Stakeholder Feedback on the February 17, 2021 Planning Advisory Committee Presentation "Looking Forward: Dynamic Reactive Device Technologies, Power Electronic Devices vs. Synchronous Condensers"[1]

Comments from RENEW Northeast

We are writing to express our appreciation for the presentation Brent Oberlin gave at the February 17 PAC meeting "Looking Forward: Dynamic Reactive Device Technologies".

RENEW is fully supportive of ISO's interest in moving to use of synchronous condensers as the preferred DRD to address needs identified in Needs Assessment studies unless a specific limitation causes a need for a different type of device. We hope that ISO receives sufficient positive feedback to move ahead with this.

From the discussion at that meeting we came away with the understanding that while initial costs for synchronous condensers (SC) may be slightly higher than for STATCOMs or SVCs, this price difference may be narrowing considerably. Bruce Jagolinzer shared that the quote they received in July 2020 for a +/- 50 MVAR SC was $14.5M compared with $13M for an equally sized STATCOM. This 11% difference is substantially less than the 30% estimated initial cost difference in the ISO's presentation and we think is further reason for ISO to make SCs the preferred DRD.

Beyond the potential narrowing difference in initial costs, we also think it is prudent for ISO to make its selection of a preferred DRD based on the long-term costs for meeting the identified system need as well as the potential future system savings from creating a more flexible, operable system. Brent noted in the discussion that SVC/STATCOMs appear to have a shorter operable life than SCs. If an SC is 11% more expensive upfront but lasts considerably longer than the alternative, it may very well be the least cost solution over the lifetime of the SC. It would be shortsighted not to consider the total lifetime costs. Further, if installing SCs as reliability solutions rather than SVCs or STATCOMS reduces the cost of future interconnections, that is also a savings (albeit currently in a different bucket for cost allocation purposes) that should not be ignored.

Given all of this, we think it is both reasonable and prudent for ISO to make SCs the preferred DRD going forward when it comes to solutions for needs identified in Needs Assessments.

Further, it was discussed at the meeting that there are other ways in which ISO has seen opportunities to slightly modify transmission system solutions that could prepare the system to perform better in the future. However, ISO noted that it has not pursued these in the past due to the feedback it received related to MPRP almost thirteen years ago. We hope that, as Brent put it,

[1] https://www.iso-ne.com/static-assets/documents/2021/02/a6_dynamic_reactive_device_technologies.pdf

the tide has now turned sufficiently for ISO to once again begin considering and proposing such forward-looking solutions that solve both an immediate need and also position the system better for the future. There is a balance that will need to be struck, but when the opportunity presents itself to consider solutions that can more cost effectively meet an anticipated system need through modification to the preferred solution rather than through a future system upgrade, we think that it would be desirable for ISO to bring this to the PAC for further discussion.

Thank you for considering these comments. We look forward to further discussion on this at the PAC.

Comments from NESCOE

NESCOE appreciates ISO-NE's request for comments on the dynamic reactive device technologies.

At the February 17, 2021 PAC meeting, ISO-NE recommended that synchronous condensers become the standard solution for many voltage related issues found in Needs Assessments, in place of STATCOMs or SVCs, unless specific system limitations cause the need for a different type of device. ISO-NE has asked for comments on this recommendation. ISO-NE has historically preferred to employ STATCOMs because they are less expensive. ISO-NE stated to the PAC that new considerations warrant a different approach: STATCOMs do not provide all the benefits that synchronous condensers provide and ISO-NE feels that the system may need these additional benefits in the future.

NESCOE agrees that it is appropriate for ISO-NE to consider new options for dynamic reactive device technologies. In some cases there may be good reasons to use the more expensive synchronous condensers due to the additional benefits they provide, especially in areas of the system like Upper Maine where the transmission system has been historically weak, renewable resources are increasingly displacing sources of synchronous generation, and there is a lot of invertor based generation in the queue. NESCOE agrees with ISO-NE that the least expensive solution in the short term is not always the best solution for the long term. Given expected transmission system changes in the future, it is particularly important that ISO-NE not design to the short term without considering the longer term needs of the system.

Importantly, while NESCOE agrees that ISO-NE should reevaluate its approach, NESCOE does not yet support a blanket change in the use of synchronous condensers technology. Each situation should be evaluated individually to determine if using the higher cost approach is beneficial. Synchronous condensers should not necessarily be the first choice especially in areas of the grid where there is no indication of a potential future need for the added benefits that the synchronous condensers provide. We look forward to a dialogue with ISO-NE and other stakeholders about how the determination of one technology over the other should be made.

Comments from Hitachi ABB Power Grids

In response to the WebEx presented on February 17th, 2021 titled 'Looking Forward: Dynamic Reactive Device Technologies', the following comments are provided from Hitachi ABB Power Grids:

- Longer term trends may point to different needs and properties required in dynamic devices. A position paper published December 2020 by the German Transmission Operations (50Hertz, Amprion, TenneT, and TransnetBW) describes the reactive power demand need seen in

the German transmission network to achieve the goals of their grid development plan. In the paper, the need for further development in STATCOM capabilities is emphasized, specifically the need for grid-forming capabilities in order to address similar challenges described in the webinar. The German TSOs propose to address this using a staged approach, with the first phase including the replacement of grid-supporting control with a grid forming control concept. The second phase would consider topological changes to the current STATCOM systems, with the converter capability being expanded to provide intertia. The position paper is available on the internet at the following address:
https://www.netztransparenz.de/portals/1/Content/Weitere%20Ver%C3%B6ffentlichungen/4%C3%9CNB_Positionspapier_netzbildende_STATCOM_final_EN.pdf.

- The benefits of a combined approach using STATCOMs and Synchronous condenser technology should be considered. ISO New England is encouraged to explore the learnings of the Phoenix project in Scotland placed in service in 2020. According to the website SP Energy Networks website (https://www.spenergynetworks.co.uk/pages/phoenix.aspx), the project aims to address similar issues such as reduced inertia, limited voltage control, and a lower short circuit level by combining synchronous condenser and STATCOM technology. The website describes the project: 'The project will be providing dynamic voltage control, inertia and short circuit level in light of diminishing synchronous generation by combining two existing technologies, Synchronous Condensers and Static Compensators referred to within the project as Hybrid- Synchronous Compensator.' Placed in service late 2020, the project enters a 2-year monitoring period where operational data and learnings will be shared in the public domain. Hitachi ABB Power Grids participated as the system supplier of the Phoenix project and believes this approach should be considered by ISO New England as an opportunity to see SVC/STATCOM and Synchronous Condensers as complementary technologies as opposed to competing technologies, with the opportunity to employ a 'best of both worlds' approach taking advantage of the pros of both types of technologies.

- Total cost of ownership, including lifecycle costs like losses and maintenance, should be considered as part of the overall evaluation. These types of dynamic devices often operate at little to no reactive output for the bulk of the installation's lifetime. The potential impact on reactive compensation system losses should be considered, both from a ratepayer cost perspective, but also from an environmental and sustainability point of view. Continued investments in power electronic technology are expected to continue driving down losses, footprint and cost per MVA, while the same is not expected for rotating machines.

- Early generations of STATCOMs deployed in the transmission system could be viewed as 'non-perfect' sine wave, but improvements in voltage source converter technology, namely the introduction of MMC-based converters result in the STATCOM being nearly as passive as a rotating machine in this aspect.

- For STATCOMs, grid forming properties where controls and behavior emulates useful aspects of the rotating machine are becoming available in the market. Additionally, various energy storage concepts are being developed for STATCOMs. It is suggested that the approach should be to determine the solution needed from a system perspective, to be used to guide the choice of technology. With the relatively new grid forming control concept and the introduction of different energy storage concepts used to provide short term active power, the controllability and dynamic capacity of the STATCOM widely surpass that of the rotating machine. Therefore, in trying to predict

long term system needs, the STATCOM based dynamic device can be viewed as a much more sustainable option than other devices. Although a STATCOM with grid forming capabilities doesn't provide the same magnitude fault current as the comparable Synchronous condenser, it can be tuned to a similar or lower inherent sub-transient reactance. The capability to provide fault current injection capability is related to the topology of the STATCOM. Thereby, the system strength measured by its impedance, isn't necessarily weaker than with a synchronous condenser.