

To: SSC and STF
From: Roy Thilly and Kevin Gunn
Date: October 25, 2011
Re: Final Scenario Decision

On October 31, the SSC needs to make its final selection of the scenarios for which the Planning Authorities will prepare transmission-planning analyses. Reaching this decision has proven to be much more difficult than expected. On September 26, the SSC reached consensus on three scenarios and decided to use remaining sensitivities to refine these scenarios. The three scenarios selected, based on the recommendations of the Scenario Task Force, were:

1. The BAU base case with hardened limits– F1S3;
2. A regionally-implemented national RPS run – F6S10 (a regional transmission build-out); and,
3. A nationally-implemented carbon policy with enhanced EE/DR – F8S1 with hardened constraints (a large transmission build-out).

In making these recommendations, the Task Force sought to present a pair of transmission bookends for study – a large build-out and a much smaller regionally oriented build-out. The BAU case was selected to provide the starting point for comparative purposes.

At the September 26 meeting, SSC decided to use the remaining sensitivities to fix what appeared to be several anomalies resulting from the way the model functioned, and perform other necessary fine-tuning. First, for the BAU and the F8S1, gas builds (CTs for the BAU and CCs for F8S1) unreasonably concentrated in WUMS and Indiana were to be more evenly distributed within the MISO. This fix was not deemed important for F6S10, where the concentration of CCs was considerably less. The group was advised that the CTs could be redistributed in F6S10 without the need for a new run, since the CTs were run very little in the case. In addition, for the F8S1 case, unreasonably concentrated wind builds in Indiana also were to be redistributed within eastern MISO. In the BAU, a correction to the wind contribution to reserves that was made in other futures also would be made. Finally, in F8S1 the soft constraint run at OL75 would need to be hardened to provide the PAs with transfer limits between the NEEM regions, since unlike the other futures the base case in F8S1 was not rerun with hardened limits in order to save a sensitivity. When this was to be done, the group also decided to flatten the CO2 price after 2030, as was done for sensitivity in F2S9 to address what many regarded as an unreasonably high increase in the CO2 price in later years do to the way the model functions.

In each case, we believe, the SSC did not expect this fine-tuning to produce significant changes in the scenarios selected for Phase 2. This assumption has not

proven to be true for F8S1, the large build-out selected. When this case was recommended by the Task Force, the choice was between F2S9, the carbon regulation future base run with hardened constraints and a flattened CO2 price and F8S1. For the F2S9 case to be used as the final scenario, the group decided that additional energy efficiency and demand response would need to be added, which would have taken several sensitivities to accomplish. F8S1 was selected instead because the additional EE and DR were already incorporated, and the transmission hardening calculations had already been run for other F8 sensitivities. It was felt that it would take less sensitivities to add the flattened CO2 price.

In contrast to F2S9, where the flat carbon price caused only a modest change in the generation and transmission expansion, a major difference in result has occurred for F8S5 – that is, F8S1 with a flattened CO2 price after 2030. This difference has come about because, unlike what was done with F2, the flat CO2 post 2030 was run as a sensitivity to F8S1 before hardening the constraints. This run substantially reduced the transmission build-out from about 37,000 MW to 18,000 MW. It also moved a fair amount of wind generation to the east in a manner inconsistent with MISO planning. While the reasons for these changes are not clear, experts believe they are in part driven by the use of high shadow prices assumptions derived in F8S1 (escalating CO2 prices beyond 2030) rather than new shadow prices developed consistently for the new run. The SSC next tried to fix the eastern shift in wind, by reallocating wind back to the NEEM regions that experienced more than a 10% change. The result of this run was to increase the transmission build to about 23,000 MW. This is still about a 38% drop in the incremental transmission expected to be added in the large build-out scenario. This additional run –F8S6 - may still be affected by the high shadow prices resulting from F8S1, resulting in a lower transmission build-out than would occur with correctly matched shadow prices.

We have two sensitivities left - one for the BAU and one for F8, unless the group chooses to use two for F8. The SSC now must choose for the large build case whether to:

1. Use the latest run -F8S6 - with the 23,000 MW build-out by now hardening constraints based on this run. **Option 1**
2. Go back to F8S1 and harden the constraints based on the 37,000 MW result, and simultaneously fix the anomalies and flatten the CO2 price in a manner similar to what was done in F2S9, the other choice for the large build-out. **Option 2.** (If the group wants to avoid a mismatch in shadow prices, using the flattened CO2 price could be dropped.)
3. Use the default agreed to at the September 26 meeting, which would be similar to Option 2 above, except the Indiana wind concentration would not be fixed. **Option 3**

None of these options is ideal. Based on input from Stan Hadley and Ralph Luciani, we believe that the results of the new runs called for in Options 2 and 3 will be

reasonably close to the results from F8S1 although there are likely to be some shifts in generation.

It is not possible to tell how much using the shadow prices from F8S1 has affected the result in F8S6. There are not enough sensitivities left to rerun a base case to derive appropriate shadow prices, then run the soft constraint case with a flattened CO2 price, and then harden the constraints. However, the F8S5 and S6 runs do suggest that meeting the reduced carbon price assumption is likely to require somewhat less new transmission than F8S1 did.

Changing the carbon price is clearly a more complex change than other sensitivities. We now know that we should have modeled the revised carbon price under the soft constraint earlier in the process, so we better understood the implications and could have made adjustments as needed..

It will be important to note these problems in the Phase 1 Report, and to be clear that whatever large build-out is selected for Phase 2 has been selected as a bookend for transmission analyses purposes only and does not reflect a well-defined CO2 constrained future, given the complexity of modeling such a future at this late stage.

With this background, the Co-chairs recommend that the SSC consider choosing Option 2 above for the final scenario, as most consistent with the consensus reached on September 26, and the SSC's expectations with respect to the fine-tuning the group agreed to do with the final sensitivities. We do not believe a consensus would have been reached if people were concerned that the new sensitivity run would materially change the results. Option 2 is the closest to the other large build-out run – F2S9 – which the Task Force considered to be functionally equivalent to its recommendation, with an EE and DR adjustment. Use of Option 2 will provide a substantial bookend, as anticipated, for transmission analyses purposes.

We believe that this option is preferable to Option 3, given the highly concentrated wind build in Indiana for which transmission would need to be planned.

The Co-chairs are concerned that Option 1 - use of the F8S6 result for the final scenario - would deviate substantially from the large build-out scenario that was agreed upon in September, which was at the low end of the choices at that point for a large build bookend. We make this recommendation recognizing that the build-out will largely reflect the original higher carbon price assumption. However, we believe it is unlikely that agreement would have been reached on using Future 8 for the large build-out as modified by F8S6, if the results of S6 had been known during the selection process.