Counterflow

By Steve Huntoon

Apples and Oysters

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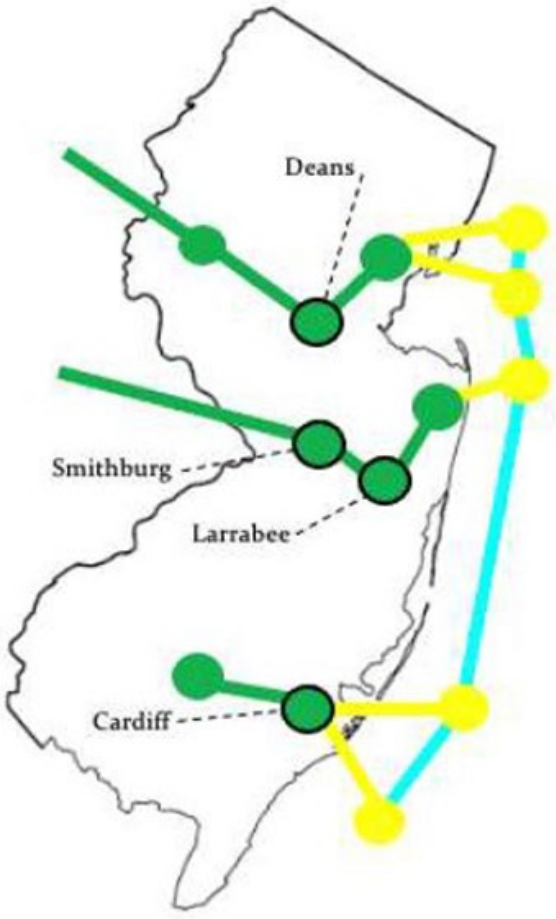
In my last column[1] I discussed the importance of retaining participant funding for generation interconnection — a long-standing foundational principle in all the RTOs. It ensures economic siting of new generation and thus economic deployment of new resources. It is fundamentally fair as new generation benefits from existing transmission "headroom" paid for by others, just as new generation may create new headroom used by others in the future. I also explained how a study by the ICF consultancy, purporting to support the end of participant funding, actually supports the opposite conclusion. Finally, I showed that FERC's reasoning given in its Advance Notice of Proposed Rulemaking (ANOPR) on transmission planning for ending participant funding had four fatal flaws (*RM21-17*).

Another Day, Another Study

On the eve of the due date for filing comments on the ANOPR another study appeared. This one also paid for by the renewable energy industry, with the Brattle consultancy the lead author. (See *New Tx Study Calls for Holistic Planning Across Regions*.)

I will spare you point-by-point commentary on Brattle's 105 pages (some of which I actually agree with), but I do want to address the study's focus on a recently released PJM offshore wind analysis. This Brattle study, like the ICF study I previously discussed, does *not* undercut the case for participant funding. As I explain in (agonizing) detail below, the crux of the matter is that Brattle uses a number for transmitting offshore wind that does not include the cost of delivering the wind to onshore, inland substations.



A PJM analysis done at the request of the New Jersey Board of Public Utilities assumes that most offshore wind will be interconnected at inland substations, where there are lots of high voltage transmission lines and lots of load to absorb generation. | *NJBPU*

Into the Weeds!

Brattle says individual PJM interconnection studies of offshore wind show network upgrade[2] costs of $6.4 billion to interconnect 15.5 GWs.[3] Per the math Brattle says this is more than $400/kW to interconnect new offshore wind.

Brattle then contrasts that with a recent, single PJM analysis showing network upgrade costs of $3.2 billion to interconnect 17 GWs.[4] Per the math this is $188/kW to interconnect new offshore wind.

Aha! Brattle says. Studying project interconnections individually costs more than double ($400/kW v. $188/kW) than when using a "proactive region-wide study." A poster child for "holistic" planning!

Being a glutton for punishment, I waded through the 59 offshore wind interconnection studies posted on the PJM website,[5] and reviewed the PJM analysis and its history.

Let's Start with New Jersey

The biggest flaw in the Brattle study concerns the New Jersey numbers. There, individual interconnection studies for active (not withdrawn) projects[6] show network upgrade costs of $3.3 billion to interconnect 7.4 GWs. In contrast, the PJM analysis shows network upgrade costs for the three New Jersey transmission owners of $0.4 billion to interconnect 7.6 GWs.

So, you're thinking, $3.3 billion versus $0.4 billion, this holistic study stuff is amazing! But no. The individual studies bring the offshore wind to *coastal* substations, while in the PJM analysis PJM assumes (per direction from the New Jersey Board of Public Utilities) that the bulk of the offshore wind will be interconnected at *inland* substations, shown on the inset map on slide 47 of deck *here*, where there are lots of high voltage transmission lines and lots of load to absorb generation. Thus, few network upgrades are needed to accommodate injections at the inland substations.

But the rub is that you have to get the offshore wind to these inland substations. The PJM analysis includes *zero* cost for that.

How much would it cost to move 5.5 GWs[7] inland, with the added cost of using HVDC transmission instead of HVAC transmission? I have no idea, but NREL says HVDC-HVAC converter stations run about $367 million a copy,[8] and it looks like New Jersey would

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need around six of them. HVDC transmission lines through densely populated New Jersey would be on top of that.

Bottom line, the PJM analysis eliminates almost all network upgrade costs by assuming offshore wind arrives at inland substations at zero cost. This does not mean the PJM analysis is wrong, it means inland injection network upgrade costs cannot be compared with coastal injection network upgrade costs.

Moving On to Virginia/North Carolina

Now that we understand the New Jersey mismatch, the PJM results for other states will make some sense. Starting with Virginia/North Carolina, active individual interconnection studies show upgrade costs of $948 million to interconnect 5.0 GW of offshore wind. That comes to $190/kW.

The single PJM analysis shows transmission owner (Dominion) upgrade costs of $1.9 billion to interconnect 7.8 GWs. That comes to $243/kW — actually more than the individual studies' cost per kW. So much for the Brattle take.

Virginia/North Carolina Case Study for Averting Customer Disaster

Virginia/North Carolina also gives us a great example of how participant funding can avert customer disaster. The project developer proposing 2.4 GWs of injection on the Birdneck-Landstown circuit originally proposed to inject at the Virginia Beach substation. According to the PJM studies, the former costs $736 million in network upgrades and the latter costs $1.9 billion in network upgrades.[9]

In the absence of participant funding, the developer would have had no reason to change the point of injection (which it did a month after receiving the PJM studies for the initial, high-cost point of injection). Customers would have paid more than $1 billion extra in socialized transmission costs. Not good.

And Delaware and Maryland

For its single analysis PJM assumes all 1.6 GWs are injected at Delmarva's Indian River substation. The three active interconnection requests for that substation show upgrade costs of $677 million to interconnect 1.1 GWs.[10] The PJM analysis shows transmission owner upgrade costs of $711 million to interconnect the 1.6 GWs.[11] There is a difference in cost per kW but it can't be meaningful because the Delmarva-only upgrade costs are $180.6 million for the individual studies' 1.1 GWs, and $53.7 million for the PJM analysis of 1.6 GWs. This isn't possible for injections at the same substation assuming all else is equal. So idiosyncrasies in modeling, rather than planning fundamentals, must be the difference.

Wrapping Up

The Brattle's study reliance on a PJM analysis to claim that holistic, regional planning yields much less network upgrade costs than individual interconnection studies is unsound. The cost per kW difference that Brattle relies on comes exclusively from New Jersey offshore wind, where the PJM analysis assumes that offshore wind is brought inland at *zero* cost.

The other states present a mixed picture, as well as a great example of why we don't want developers to be indifferent to network upgrade costs. Which they would be if participant funding were replaced by socialized transmission cost allocation.

A Postscript on Claimed Benefits for Load

Like the ICF study, the Brattle study claims network upgrades can benefit load, citing a PJM slide about congestion relief, etc. Brattle twice uses the word "substantial" in its characterization of the PJM benefits slide, a word that doesn't actually appear on the slide.[12]

But more fundamental to the participant funding subject is that there is no reason to think that uneconomic network upgrades provide more load benefits than economic network upgrades, or somehow contribute extra benefits that would outweigh the extra cost to load. And that's the point.

And a Post-postscript on 'Holistic' Planning

It's a recipe for chaos. Revealing was this passage in a PJM FAQ about the NJBPU solicitation for transmission proposals:[13] "PJM and NJBPU will not provide a numerical weighting or metric for evaluation criteria … Participants are encouraged to provide sufficient responses in their proposal submission to enable PJM and the NJBPU to properly consider all evaluation criteria."

If I might translate, PJM and the NJBPU won't say how they will weigh the many evaluation criteria under this "holistic" approach. Instead, project sponsors must guess what PJM and the NJBPU might end up thinking and provide "sufficient responses" for PJM and the NJBPU to "properly consider all evaluation criteria." If that is the future of transmission planning, we might as well turn everything back to transmission owners' tender mercies. ■

[1] Available here, https://www.energy-counsel.com/docs/participant-funding-and-its-discontents.pdf, and here, https://www.rtoinsider.com/articles/28723-counterflow-participant-funding-discontents.

[2] Network upgrades upgrade the grid – they do not include the cost of direct connection of the project to the nearest substation or transmission line (aka circuit).

[3] https://www.brattle.com/wp-content/uploads/2021/10/Transmission-Planning-for-the-21st-Century-Proven-Practices-that-Increase-Value-and-Reduce-Costs.pdf, pages 4-5.

[4] https://www.pjm.com/-/media/committees-groups/state-commissions/isac/2021/20210729/20210729-isac-presentation.ashx, slide 14.

[5] To replicate my search go to https://pjm.com/planning/services-requests/interconnection-queues, then in the "Fuel" column select "Offshore Wind." fifty-nine projects should show up.

[6] After doing the search in the preceding footnote you can select status of "Active." Then sort by "State" and scroll down to New Jersey.

[7] This is the total inland injections, at the Deans, Larrabee and Smithburg substations.

[8] https://www.eia.gov/analysis/studies/electricity/hvdctransmission/pdf/transmission.pdf, page 23.

[9] Project queues AE2-122, AE2-123 and AE2-124 for the Birdneck-Landstown circuit, and AE1-065, AE1-066 and AE1-067 for the Virginia Beach substation.

[10] Project queues AB1-056, AF2-193 and AF2-194.

[11] Adding Delmarva, BGE and PECO network upgrades.

[12] https://www.pjm.com/-/media/committees-groups/state-commissions/isac/2021/20210729/20210729-isac-presentation.ashx, slide 24.

[13] https://www.pjm.com/-/media/planning/rtep-dev/expan-plan-process/ferc-order-1000/rtep-proposal-windows/2021-saa-proposal-window-to-support-nj-osw/2021-nj-osw-window-faq.ashx (General Proposal Window Questions and Answers).