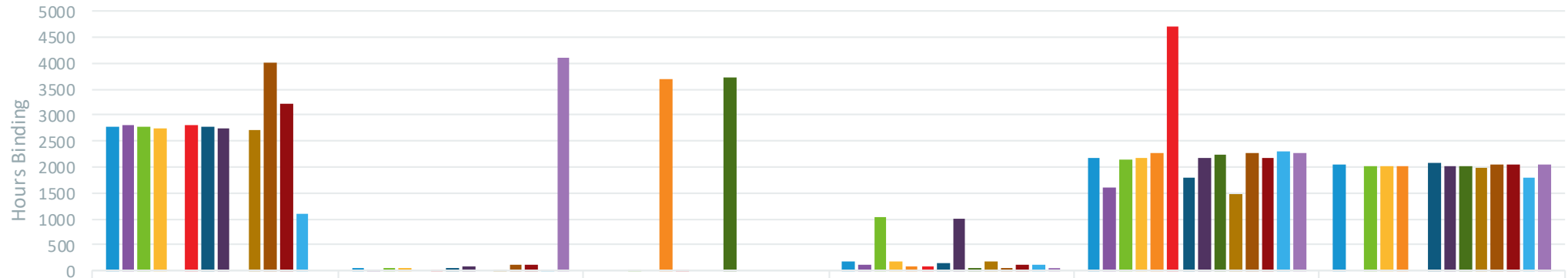


# Limiting Constraints and Upstream constraints

- In the production simulations, generation will be constrained by the limiting constraint
- However, if that constraint is relieved (e.g. by investigating what would happen if the line was upgraded), we see that upstream constraints will then become limiting
- There may not be significant benefit from just upgrading a single line
  - The analysis has to be re-run after each upgrade to examine remaining upstream constraints



# Hours of Curtailment with 399E Line at the Present Rating

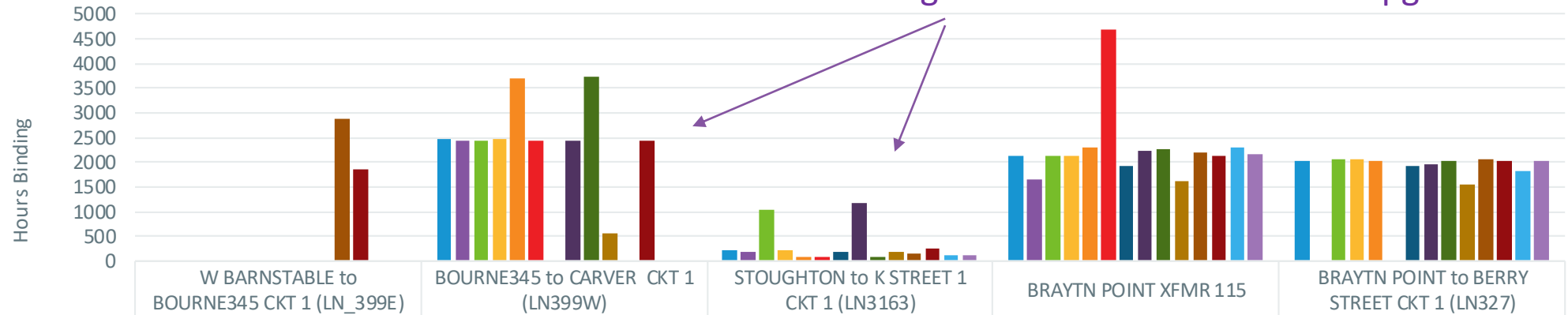


	W BARNSTABLE to BOURNE345 CKT 1 (LN399E)	W BARNSTABLE to BOURNE345 CKT 2 (LN399NEW)	BOURNE345 to CARVER CKT1 (LN399W)	STOUGHTON to K STREET 1 CKT 1 (LN3163)	BRAYTN POINT XFMR 115	BRAYTN POINT to BERRY STREET CKT1 (LN327)
base_case_no_maintenance	2765	67		185	2177	2038
lo_315	2795	41		128	1608	
lo_3162	2768	66	1	1026	2158	2025
lo_322e	2761	72		168	2177	2024
lo_322w			3692	86	2286	2011
lo_327	2821	9	10	82	4696	
lo_331	2782	43		145	1809	2066
lo_337	2731	101		996	2183	2005
lo_342w			3718	72	2248	2024
lo_344	2720	35		191	1496	1995
lo_345fb	3997	117		57	2277	2040
lo_345wf	3208	131		127	2167	2054
lo_356	1115	34		106	2297	1791
lo_399e		4115		60	2268	2041



# Hours of Curtailment with 399E Line Upgraded (From 1,083 MVA to 1,800 MVA)

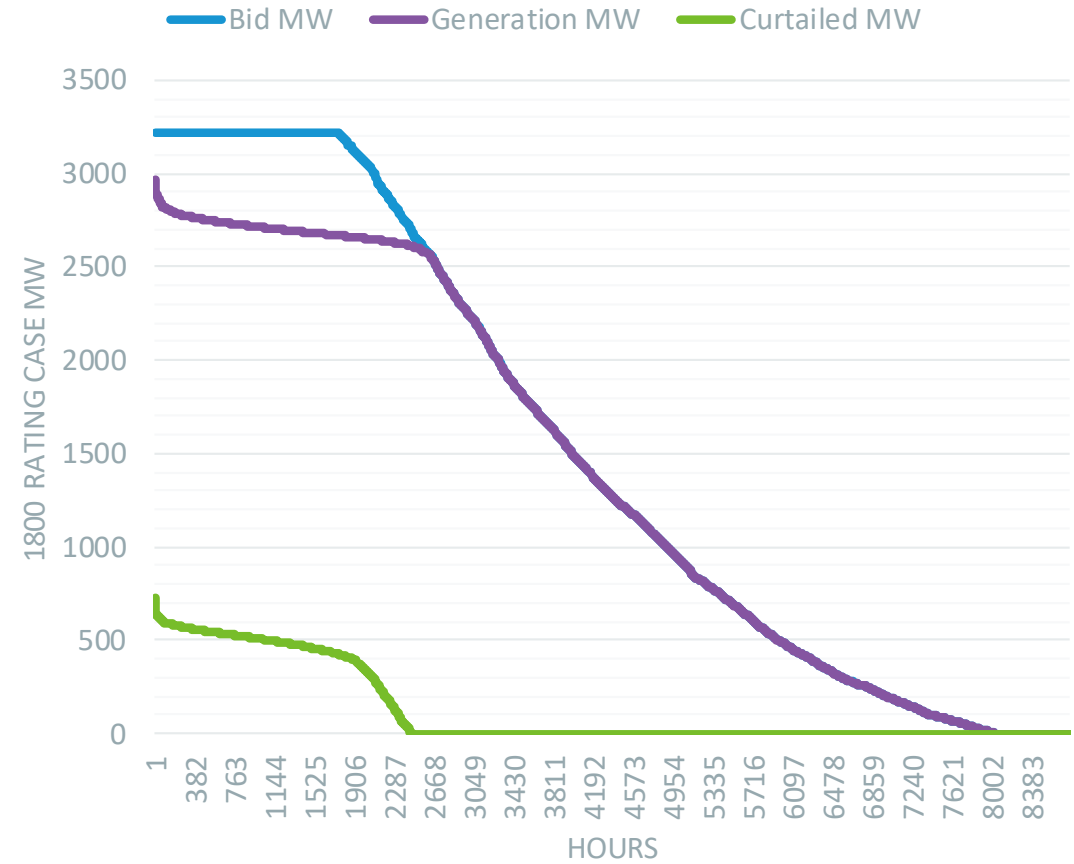
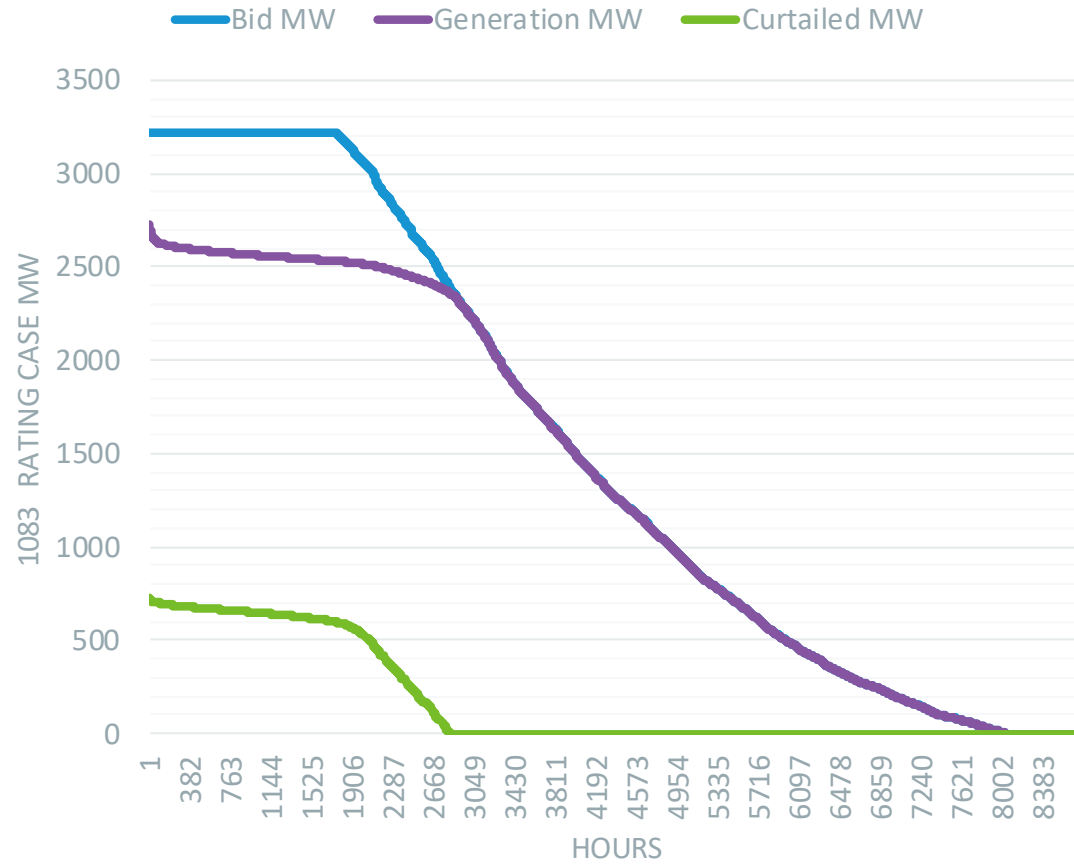
Observation: The hours when other lines are constraining have increase after 399E is upgraded



	W BARNSTABLE to BOURNE345 CKT 1 (LN_399E)	BOURNE345 to CARVER CKT 1 (LN399W)	STOUGHTON to K STREET 1 CKT 1 (LN3163)	BRAYTN POINT XFMR 115	BRAYTN POINT to BERRY STREET CKT 1 (LN327)
base_case_no_maintenance_1800		2454	225	2133	2036
lo_315_1800		2451	170	1653	
lo_3162_1800		2452	1045	2126	2048
lo_322e_1800		2453	231	2132	2047
lo_322w_1800		3692	86	2286	2011
lo_327_1800		2438	68	4697	
lo_331_1800			173	1908	1938
lo_337_1800		2451	1157	2216	1957
lo_342w_1800		3718	72	2248	2024
lo_344_1800		557	169	1609	1559
lo_345fb_1800	2863		132	2184	2055
lo_345wf_1800	1848	2451	235	2138	2013
lo_356_1800			104	2292	1822
lo_399e_1800			127	2168	2036

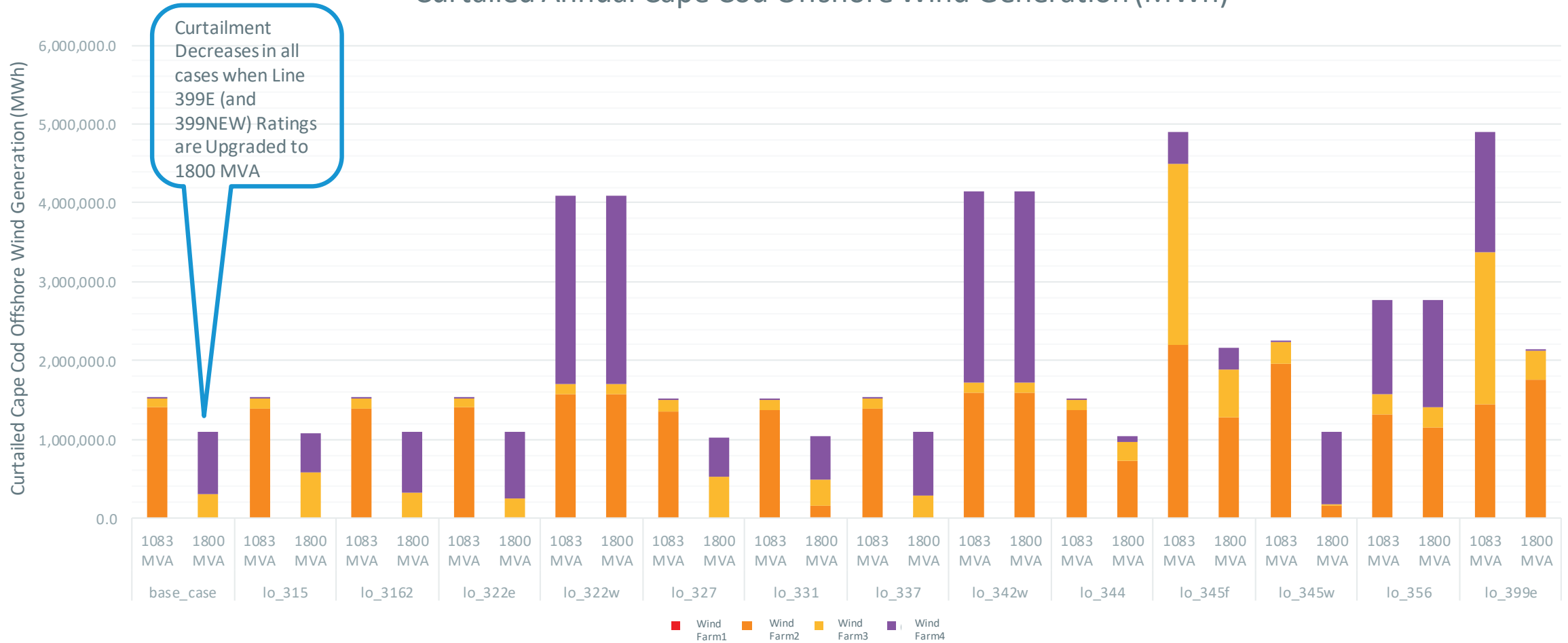
# Upgrading the 399E Line Reduces Curtailment But Other Lines are Still Limiting

Cape Cod Offshore Wind Generation



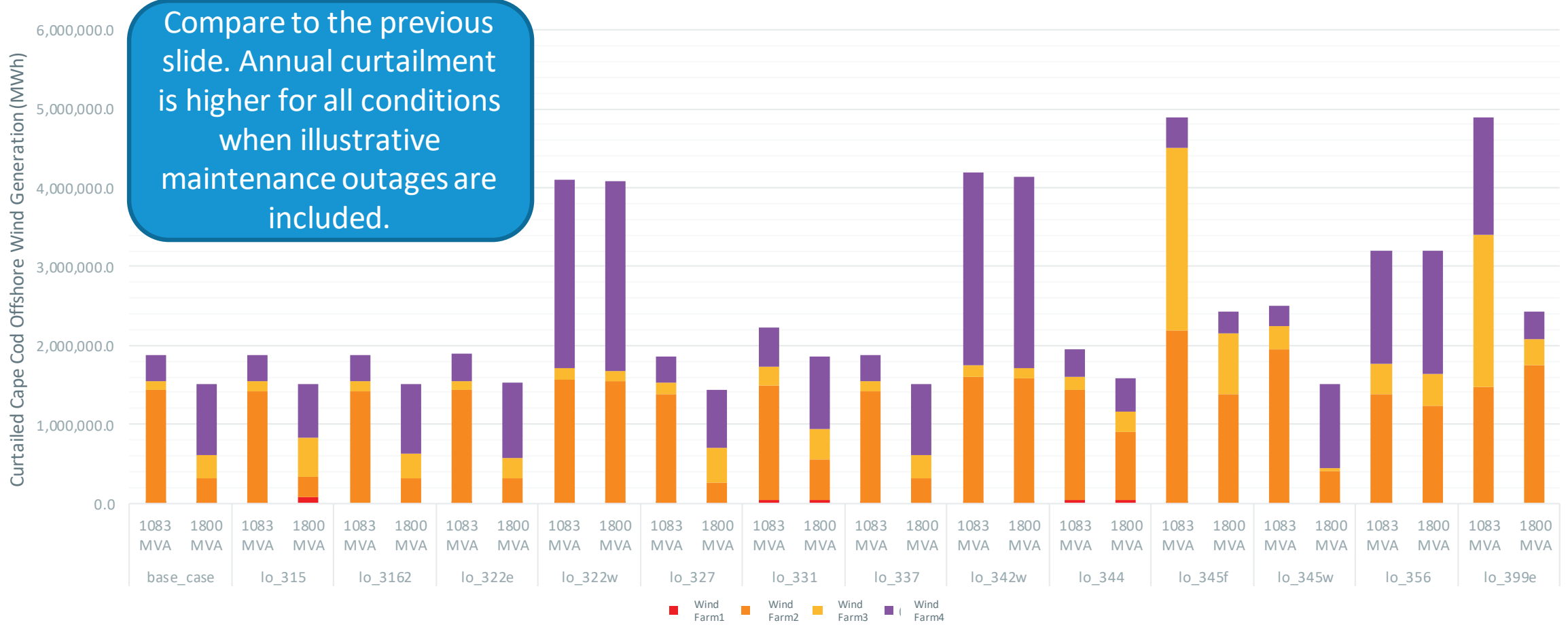
# Curtailment Under Base and Line Out Conditions

Curtailed Annual Cape Cod Offshore Wind Generation (MWh)



# Curtailment Under Maintenance and Line Out Conditions

Curtailed Annual Cape Cod Offshore Wind Generation (MWh)



# Next Steps

- Consider input from the Planning Advisory Committee regarding the approach to the Curtailment Pilot Study
- Consider the effect of the proposed [change to the K Street 345 kV breaker status](#)
- Conclude the Pilot Study by the third quarter of 2022



# Questions

