MTEP21 Future Sites and Draft Expansion (20200713)
OMS Transmission Planning Work Group

The OMS Transmission Planning Work Group (TPWG) appreciates the opportunity to respond to the feedback request following the July 13, 2020 MTEP Futures Workshop. This feedback does not represent the views of the OMS Board of Directors.

This TPWG feedback pertains to the modeling of carbon capture and sequestration (CCS) technology in the MTEP21 Futures. The introduction of CCS into the MTEP Futures as suggested by MISO in the July 13, 2020 MTEP Futures Workshop could have large implications for future transmission projects and should not be considered merely to a fix to a non-convergent model.

MISO engineers found that reliability of the transmission system cannot be guaranteed under the carbon reduction goals in Future III given the current portfolio of technologies used in the model. As such, MISO suggests equipping combined cycle (CC) natural gas facilities with carbon capture and sequestration technology to reduce the carbon emissions of the CC facilities. Doing so will allow the EGEAS capacity expansion model to increase the number of CC plants to address reliability issues without violating the strict emission reductions of Future III.

The TPWG believes that the EGEAS outputs are not considering a full suite of technological solutions. MISO should not base the reliability of the future transmission system on a single emerging technology (CCS), which may never be financially viable for utility-scale deployment. Instead, MISO should also consider a suite of existing and emerging technologies that can improve system reliability such as siting battery storage at wind and solar facilities/bus locations, hydrogen fueled CCs or CTs, modular nuclear units, or smaller pumped storage units. CCS is one of several emerging technologies that can help improve system reliability while limiting carbon emissions. Expanding the portfolio of technologies considered will mitigate the risk of failure associated with any one technology, and this diversification may reduce the burden on customers of unreasonably high system investment costs. The TPWG is classifying its feedback into the following three categories: CCS modeling assumptions, the inclusion of additional emerging technologies, and modeling considerations for existing resources.

Current CCS modeling assumptions

1. The cost assumptions for CCS need to include the cost of carbon sequestration.
   The capital cost assumptions proposed for CCS seem to only consider cost of carbon capture but not of sequestration.[1] The inclusion of carbon sequestration costs in the unit costs for CCS technology should be considered.[2]

2. Allow CCS to be built in both red and gray zones of the USGS Geological CO_2 Storage Resources map presented at the July 13 MISO workshop.

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[1] Sargent & Lundy, "Capital Cost Study," p. 9-1. 202. Online: https://www.eia.gov/analysis/studies/powerplants/capitalcost/pdf/capital_cost_AEO2020.pdf

[2] For reference, a comprehensive list of current CCS projects can be found in the National Energy Technology Laboratory's 2020 Compendium of Carbon Capture Technology: https://netl.doe.gov/sites/default/files/2020-07/Carbon-Capture-Technology-Compendium-2020.pdf

The USGS has assessed both the published (red) and unpublished (gray) zones and has found both to be viable carbon sequestration sites.[3] By only allowing CC-CCS sites to be sited on the published (red) zones, EGEAS will disproportionately build natural gas facilities in MISO South and not in MISO North. Doing so will likely stress the North-South transfer limit and require additional transmission resources that might not be needed. As drilling/storage techniques improve over time, and experience in deep underground storage is acquired, a better understanding of these process may make the unpublished zones viable.

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Inclusion of additional emerging technologies

3. Consider a suite of emerging technologies as planning alternatives.
   The inclusion of a diverse portfolio of emerging technologies would help mitigate the risk of relying too heavily on any single technology. The consideration of CCS technology alone to manage system reliability and dumped energy issues in EGEAS is likely to skew the results of the modeling analysis towards building more CC-CCS units.

   Several emerging technologies, in addition to carbon capture and sequestration, provide grid services with low carbon emissions. These include advanced modular nuclear reactors, fuel cells, compressed air energy storage, and other long-duration storage technologies. Numerous government and industry research reports consider the costs and effectiveness of long-duration storage technologies that could be used in the MTEP Futures models.[4,5,6]

Modeling considerations for existing resources

4. Allow existing resources to provide more grid services.
   There are several existing technologies (*e.g.*, wind, solar, hydropower, demand response, battery storage) used in the MTEP model that are capable of providing the necessary reliability services.[7] These existing resources should be allowed to provide the full suite of reliability services they are technologically capable of providing in the EGEAS analysis. Disallowing their services will result in over-build of CC-CCS and the resulting over-build of transmission facilities solely for reliability services, leading to unjustifiable system costs for ratepayers. MISO need not limit the use of existing resources from use in

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[3] USGS, "National Assessment of Geologic Carbon Dioxide Storage Resources— Summary." 2013. Online: https://pubs.usgs.gov/fs/2013/3020/pdf/FS2013-3020.pdf

[4] International Renewable Energy Agency, "Electricity Storage and Renewables: Costs and Markets to 2030." 2017. Online: https://www.irena.org/-/media/Files/IRENA/Agency/Publication/2017/Oct/IRENA_Electricity_Storage_Costs_2017.pdf

[5] Pacific Northwest National Laboratory, "Techno-economic Performance Evaluation of Compressed Air Energy Storage in the Pacific Northwest." 2013. Online: https://caes.pnnl.gov/pdf/PNNL-22235.pdf

[6] Sargent & Lundy, "Capital Cost Study," p. 9-1. 202. Online: https://www.eia.gov/analysis/studies/powerplants/capitalcost/pdf/capital_cost_AEO2020.pdf

[7] M. Milligan "Sources of Grid Reliability Services," The Electricity Journal, vol 31(9), 2018. Online: https://www.sciencedirect.com/science/article/pii/S104061901830215X

ancillary services due to existing market rules. If we are to include emerging technologies in the MTEP Future modeling, then we should first include the full suite of grid services provided by existing technologies. MISO should consider reviewing, and if necessary modifying, any market rules and similar constraints that inhibit the full deployment of emerging and existing technologies that offer more effective and efficient ancillary services.

5. Consider a modeling sensitivity where nuclear units are included in the generation fleet. The reliability challenges raised in both Futures II and III, as a result of increased reliance on intermittent generation, can be partly mitigated in a carbon-free manner by relying on more nuclear generation units. This could be achieved through the extension of existing operating licenses for existing nuclear units, as well as through the introduction of new nuclear units that apply emerging nuclear technologies being evaluated and introduced in other jurisdictions, including small-scale modular units that represent lower capital investment risk concentration.