

11.24.08

## NEBRASKA STATEWIDE WIND INTEGRATION STUDY SUMMARY of Technical Review Committee Meeting #1

October 29, 2008 – 10:00 AM to 4:00 PM (Central Time)-Omaha

**Reference Document** - Email to TRC and Observers dated 10.31.08 from Clint Johannes containing three attachments: the meeting Agenda, Roster, and Study Plan table all being updated to reflect any changes resulting from the meeting. Also PowerPoint presentation files used at the 10.29 meeting by Bob Zavadil, EnerNex, and Gary Moland, Ventyx.

### TRC Members in Attendance:

Utility- Clint Johannes, Paul Malone, Dave Rich, Doug Kallesen, David Ried, Marc Nichols, Jon Iverson, Bruce Merrill, Billy Joe Cutsor, Dave Mazour.

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

Technical Experts and Stakeholders- Michael Milligan, Laverne Kyriss, Jay Caspary(by phone), Sohrab Asgarpoor, John Hansen, Michael Goggin.

### Observers in Attendance:

NREL Subcontract- Brian Parsons.

Utility- Jim Fehr, Rocky Plettner, Jim Wilbur, Travis Burdett.

Technical Experts and Stakeholders – Charles Hendrix.

### Overview of Meeting and Summary:

The complete agenda was covered and the general purposes achieved, that being to outline assumptions and methods for the study, get acquainted, gather initial comments and questions, and make assignments for the next required actions. This summary is intended to document key points of the discussion and list assignments going forward, which is in **the end section “Key Action Item List” – be sure to check it out (you may be involved!)**.

*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. Sometimes answers were provided and sometimes not. At this point many issues remain undecided so continued discussion and input is encouraged in order to accomplish the best study possible.

A small group was identified to develop and review materials before total group review and for other coordination (Johannes, Kallesen, Iverson, Merrill, all Consultants, Milligan, Smith, and Parsons).

Data requests and detailed recommendations for assumptions and study methods were set for action during November.

Afterthoughts and suggestions can be emailed at any time to Doug Kallesen, [drkalle@nppd.com](mailto: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](mailto:cjohannes@neb.rr.com), 402-910-1856.

**Key Points of the Discussion:**

1. Adrian Minks, OPPD Vice President, gave a brief welcome to Omaha and OPPD, describing their activities in renewable and efficiency resources. Also she thanked everyone for participating in this important study for the state of Nebraska.
2. Clint Johannes, Chair of the Technical Review Committee (TRC), Chair of the NPA Joint Planning Subcommittee (JPS), and Assistant General Manager of the Nebraska Electric G&T Cooperative, Inc.:
  - a. Thanked all for being willing to give time and effort to the study. Especially to NREL and WAPA entities for providing financial and technical support to the project.
  - b. Related background – NPA prepared the document *“Renewable Energy Background and Outlook for Nebraska Electricity Consumers: A Reference Document by the Nebraska Power Association”* published Dec. 28, 2007; immediately entered into the National Renewable Energy Laboratory (NREL) RFP process for performing a wind integration study; and executed an agreement with NREL on October 23, 2008 for such (this) study.
  - c. Explained that NPA feels the consultant team is a strong one with much experience in wind integration studies and system modeling. EnerNex is responsible for statistical analysis and overall project management of the consultant work. Ventyx is responsible for production and transmission system modeling.
  - d. Outlined the general responsibilities of the TRC as being discussion of the study assumptions and processes and to provide guidance for the study. Meet four times face to face (two times by phone) over the course of the next twelve months, review and approve the results, and distribute the results for public purposes.
  - e. Organizationally, the consultants report to NPA, and NPA reports to NREL.
  - f. Described the current level of wind generation in Nebraska as 72MW existing, 120MW more contracted in 2008-2009, and still more in RFP stages both at NPPD and OPPD. Plus the long range plans are to add more wind generation.
  - g. The study objectives as described by NREL were presented and, as taken from the RFP, are:
    - i. Ascertain the impact of wind energy on system operations using synchronized wind and load data and state of the art analysis techniques.
    - ii. Wind energy penetration of at least 10%, based on wind energy to total energy sales should be studied. Additional scenarios at higher penetrations are encouraged.
    - iii. Assessment should be a combination of statistical analysis and production simulation.
    - iv. Ascertain the extent to which the Federal hydroelectric system can be used to help with cost-effective wind integration that is consistent with reliable system operation.
    - v. Ascertain potential mitigation approaches that may include innovative markets, institutional arrangements within or between Balancing Areas, or physical response on an economic basis.
    - vi. Produce meaningful and supported results in coordination with a Technical Review Committee (TRC), which should include stakeholders and experts in wind integration analyses.

These objectives are fleshed out in more detail in the Study Plan table – see Reference Document at the top of this Summary.

3. Bob Zavadil, study technical manager, EnerNex, led the next portion of the meeting with key points and discussion during that time being:
- a. See Reference Document noted at the top to locate the 56-slide presentation used by Zavadil throughout the meeting. Its contents are not duplicated herein; only key additional comments will be related here.
  - b. Compromises will be a necessary part of TRC work. We can't expect everyone to completely agree on everything; but rather we will strive for understanding amongst the group and a spirit of cooperation will be valued on all fronts.
  - c. This team of consultants is also working on the Eastern Interconnection Wind Study; since that project is ahead of us on schedule, the lessons learned there will be helpful here.
  - d. Interconnection analyses are about "volts and vars"; that is not a focus here as in integration we are primarily doing economic analysis.
  - e. NREL's 10-minute data for 2004-2006 is an average over the 10-minute period.
  - f. Case setups need to be carefully thought out, and reviewed by the group, so that we are efficient yet get what we want.
  - g. Wind integration cost comes from the variability and uncertainty of the wind. But load level is also variable and uncertain, so what we need to identify is the incremental additional variability and uncertainty that needs to be served in the "net" load.
  - h. One solution for the industry under heavy penetration of wind generation might be to change balancing area practices: expand them and make them operate on a shorter time frame. A balancing area (authority) has an area operator that is responsible for matching generation and load, maintaining scheduled interchange with other balancing authority areas, and maintaining the frequency in real-time, of the electric power systems in the area.
  - i. This study has a lot of work to do in the sensitivity and mitigation areas – the consultants have done pumped storage analysis before.
  - j. *Laverne Kyriess indicated that doing scenarios on the WAPA hydro support of wind generation but the study must recognize that there are significant operational limitations included in the Corps' Operating Manual for other needs regarding river flows. Also in low water years, much of WAPA energy is purchases they make to supply contracts.* Understood – that cases can be just scenarios that may or may not end up being possible, but are useful for the learning value.
  - k. May want the production base case developed sooner than the scheduled 3/4/09, but the validity of the base case is very important.
  - l. Draft report by 6/15/09 might be aggressive but it can be under development all the way along.
  - m. *Sohrab Asgarpoor asked what reliability tests are included in the analysis – adequacy and/or security?*<sup>1</sup> Focus here will be more adequacy (ensuring scenarios have required reserve margin) rather than in-depth testing of contingencies. Need to discuss incorporation of efficiency programs and identifying wind capacity value.

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<sup>1</sup> "Adequacy" is the ability of the electric system to supply the aggregate electric power and energy requirements of the electricity consumers at all times, taking into account scheduled and reasonably expected unscheduled outages of system components. "Security", now called by NERC "Operating Reliability", is the ability of the electric system to withstand sudden disturbances such as electric short circuits or unanticipated loss of system components. (taken from *Definition of "Adequate Level of Reliability*, a NERC document at found at [www.westgov.org/wirab/ALRdef.pdf](http://www.westgov.org/wirab/ALRdef.pdf)).

- n. *Brian Parsons- study needs to make sure the system representation for the study year (facilities and operating practices) make sense—that the three balancing areas in Nebraska are represented properly as well as market conditions. NREL expects an especially good job on this aspect.*
- o. There are three parts to assembling the system facilities representation:
  - i. The outer edges – can draw from the Joint Coordinated System Plan (JCSP) work (being led by MISO) and the Eastern Wind Integration and Transmission Study (EWITS) – basics described for both at <http://www.nationalwind.org/pdf/LynnColes.pdf> . EWITS study is to evaluate power system impacts associated with wind at 20% and 30% of retail sales in 2024 for the JCSP study area (MISO/PJM/SPP/TVA/MAPP/NYISO/ISO-NE). These percentages are study area-wide, so the Midwestern states with more potential are represented with much higher effective percentages and the resulting power is shipped east. EWITS is much like this study, only much bigger area, and higher penetration levels in the Midwest. EWITS study schedule and progress is a few months ahead of this study, which can be helpful as a starting point for us.
  - ii. SPP plans – we will want to incorporate SPP plans in respect to transmission expansion, market development, and wind generation penetration scenarios. *Jay Caspary indicated that the current plan for the SPP wind integration study is to start in the first half of 2009. SPP has already done some wind penetration scenarios and identification of associated transmission requirements.*
  - iii. Nebraska – review wind sites in NREL data, identify market and balancing area scenarios, include supplementary generation and transmission expansions as needed to align with outside systems and assumptions.
- p. NREL data set is a real and valuable service to the industry. The load and generation (wind and other) data set we develop may well become a reference data set for future studies. We will try to keep some alignment between representation herein and the EWITS.
- q. *Sohrab Asgarpoor asked how study results will be aggregated?* Considerable capabilities here with the softwares to be used (balancing area, Nebraska, SPP, etc.), usual outputs of interest are dump energy, unserved energy, congestion, \$cost/MWh of wind, etc. Also see EnerNex slide #29. Particularly useful will be the variations identified through sensitivity runs – i.e., how is an output expected to vary by variation of an input like wind penetration.
- r. AWS TrueWind is the consultant that developed the mesoscale data for NREL. Resolution is a grid of 2km by 2km – i.e., this is point data at each intersection of these grid lines as a calculation of wind speeds was made at various heights, throughout three historical years (2004-2006), as averages over 10-minute periods, then converted to wind generation data using a typical wind generation design. **Data can be obtained in various forms, and can be viewed “in motion” for the Eastern Interconnection at [www.jcspstudy.org](http://www.jcspstudy.org) .** On that page, click on, for example, 2006 Wind Movies, then it will display the message “Below are animated movies created from data provided by the Department of Energy simulating wind power output for 580 GW of theoretical nameplate capacity. The data represents year 2006 and is presented as per unit power output. Red areas are a value of 0.9 and dark blue areas are a value of 0.0. Download the large versions of the movies for a better look.” Proceed to download and play one of the movies and you will get an overview of the NREL data, scope and usefulness. It will give you a feel for the diversity, duration, and relationship of wind across the Midwest and Eastern states.

- s. EnerNex slide #19 shows Nebraska wind farm locations totaling 50 GW from which to choose our scenarios from, e.g., 20% Nebraska scenario would be about 2000MW, or 2 GW. So there are plenty of locations to pick from in the NREL data. *Question about why Nebraska shows up here better than North and as good as South Dakota, for example. Brian Parsons pointed out that in these site selection data that transmission access is factored in North Dakota is an especially constrained transmission situation.*
  - t. PROMOD data is based on FERC-filed data. The utilities will check the Nebraska data for completeness and correctness.
  - u. Wind generation variations on a 30-second time frame have been found to be uncorrelated to such variations at other plants; therefore, being a statistical variation with a mean of zero. These variations are not large compared to load. In total, these really fast variations need not be studied; hence the use of 10-minute data. In an hour's time, load usually is going one direction (steel mills being an exception), whereas wind generation can be up or down or both. May need to include/correlate some high resolution wind generation for SPP.
  - v. Day ahead forecast data is sometimes saved historically. And could be quite helpful if available.
  - w. *Question on how the SPP generation and transmission expansions are developed. Charles Hendrix indicated that expansions are primarily handled and developed by individual utilities or group of utilities.*
  - x. *Gary Moland indicated that PROMOD has an algorithm to develop and "build" a proxy generation plan. It starts with the wind generation requirement, then adds the supplementary additional generation that is the most cost-effective.*
  - y. Eighty meters is the current height used for turbine designs in most studies like this. NREL does have data for 100 meters. *Brian Parsons indicated that the availability assumption for the conversion of wind speed data to generation data is 98%.*
  - z. Curtailment of wind generation is "always" the lowest cost mitigation option for low-load/high-wind conditions if the system is bottomed out and the wind is increasing and if the number of hours is small. Maybe an approach will be to find how much transmission is needed to incorporate all the wind in a given scenario.
4. Gary Moland, VP-Energy Advisors, Ventyx, led the next portion of the meeting with key points and discussion during that time being:
- a. Indicated that Rick Hut will be the Ventyx Lead Consultant and Brenton Meese is their Midwest Regional Sales Executive.
  - b. Energy Velocity is the hourly data source for the PowerBase Suite including PROMOD production model software. PROMOD has cap-and-trade modeling capability for emissions.
  - c. Separate load profiles (hourly shapes) for each balancing area will be maintained into the future model. Ventyx could do some individual bus projections having different shapes (e.g., industrial load tends to be flatter 24/7). Improving shape modeling can improve congestion modeling.
  - d. *Brian Parsons reminded that the original NREL work request included identification of benefits from any potential "wobble room" in the existing operating plans for the WAPA hydro system. Plus identifying potential benefits produced by extended production flexibility that might be granted through a WAPA customer request process.*

- e. *Michael Milligan indicated that in the Western Electricity Coordinating Council has been modeling hydro as a fixed hourly schedule, which prevents it from responding to load changes or to wind (or anything else). The WECC Hydro Modeling Group recently approved a new approach, called “proportional load following” to schedule the hydro units. This involves the use of multiple regression parameters on the relationship of actual hydro to load, and the development of “k-factors” for each dam. The result is that the hydro is split into load following and run of river components. The method requires substantial data. Milligan indicated he’s not sure if it can be applied to the NPA study but it may be of interest. Milligan subsequently provided the descriptive paper “Application of Proportional Load Following to Hydrogeneration modeling by the WECC Transmission Expansion Planning and Policy Committee”, dated 10 October 2008, for more details and distributed with this Summary or available for downloading at <http://www.wecc.biz/documents/meetings/board/TEPPC/TAS/MWG/2008/HydroMethodComparison101008.pdf>. Bob Zavadil indicated that the base case for WAPA modeling should be existing practices.*
  - f. *John Hansen asked about the assumptions for modeling ethanol plant expansion and irrigation load growth as to what effect they have on load shape and how that is factored into the study, including conversion of diesel to electric service. Utilities can provide some basic information on what is expected here for review by the group.*
  - g. *PROMOD study process does a direct current (DC) load flow calculation to determine by approximation the generation shift factors so that PROMOD knows where to add future generation that complies with the transmission constraints. The constraint information comes from North American Electric Reliability Corporation (NERC) reports and filings plus actual power flow information.*
  - h. *Michael Milligan asked that the study project provide more detail on the study methodology before long so better understanding is possible. For example, will the study examine benefits of rolling commitment, or shorter scheduling times. More details will be forthcoming on the study scenarios.*
5. Bob Zavadil led the last portion of the meeting in going over the last part of his presentation materials and there was good discussion by the group on several related topics and concerns:
- a. *Decided the best study year would be 2018 to line up with existing data models and be about ten years out.*
  - b. *Group discussion about the range for wind generation penetration (for reference, 2000 MW would be about 20% for Nebraska on energy basis).*
    - i. *Brian Parsons and Michael Goggin advocated a high value for penetration, perhaps aligning with the Nebraska share in the 20% national scenario – thought to be 4000 MW for Nebraska, but not sure off-hand).*
    - ii. *Doug Kallesen questioned what would be learned from a 4,000 MW scenario where the last 2,000 MW was being exported over a DC line to the east coast or dynamically scheduled out to somewhere else.*
    - iii. *Marc Nichols mentioned Gov Heineman’s comment recently about a potential Nebraska goal to be in the top 10 for wind generation installations. No one present had a good understanding of what specifically this would amount to, but everyone felt it was necessary to be aware and to factor it into the study as appropriate, especially considering the current development of the Nebraska’s State Energy Plan*

due to be released Jan 1, 2009. As a bit of background one newspaper reference is [www.omaha.com/index.php?u\\_page=2798&u\\_sid=10410726](http://www.omaha.com/index.php?u_page=2798&u_sid=10410726), which talks about a seven-fold increase, but gives no numbers. Assuming this goal means 10<sup>th</sup> in terms of raw MW (rather than in terms of proportionate use), and examining the AWEA data base for current state rankings at [www.awea.org/projects/Default.aspx](http://www.awea.org/projects/Default.aspx) shows Nebraska in 23rd place when counting MW of capacity for projects existing and under construction (shown as 154 MW with data dated as 9/30/08). So if Nebraska “instantaneously” installed 688 MW more we would nose out Oklahoma who is presently in 10<sup>th</sup>. If so done overnight, Nebraska would “tomorrow” have 842 MW. Then, assuming that all states grow their wind capacities at 10% per year, for example, then Nebraska would need to have 2,184 MW of wind generation installed in 2018. However, this is just speculation because there is no way at this time to know what really it will take to be in the top 10 in 2018, or even exactly how this goal is to be defined – this calculation is just for a bit of perspective.

- iv. *Question was asked as to what the study plan portrayed for penetrations. Doug Kalleen stated 5%, 10%, 15%, and 20% level. Some thought we did not need to go that low and that many levels may not be needed (5% was questioned and, as noted a higher end was advocated). Maybe one fewer run here could warrant one more run elsewhere.*
  - v. *Coordination to the degree possible with the penetration assumptions in other studies such as SPP, JCSP, EWITS, etc. may make sense from data development standpoint and also for communication purposes between this and other studies.*
  - vi. *Charlie Smith suggested that given a choice, he would include a higher percentage penetration scenari, since it will stress the system more, and give greater insight into challenges and solutions.*
  - vii. *The final penetration levels to be assumed for the scenarios were not determined during the meeting. Further consideration of the points raised above was considered necessary, and then a rationale brought forward.*
- c. *John Hansen wondered about assumptions for wind generation in western Nebraska, as he frequently gets inquiries from that area of the state on what can be done (given the transmission limitations for power going east and on the lack of synchronous interconnections to the west).*
  - d. *A useful examination will probably be to examine system data in PROMOD model for SPP and Nebraska with respect to minimum load levels and timing with respect to the resource stack to identify rough degree of problem in dealing with high wind generation/low load situations. Similarly we will need to examine ramping rate representations, and other key characteristics relevant to integration issues.*
  - e. *A question was asked about extent of the power system model. Gary Moland indicated initial thought was to keep SPP, Entergy TVA and MISO, but leave out Alabama, Georgia, Florida. They will be doing some evaluation to further define the extent of the model. SPP will be used for the market interaction, although there will be a Nebraska-only scenario, too.*
  - f. *Dave Mazour asked about background on the CO2 cost assumption. These values can be reviewed but were intended as cap-and-trade pricing values for the time frame of 2018. It is believed that some on the group might feel this price of \$20/ton of CO2 is high, and some might think it is too low. Maybe it is about right?*



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**Key Action Item List** (The note in parentheses identifies where to go in the outline above for some background):

1. **Merrill/Iverson** – Draft a high-level explanation of how and degree to which efficiency and demand response effects are factored into the existing NPA load forecast. Solicit input and propose a method to address these uncertainties in the context of this study and its work scope. (3m – finish by Nov 30)
2. **EnerNex/Ventyx** – Draft a more detailed plan of attack for identifying wind capacity value (3m – finish by Nov 30.)
3. **EnerNex/Ventyx** – Draft a more detailed description of the study scenarios and implications of the representation of balancing areas and market operations (3n – by Nov 30).
4. **Iverson/Merrill** – Investigate, and if possible, arrange webinar capabilities for the Jan 7 meeting (by Nov 30).
5. **Johannes/Malone/Merrill/Iverson (in consultation with SPP and consultants)** – Write up for the project a description of pertinent SPP activities, plans and possibilities, now and into the future time of representation (approximately 2018) as they would affect this study in terms of wind generation scenarios, transmission and other generation developments, market development (energy, capacity, and ancillary services), balancing areas, etc. (3o.ii – by Nov 30). For all scenarios, especially high penetrations, provide guidelines on (a) what 345kV and/or 765kV “collector system” requirements are needed to tie into the DC (probably) lines that go east and south east, and (b) the ability to schedule and the economy of scheduling through MISO in comparison to scheduling through SPP (even though Nebraska is “in SPP”).
6. **Iverson/Merrill (in consultation with EnerNex, Ventyx, and Jim Fehr-NPPD)** – investigate and write up any findings or possibilities for identifying the effects on various emissions from fossil plants when they move to an operating regime where they operate at different levels and do more ramping as a result of wind generation penetration. Discuss PROMOD capabilities and data needed, or other approach to identify this cost. This could be an additional cost not typically addressed in integration studies. Also it was brought up in the Nov 5 Nebraska Energy Office hearing on the State Energy Plan, whereupon the industry answer referred to this study as a possible resource on that question (by Dec 15). Closely associated with this question would be the effect of more coal unit ramping and regulation – that is, making sure that the PROMOD data and modeling approach has sufficient detail in Nebraska (especially) to determine loss of efficiency and similar effects.
7. **EnerNex/Ventyx** – provide an explanation of how much wind is actually being modeled in Nebraska for the other studies (JCSP and EWITS) (3s by Nov 30).
8. **Ventyx** will send the PROMOD data sets to the Nebraska utilities for review and input prior to their use. Further, Ventyx will point out what special modeling techniques and output variables will be used to capture the special needs of this wind integration study (3t by Nov 30 and throughout).

9. **EnerNex** will obtain/review some high resolution wind data for SPP (3u by Dec 15).
10. **Kallesen, Iverson, and Merrill** will respond as to whether they have any historical or other information on the accuracy of load and wind generation forecasting, and at what lead time (i.e., scheduling lead time). If available, then collect and provide it as historical time series or summary statistics. An approach to how a load forecast error stream will be derived for use should probably be vetted with the TRC. (3v by Dec 15).
11. **EnerNex** will prepare a request letter outlining the specific archival data needs for people to start working on by Nov 30.
12. **Johannes/Merrill/Iverson/Steinbach/Rich (in consultation with consultants and Radecki)** – research with WAPA operations and write up what potentials might be available for hydro generation to be more flexible (and responsive to wind generation patterns), both for current operational plans and with modified plans, and how to model this in the study to identify such benefits and impacts (4d by Dec 15)—coordinate with #13.
13. **Johannes/Steinbach/Merrill/Iverson/Rich (in consultation with consultants and Radecki or WAPA operators on the east and west, and Milligan)** – find out what exactly flexible features are being allowed by other WAPA customers, especially in the west and the east (including preference power shares and any hydro operational flexibility, and particularly if any dynamic ramping flexibility is being granted, how and to what extent, plus how to model it (4e by Nov 30)—coordinate with #12.
14. **Kallesen** – provide a description of the ethanol and irrigation assumptions inherent in the load forecast (4f by Nov 30).
15. **EnerNex/Ventyx (in consultation with Kallesen and anyone else on NPA so inclined)** –draft up more details on the study methodology, including scenario assumptions (data and logic) and outputs to be collected. In this process, be sure to review the 5-page study plan to be sure to capture its content in this larger description (4h by Nov 30). One specific is mentioned here, that whenever evaluating benefits of shorter term scheduling updates, that we also look at shorter term wind plant output forecasting in addition to the day-ahead data that comes from the NREL data set. These types of documents need to be “living” documents throughout the study.
16. **Nichols, Rich, Hansen, Moseman** – keep the project advised as relevant details of the Top 10 goal and the State Energy Plan continue development (5.b.iii – ongoing).
17. **EnerNex/Ventyx (in consultation with Kallesen and anyone else on NPA so inclined)** –draft up a rationale for the penetration levels to be assumed for the scenarios, both for Nebraska and surrounding systems, especially considering what shows up in other models and regional studies as coordination – can be combined with 15 above (5b by Nov 30).
18. **Steinbach/Brooks/Malone /Cutsor/Kallesen (in consultation with EnerNex and Ventyx)** – once some NREL siting information is made available to the study, identify and evaluate some wind generation development in western Nebraska that could directly tie in to the Western system, including approximate transmission requirements and draft a simplified side analysis (without

making PROMOD runs) for inclusion into the study report (5c by Dec 30). This would be intended to help address wind possibilities for Nebraska export to WECC without identifying a \$/MWh integration cost.

19. **Ventyx/EnerNex/NPA** – Carefully examine the PROMOD data for the base case of 20% by energy (~2,000 MW), especially for SPP and Nebraska, to see what data needs tuning up. Ventyx will send out the PROMOD base case data for review by NPA regarding ramp rates, minimum levels, etc. (5d, base case data by Dec 15).
20. **Ventyx**– Draft a rationale for the extent of the system to be modeled in PROMOD and structure of the market (5e, by Nov 30).
21. **EnerNex/Ventyx** will outline a rationale for how the cost allocation algorithm will work for SPP market involvement. For example, under the standard procedure cost is registered through the extra reserves required as determined by the statistical analysis. Does that then require detailed high frequency load data for SPP, too? Is that available? And what about ancillary-type service charges for others in SPP doing our balancing? How does all this fit together in a market participation scenario? (by Nov 30).
22. **Anyone is welcome** – to draft up arguments for the \$20/ton CO2 base case pricing being high, or low, or about right (5e by Dec 15). Utilities especially may want to relate this assumption to what valued they are using in other planning studies (suggest that each utility send their value(s) to **Iverson** to develop a composite).
23. **Ventyx/EnerNex** – draft a suggested rationale and treatment of REC pricing -- whether it would be relevant or not, considering a CO2 regulation in place, and whether an RPS would be in place rendering for sure a non-value for revenue on at least the RPS portion of the energy created (5f by Dec 15).
24. **All** – at the same time as you are doing all the other assignments above, review the 5-page study plan (see Reference Document) and pick up on any additional tasks that you can help with or that relate to what you are doing.
25. **Kallesen/Asgarpoor** – Keep in close and early touch in the transmission development and base case development processes in case Dr Asgarpoor has any available extra technical review time to participate in these activities (beyond normal TRC review processes).