

NEBRASKA STATEWIDE WIND INTEGRATION STUDY

SUMMARY of Technical Review Committee Meeting #7

September 23, 2009 – 9:00 AM to 3:00 PM (Central Time)-Omaha – Gallup Headquarters Building

Reference Documents - Email to TRC and Observers dated 09.16.09 from Doug Kallesen (for Clint Johannes) containing three attachments: the meeting Agenda, TRC Meeting #6 Summary, and Roster, some of them having been updated from previous distributions. The five EnerNex, Ventyx, and NPA presentation files for the meeting were provided in two emails on 09.21.09. The EnerNex presentation file was updated after the meeting and was resent on 09.25.09, along with an additional small file containing a final report outline and completion schedule discussed in the meeting [that schedule has been subsequently revised].

TRC Members Participating [(p) means by phone]:

Utility- Clint Johannes, Dave Rich, Doug Kallesen, David Ried, Chris Bywater (for Marc Nichols), Jon Iverson, Billy Cutsor, Dave Mazour, Ron Steinbach.

Consultants- Bob Zavadil, Tom Mousseau, Gary Moland, Rick Hunt, Brenton Meese.

Technical Experts and Stakeholders- Michael Milligan, Ed DeMeo (p), Charlie Smith, Mike Radecki (p), Jay Caspary (p), Neil Moseman, Bruce Hauschild, John Hansen (p), Tim Texel, Michael Goggin (p), Steve Eveans.

Observers Participating:

Utility- Tim Owens, Mike Matheson, Max VanSkiver (p).

Technical Experts and Stakeholders – Tim McCoy (p), Bill French (for Patrick Dalseth), Dave Dingman.

Overview of Meeting and Summary:

The complete agenda was covered and the general purposes achieved, that being to review new results, discuss and make decisions about finishing up the study project including schedule and content of the final report.

This summary is intended to document key points of the discussion. *Questions and comments from the audience are usually identified in italics* and plain type is intended to indicate statements by the presenter at the time. Usually the person involved will be clear, but not always. [Followup is usually shown in brackets].

Afterthoughts and suggestions can be emailed at any time to Doug Kallesen, drkalle@nppd.com, 402-563-5274, and they will get “logged” into the study process, or to Clint Johannes, Chair of the TRC, cjohannes@neb.rr.com, 402-910-1856.

Key Points of the Discussion:

1. Clint Johannes, Chair of the Technical Review Committee (TRC) and Chair of the NPA Joint Planning Subcommittee (JPS):
 - a. Welcomed all, provided an overview of the meeting purpose, and took roll call.

- b. Asked for any additional comments to the TRC 6 Meeting Summary dated 09.14.09 and distributed 09.16.09. No comments offered.
2. Bob Zavadil, study technical manager, EnerNex, preceded into the EnerNex presentation with some more background on meeting objectives and general work status.
3. Tom Mousseau continued the EnerNex presentation covering through slide 10 on range of weekly performance and hourly ramps, the rest through slide 47 being an appendix with lots of details on work done (slide numbers listed below refer to the finalized presentation sent to the TRC on 09. 25.09).
4. Rick Hunt, Ventyx, presented work results since the last TRC6 meeting of September 23:
 - a. [NOTE: slides 6, 10, 16, and 17 contain information on wind integration cost results for non-shaped proxy resources that were later found to be too high. Their corrected results will be presented in the final report.]
 - b. *Billy Cutsor asked for background on the use of the daily block proxy in some of the cases.* Intent was to capture more of the cost effects of the wind variability and to benchmark our results against the previous studies and methodologies. Daily block was only used for 10% and existing penetrations. Related point is that previous studies typically used fixed schedules to the external market thereby confining the integration obligation to the local area, which was not enforced in these runs for any of the proxies.
 - c. *Mike Radecki asked why such small differences between cases (with the shaped proxy).* There are a couple factors influencing that both ways:
 - i. There is wind all over the model footprint yielding some diversity/counterbalancing but also adding to the integration burden (from previous studies that usually did not show significant wind injections external). The “extra” external wind would tend to raise the integration cost.
 - ii. Wind integration areas are not really isolated as we are modeling the injections because hourly transaction variations are still allowed. Previous studies were usually modeled as true isolation and in this study a hurdle rate for SPP transactions is only \$5/MWh so wind-related, hourly transactions flow easily in these cases.
 - d. Nebraska existing wind integration cost has such a high resultant value (where Nebraska is modeled as 1% penetration, rest of SPP is 5%, and the rest of the model is 7%).
 - i. *Mike Radecki questioned whether we are missing an ancillary service payment due Nebraska for responding to external wind variations.* Currently in this study we don’t have a methodology to model such but is an interesting concept. And the opposite could be true for cases where SPP has higher penetrations than the rest of the footprint. All this due to the nearly free (\$5/MWh hurdle) interchange of hourly varying sales and purchases.

- a. *Ron Steinbach mentioned that in the West Interconnect study a fair amount of dump/surplus energy had shown up in their results and leading to curtailment.* There is not much dump energy showing up in our cases. Reason being we are representing a growing load and we are modeling a very large footprint, and there is more export capability now with the inclusion of the balanced portfolio. We could look at the \$20/MWh hurdle rate to see if dump energy showed up there.
- b. *Request to also show baseline reserve requirement and average numbers (in the final report).* Greatest reserve requirement with the most wind. But the wind can also free up additional capacity to act in reserve. But depends on if a different generation profile is called for.
- c. Mean Absolute Error of 11%. Forecasters will indicate 15-20% MAE for an individual plant, but it can be 11% for lots of plants, due to some cancellations of forecast errors.
- d. *Michael Milligan asked that the process showing wind data as input resulting in incremental reserves in functional form and/or visual charts (histogram or 8760 chronological),* this will be part of the final report.
- e. Transmission at 345kV level appears to be satisfactory for the 40% case but probably not for amounts much above that penetration as found in the DOE 20% (EWITS) cases.
- f. Coordination with WAPA on a wind integration arrangement of whatever type, may be a little more complicated now with Nebraska in the SPP, depending on what the coordination is (some types of coordination might not be complicated by SPP membership and some might).
- g. As far as the Additional Considerations (slide 9) are concerned, these could be important but we do not have anything concrete too included here (regarding effects from additional maintenance and forced outages/derates; degradation of heat rate from ramping, cycling, and range of operation; emission rate increases; and other factors. A Carnegie Mellon paper on some modeling studies they had performed in this area, but it was indicated that they had assumed an unrealistic one-on-one matchup of fossil generator moving with the wind (instead of spreading the movement over several units in the generation system. Hawaii has found ways to accommodate wind with the existing fossil generation.
- h. Areas for Future Work Discussion (beyond this study):
 - i. Proxy resource investigation and further definition (especially how to analyze in multiple operating areas with large footprints and high wind penetrations.
 - ii. Similarly, proper valuation of “volatile” interchange between markets and operators due to wind fluctuations (and “trading” wind integration service).

- iii. What's happening in this study (continued low integration cost for high wind penetrations) --- does it essentially represent the wind being pseudo-tied) to the outside world?
 - iv. Transmission design for Nebraska wind development
 - v. Relief for curtailment situations
 - vi. More hourly investigation on interactions between generators, wind and export.
 - vii. *For local NPA need – more transmission study, land use studies, export studies (like LR 83, etc) (Johannes)*
 - viii. *For SPP – absorb the results of the Wind Integration Task Force study that is well underway. (Johannes)*
 - ix. *Reserve categorization, reserve sharing policies, anything that relates to better integrating wind generation. (Smith)*
 - x. Look at existing units in more detail to identify best capabilities and use, including limiting reserves to fewer units to provide regulation.
 - xi. Include more people involved in operations in more in depth work for their benefit, but mainly to get more real-world modeling input.
 - xii. *Could run Nebraska in a more isolated manner to better tie back to previous studies. (Johannes)*
 - xiii. *Determine the value of short term storage that could handle the large short-term reversals noted in the wind patterns. (Perhaps considering this to be like the wind variability problem much like the hybrid car problem as it alternates between storage and discharge.) (DeMeo/Kallesen)*
 - xiv. [Several ideas relating to learning the meaning of the different results coming from the different proxy resources are not pertinent any more now that some of the results were later found to be flawed. However, as mentioned the 5-hour moving average proxy run at 20% penetration was run and results will be included in the final report.]
- i. The final report outline was briefly discussed and it was decided that the Executive Summary should be written in such a manner that it could stand alone, meaning it should be approximately 25 pages in length.
 - j. A final report schedule was set in the meeting that would have the report finalized by Nov 2. [Subsequent to the meeting this completion date has slipped at least two weeks.]



- k. Michael Milligan thanked the TRC members for their good service on behalf of NREL
- l. Doug Kallesen relayed LaVerne Kyriss' appreciation to the TRC on behalf of WAPA.
- m. Clint Johannes expressed the NPA's sincere appreciation to all on the TRC, the observers, and others, who have shown interest, supported, and contributed to this study project. Especially to the NREL organization for its steady technical and financial support.
- n. TRC7 Meeting adjourned at 3:00 PM

By Doug Kallesen, NPPD (for NPA)