Questions from SMARTransmission Stakeholder Meeting

At what point in the study will the overlay's benefit (a reduction in the need to upgrade underlying transmission lines) and cost (an increase in the need to build underlying transmission lines) be rolled into the benefit/cost calculations?

The objective of the SMARTransmission Study is to design a transmission overlay that would facilitate connecting 56.8 GW of renewable energy to meet federal and state Renewable Portfolio Standard (RPS) requirements within the study footprint. As a result of the proposed overlay, many existing facilities will see a reduction in loading so the underlying system may not require additional reinforcement to accommodate the increase in wind generation. On the other hand, some facilities may see increased short circuit duty and flow patterns that may require the underlying local transmission system to be reinforced (depending on the location of new generation).

The wind numbers for Iowa in all scenarios (base, low wind, high wind) appear low. We have submitted this input before, but continue to see low wind assumptions for Iowa. This is a difficult planning issue, given that Iowa has already met its state RPS goal (utilities have long exceed the original 105 MW wind requirement).

Absent a clear legislative RPS, here are three relevant pieces of information that may help justify higher wind levels for Iowa:

- Iowa already has an installed capacity of 3,700 MW, according to AWEA's year-end report on installed capacity for 2009.

- MidAmerican Energy has received regulatory approval and incentives to build 1,001 MW of additional wind energy by year 2012. It is likely that Iowa will have, at a minimum, 4,700 MW of wind by 2012, or an installed capacity that is higher than some of the 2015 and 2019 assumptions in the study.

- The latest state energy plan sets achieving Iowa's share of the DOE 20% Wind Power by 2030 Report as a goal. The plan also sets the goal of achieving that by year 2020. This would be between 10 GW and 20 GW of installed wind in Iowa.

Not enough transmission capacity will be planned as part of this study to allow Iowa to add more wind than the 4-7 GW identified in the study, even though Iowa is on track to have 5 GW by 2012 and state policymakers are currently planning to achieve between 10 and 20 GW by year 2020 or, at the latest, 2030. Any sensitivity analysis to account for a higher wind penetration in Iowa would be appropriate, and much appreciated.

One of the main SMARTransmission study assumptions is that all the renewable energy produced in the study area will be consumed within the study area. A Federal RPS of 20% was used for states with no RPS mandates and for those with state RPS less than 20%. The 56.8 GW total wind nameplate capacity considered in this study includes the existing wind generation. To determine the incremental wind nameplate capacity that will be generated within each state, the wind potential identified by the National Renewable Energy Laboratory study was used. The process accommodated those states that have in-state renewable energy requirements. For example, Michigan requires 100% of its renewable requirement to be sourced from generation within the state whereas Ohio has a requirement that at least 50% be developed within the state. The wind requirements of other states were calculated by prorating the total wind potential of the NREL states. This was done to maintain a similar proportion of wind potential across the different states. The study also considered Illinois' requirement whereby after 2011 equal preference will be given to resources within Illinois and adjoining states like Iowa. This resulted in additional adjustments to the prorated values. In summary, this was an iterative process following which the states were found to be either wind energy exporters, importers or self sufficient. This methodology resulted in Iowa generating

6,791 MW of wind in 2029 of which approximately 3,900 MW was exported to other states. The wind requirements in 2019 and 2014 were determined by first estimating the RPS for the respective years and then going through an iterative process as described above.

Given the level of uncertainty with wind development, the study considered high wind sensitivity to assess the overlay performance. The results provide some insight on additional reinforcements that will be required on the proposed overlay for adequate performance as the wind injection levels increase.

If Iowa policymakers continue to plan for and achieve between 10 and 20 GW of wind generation by 2020 or, at the latest, 2030 and to sell excess wind to states farther east then the capacity provided by SMARTransmission EHV overlays would be the minimum required.

The New Sub MN1 seems to line up with a proposed CapX sub Hazel Creek substation. Why not connect the two subs and just call it Hazel Creek?

The New Sub MN1 station is located where there is significant wind activity in Minnesota and South Dakota based on the MISO queue. It is feasible that New Sub MN1 may be connected to another station in the area.

Did the SMARTransmission Study consider a scenario where the RPS's are satisfied through means other than wind generation? Say solar, conservation, biomass, load reduction, clean coal/sequestration.

The study, in general, assumed that approximately 80% of state RPS requirements will be met by wind energy. The remainder was assumed to be achieved through other means.

Were the CapX Brookings-Hampton 345 kV, CapX Fargo-Monticello and Hampton-LaCrosse projects included in your models?

These projects were included in the model.

Were the Dakota substations, such as Harvey, Prairie and others, connected to the existing underlying system?

Many, but not all of the stations included in the SMARTransmission EHV overlays, are connected to the underlying system.

Why did you not move the HVDC west terminal further west, for example Pocahontas County or Lakefield Junction?

The wind zones considered in the west are spread across a large geographic area in the upper Midwest. If an HVDC line terminal was located further west, as suggested, the costs to connect the multiple wind zones along the path of the HVDC line would be substantial. The application of HVDC between Adair County and Kincaid stations was considered more suitable since it is a long line without intermediate taps.

The optimal location of a western terminal of any HVDC in western Iowa, northwest Missouri, will depend on transmission expansion assumptions in SPP. Also, bulk storage needs to be considered as a complimentary technology not only to manage the intermittency of renewables, particularly during network expansion, but also to increase the utilization (and value) of future AC overlays with DC links. Please consider a reconfiguration of the existing balkanized grid to improve future network performance and its value to consumers. Much of today's transmission may need to become tomorrow's distribution.

We agree that the optimal location of a western terminal of any HVDC depend on transmission expansion assumptions in SPP. Further studies will be required to address the need and location of future bulk storage needs.

What was the capacity of the HVDC cable circuit across Lake Michigan?

The study considered ± 400 kV DC with a capacity of 1200 MW across Lake Michigan. Voltage source converter technology was used.

Did you compare the reactive needs in the on and off peak cases to determine the required reactive switching?

The study assumes that all new reactive correction facilities will be installed with circuit breakers to facilitate switching.

Did you consider network performance resulting from changes to the dispatch patterns caused by the cycling of conventional generation due to minimum generation considerations to accept the high wind off peak capacity? This includes both voltage and thermal performance.

System re-dispatch associated with additional wind generation considered minimum generation criteria for conventional units. Both voltage and thermal performance were evaluated.

Who will propose these alternatives to the RTOs? Will they be the sponsors or Quanta?

The objective of the SMARTransmission study is to design a transmission overlay that would integrate renewable energy to meet federal and state RPS requirements within the study footprint. The study sponsors are members of the Midwest ISO or PJM and have a vested interest in ensuring the best technical and economical plan is implemented. The sponsors, along with others, may have an interest in pursuing projects that are recommended in the study.

With 8.2 GW (14% of 56.8 GW) of wind generation in Michigan, what effect will the lack of new transmission in Michigan have on these results?

The SMARTransmission study included Michigan's requirement that its renewable requirements be fulfilled by in-state generation. Based on this requirement, Michigan will neither import nor export wind energy. As such, new transmission built in Michigan to accommodate the state's wind energy requirement will not significantly affect the results of the study.

To create the on and off peak cases, did you increase or decrease load for the participating members only or for the whole Eastern Interconnection?

The loads were changed only within the study area.

I can recall in the last meeting it was decided to go with Alternatives 2, 5, and 7 - now I am seeing 2 & 5 what happened to 7?

Changes to optimize Alternative 7 made it similar to Alternative 5. As a result, Alternative 7 was removed from further evaluation.

Is HVDC defined as 500kV or 800 kV?

HVDC is considered at ±400 kV.

Why is there a need for the HVDC line? Why wouldn't a 765 kV lines from Collins to DC Cook get the same job done?

The HVDC line provides another reliable east-west tie and alleviates constraints associated with the rapidly developing wind generation in Eastern Wisconsin. Currently, the existing wind generation is experiencing transmission congestion. This can be alleviated by building an HVDC line across the lake.

Was series compensation used on any of the 765 kV transmission lines?

The SMARTransmission alternatives reliably integrate the wind zones that are geographically dispersed. Series compensation was not required.

Is loss of double circuit 345 kV line considered N-2 for this study?

Yes, the loss of a double circuit 345 kV line is considered as N-2 study.