October 9, 2020

Comments of Anbaric Development Partners, LLC on Future Grid Consensus Document

Anbaric is submitting these comments regarding the September 29, 2020 presentation "Future Grid Study, Scope, Metrics, and Developing a Straw Proposal" ("September 29 Presentation").

I. Transmission System Assumptions

As noted in Anbaric's "Future Grid" study submission to the joint Reliability Committee and Markets Committee, assumptions for transmission topology will have a significant impact on modeling the possible resource mix of the system, the reliability of that system, and the amount and type of resources that are curtailed or "spilled" for that system to function. Slide 11 of the September 29 Presentation seeks input on transmission and whether the needed grid expansion is looked at as part of a Future Grid study. Understanding the transmission needs for a future grid will be critical to modeling a future system and, thus, answering questions about resource needs and whether markets can deliver those needs.

The power system functions based on the capabilities of the transmission system. Market signals can work or be rendered ineffective depending on whether there are facilities for resources to interconnect to, whether there are transfer limits between zones, what the capability of the transmission system is to address issues like low or high voltage across a range of dispatches, etc. Whether a power system can operate reliability or not will be a function of the transmission it has to function.[1] A just-published final economic study report[2] by ISO New England, Inc. ("ISO-NE") shows the dramatic impact assumed transmission can have when evaluating future grid scenarios. The study report, which was based on a request from Anbaric to look at the impact of 8 to 12 GW of offshore wind on three areas,[3] demonstrated that the amount and usability of renewable energy will depend greatly on points of interconnection, i.e. the choices made about how to utilize the transmission system.

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[1] Understanding the transmission system that will be needed for a Future Grid is therefore not a complexity that is unlikely to shed light or resource or operational reliability needs, but the starting point for such an analysis.

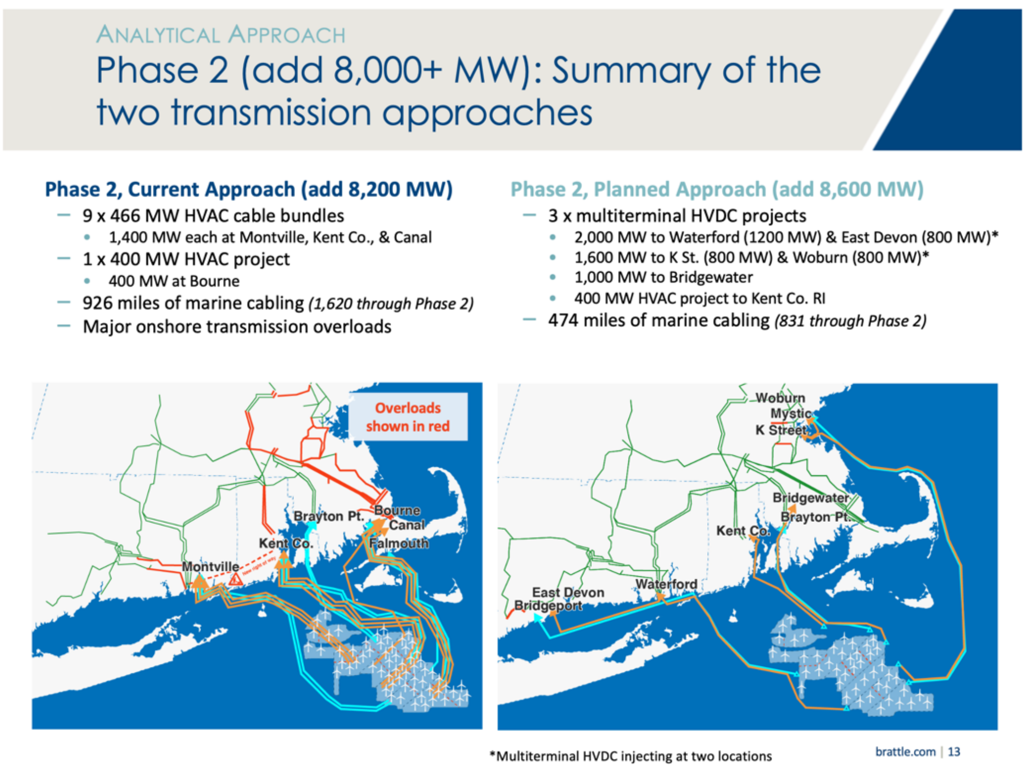
[2] https://nam11.safelinks.protection.outlook.com/?url=https%3A%2F%2Fwww.iso-ne.com%2Fstatic-assets%2Fdocuments%2F2020%2F10%2F2019-anbaric-economic-study-final.docx&data=01%7C01%7Ctparadise%40anbaric.com%7C8c3b80ceeffc4cac5e6408d86b053b53%7C611e29a19dfb4000b93dc977a07a2298%7C0&sdata=mod3G1DQfyAGMQITC%2BTtoVXSssnXACBnVm0oHVOSlzE%3D&reserved=0 ("2019 Anbaric Economic Study Report") *See also* the related Economic Study – Offshore Wind Transmission Interconnection Analysis, June 16, 2020 at https://www.iso-ne.com/static-assets/documents/2020/06/a4_2019_economic_study_offshore_wind_transmission_interconnection_analysis.pdf

[3] Anbaric asked ISO-NE in its April 1, 2019 economic study request to the Planning Advisory Committee to look at the impact of 8, 10, and 12 GW of offshore wind on system production costs, carbon dioxide emissions, and reliability benefits resulting from the diversification from the current overreliance on natural gas. ISO-NE declined to look at the final area regarding reliability, but did examine production cost and emissions impacts. https://www.iso-ne.com/static-assets/documents/2019/04/anbaric_2019_economic_study_request.pdf

ISO-NE's 2019 Anbaric Economic Study Report shows significant benefits to the New England system and consumers from the integration of 8,000 MW of offshore wind:

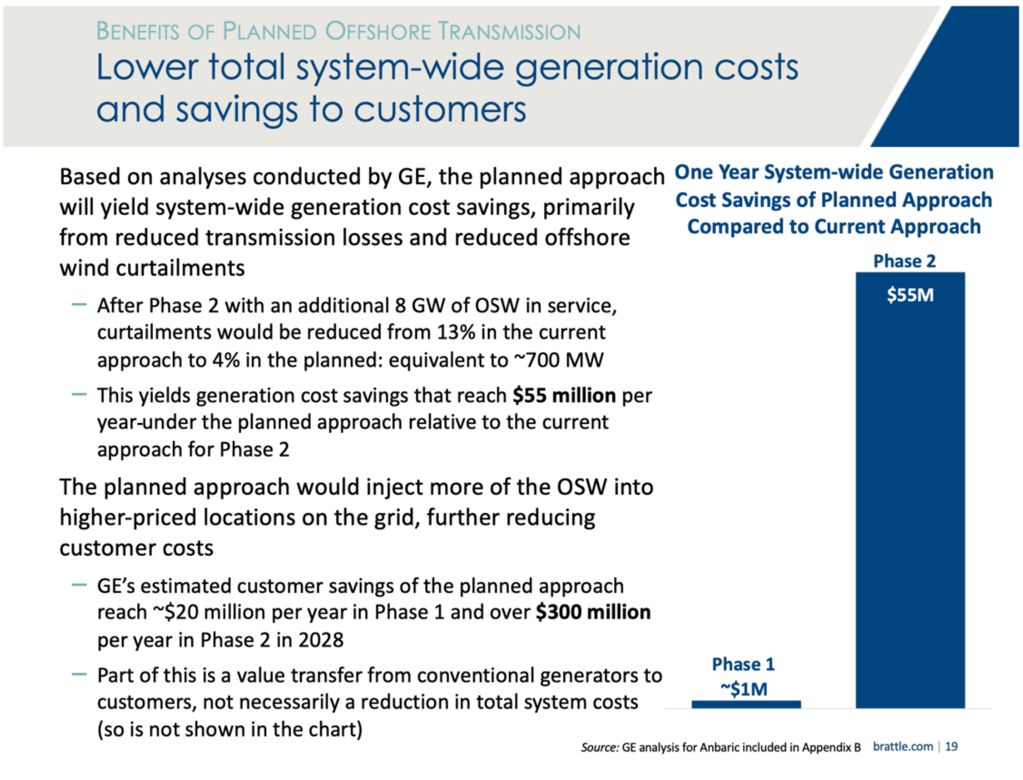
- The reduction of systemwide production costs by <u>one-half</u> with 8,000 MW of offshore wind
- The reduction of carbon dioxide emissions by <u>one-third</u> with 8,000 MW of offshore wind[4]

However, that study also showed increasing curtailment if offshore wind is largely connected into Southeast Massachusetts and Rhode Island ("SEMA/RI") area, and that even the 8,000 MW required material onshore transmission upgrades above 5,800 MW. Another recent study by The Brattle Group, GE Energy Consulting, and CHA Consulting demonstrated that by planning transmission, over 11,700 MWs of offshore wind could be integrated before significant onshore transmission upgrades are required.[5]



[5] Brattle/GE/CHA New England Transmission Study at slide 13. This work, including referenced slides, was presented by Brattle and GE to the joint Reliability and Markets Committee at the August 4, 2020 meeting. The 8,600 MW referenced on this slide is in addition to the starting point base case of 3,112 MWs already procured by states at the time of the study. The injection depicted totals: 11,712 MW without significant onshore transmission upgrades. https://brattlefiles.blob.core.windows.net/files/18939_offshore_transmission_in_new_england_-the_benefits_of_a_better-planned_grid_brattle.pdf

More importantly for the future grid study, the planning of transmission to bring wind to load centers dramatically reduced curtailment,[6] showing large consumer and system benefits at levels well above 8,000 MWs. This is in contrast to what was observed with the SEMA/RI concentrated points of interconnection in the NESCOE economic study and 2019 Anbaric Economic Study Report.



Thus, in looking at what resource mix will be needed and the system security / reliability of the grid, the amount of effective renewable resources is a function of the transmission system assumptions. For this reason, the Future Grid should not just rely on assumptions that wind will interconnect to suboptimal locations as set out in either the Anbaric or NESCOE economic studies, but may in fact play a much larger role for the region, enabled by a more robust transmission system. The future grid.

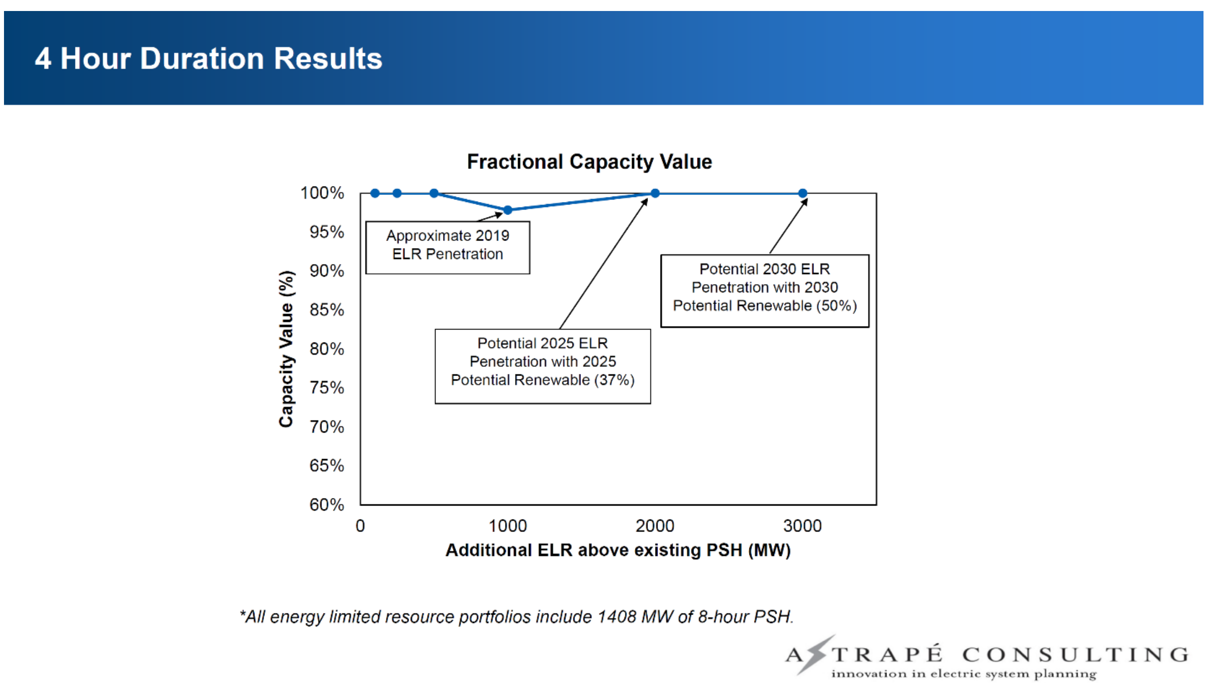
II. Storage Assumptions

In the context of Future Grid modeling, storage as an asset class has some attributes that make it difficult to model the full system value of storage (beyond its economic value via

[6] *Id.* at slide 19. "Phase 2" referenced on the slide is with the injection of 11,712 MW of offshore wind. To meet regional goals, offshore wind is likely in the 25 GW (identified by Massachusetts) or 40 GW (identified by Brattle) range, where transmission design could have an even more dramatic effect on curtailment or maximizing offshore wind and power system reliability.

dispatch into the market). Storage is an asset that has system value to operating the transmission system (hence one that might receive tariff-based compensation), but also can be modeled as a market participant helping to manage curtailment of renewable resources in a least cost resource mix for various levels of decarbonization. Modeling that determines the optimal mix of resources that only recognizes one of the various types of value that storage provides is not an economically efficient solution (over-deploys resources at higher total system cost).

Anbaric agrees that probabilistic reliability/resource adequacy assessments are appropriate. When looking at resource adequacy ("RA") modeling for a Future Grid with high renewable penetration, it is important to structure the modeling assumptions properly to recognize the interaction between variable renewables and storage resources. In NYISO capacity value analyses, Astrapé's SERVM model has shown that four-hour battery storage retains 100% capacity value with higher penetrations of storage as long as the generation mix includes more variable renewables (see below).



This resource adequacy model provides capacity value as an output (rather than effective load carrying capability). Either approach can be effective for evaluating RA related to storage resources, but it is important to use a wide range of weather years for load shapes used in the analyses, as well as fine-tuned outage modeling assumptions. For RA modeling (as well as many other potential types of modeling), the value of storage is often best elucidated via 8760 hourly modeling rather than using simplifications that collapse variability to average daily curves by season or an assortment of representative daily loads (both of those approaches miss some of the nuance of modeling the role of storage in high renewables resource mixes – e.g. when fossil resources are 40% or less of the annual energy generation mix). Further, it is also important to avoid artificially broad daily shoulders in 8760 load profiles by scaling the profiles to hit higher annual load cases – this perniciously undervalues storage capacity value because the breadth of daily peak shoulders impacts the amount of storage that a model might predict is needed (or call for more traditional resources to substitute for storage additions). As a result, the load-related modeling assumptions identified on slide 13 should rely upon a wide range of weather years (and consequently many modeling runs to produce results) and special care should taken when scaling up weather years to represent high load cases for Future Grid modeling.

When analyzing transmission stability and expansion, Anbaric has seen that non-traditional assets can have value and that value is often quantified best by completing probabilistic power flow analyses in addition to deterministic modeling. This approach to system modeling can often improve the value attributed to assets such as storage.