

## *Draft Meeting Summary*

# **NATIONAL WIND COORDINATING COMMITTEE UPPER MIDWEST TRANSMISSION WORKSHOP**

*Technical Dialogue and Strategy*

**May 1-2, 2001**

**Embassy Suites Hotel**  
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Minneapolis, MN 55415  
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*Note: NWCC meeting summaries reflects views expressed by participants. Views expressed are those of individual participants and not necessarily the NWCC as a whole..*

Facilitators: Abby Arnold and Gabe Petlin, RESOLVE

### **Tuesday May 1, 2001**

#### **Welcome, Introductions, Perspective of the NWCC Transmission Subcommittee**

Charlie Smith, Utility Wind Interest Group (UWIG), and Chair NWCC Transmission Subcommittee

[See Attachment X for Charlie Smith's slides]

Charlie Smith opened the meeting with a review of the purposes of the workshop:

- Present and discuss key studies and assessments of transmission upgrades, additions and related issues for the upper Midwest, including work that addresses the full range of views on these topics;
- Understand the various transmission issues in the upper Midwest and discuss options for addressing the issues;
- Identify the decision makers and entities that need to play an active role if transmission issues are to be resolved, and agree on next steps for engaging these individuals and organizations through education, outreach, and information dissemination.
- A follow-up workshop to help build consensus on potential solutions is envisioned for the Fall of 2001.

Mr. Smith presented an overview of the NWCC Transmission Subcommittee's recent work as backdrop for this meeting.

#### **NWCC Role in RTO Process:**

- Facilitator and resource to stakeholders
- Recognize RTO/ISO writing new "rules of the road"
- Seek level playing field and fair treatment for wind generation
- Develop and disseminate RTO Principles (available at: [www.nationalwind.org](http://www.nationalwind.org))

## Issues Critical to Fair Treatment of Wind in Evolving Markets

Subjects of NWCC Issue Briefs under development:

- Transmission Planning Process
- Balancing Markets
- Real-time Scheduling
- Markets for Transmission Rights
- Interconnection Standards and Policies
- Congestion Management
- Rate Pancaking

## NWCC Transmission Case Studies

- Four case studies conducted, including one on transmission system improvements in the upper Midwest (available at NWCC website)
- Long distance between wind generation and load
- Transmission system is often congested
- Issue is broader than wind

## Conclusions of NWCC Upper Midwest Transmission Case Study

- Stakeholder groups have different perspectives and conflicting conclusions on need for new transmission.
- Improved regional approach to resolving transmission planning issues must be found.
- Transmission upgrades needed for wind development will benefit multiple generators and will likely face continued environmental and community advocate opposition.
- A new approach which will produce renewable energy, environmental, and transmission abutter benefits may be required.

## **Opening Panel: Context for Transmission and Wind Power in the Midwest**

Moderator: Ron Lehr, NARUC and NWCC

Ron Lehr stressed the importance of understanding a range of perspectives when addressing transmission issues. He framed some of the issues to consider by asking the panelists to address the following questions:

- What are the electric market issues? Demand growth, regional power market issues, Canadian imports, distributed generation, FERC policy, etc.
- What are the transmission issues? Cost recovery, planning, RTOs, congestion, etc.
- What are the other key issues? Environmental concerns, local abutter responses, permitting issues, loop flow, etc.

## Panelists:

### **Larry Brunnel, Wisconsin Electric Perspective on Transmission and Wind Power**

- Mr. Brunnel characterized the restructuring of the electric transmission system under FERC Orders 888 and 2000 as the “story of haves and have nots,” those that own transmission

assets and those that need access to transmission services. Transmission-owning utilities are positioning themselves to benefit their own generation resources at the expense of competing generators that need transmission.

- Transmission lines originally were built to share reserves and increase electric reliability. The bulk transmission system was an “old boy” network of vertically integrated investor owned utilities and transmission engineers.
- Now under restructuring bulk transmission markets are rapidly changing. Reliability is still a paramount concern, but within a new context: the struggle to create fair, open, non-discriminatory access to transmission for all competitive generators. New structures are being proposed to replace the “old boy network” and create open access.
- In the new context we are all in this together. Regionalism spans beyond the boundaries of transmission [control areas? Or reliability regions?]
- Unbundling generation from transmission does not alleviate the need for coordination across transmission regions.
- FERC is currently assessing many RTO proposals in different forms.
- Congress is looking at legislation to give transmission siting and reliability authority to FERC.
- Locally attention is focused on the Arrowhead-Weston transmission line proposal; a well-known bottleneck. There is a big market for green power in Wisconsin, but the sources of green power need access to transmission in order to get to market.
- In sum, Mr. Brunnel sees a chaotic transmission system and a process of change with strong potential for additional crisis.

### **Charlie Grunewald, Xcel Energy and MAPP Transmission Planning Sub-Committee**

[Mr. Grunewald gave a detailed handout as background entitled “What is MAPP? What are the Issues?” Attachment X]

The issues addressed in Mr. Grunewald’s handout are: demand growth, market issues, Canadian imports, distributed generation, environmental concerns, FERC policy, TPSC/SPG process and planning guidelines, stakeholder planning process, and transmission planning product.

His talk covered these points:

- MAPP transmission planners are soliciting stakeholder input on transmission issues.
- The MAPP planners are committed to complying with FERC Order 888 which requires that every customer have equal access to competitive generation. They see themselves as common carrier providers.
- The MAPP transmission planning and implementation process: stakeholders come together to define the needs for transmission, develop transmission proposals, finalize recommendations, and find a builder.

#### Questions and Discussion:

What are the issues that prevent certain transmission projects from being built? Replies included:

Each state has its own permitting process and coordination between states is required as most transmission projects affect multiple states. Examples were presented by both Ed Weber and Charles Grunewald and include potential North Dakota Wind developments that need transmission lines, but the lines were tied up and/or compromised by state permitting process. These were two Minnesota to Wisconsin projects. There is a negative perception of high voltage lines, but high voltage lines have efficiency gains in terms of less line loss.

- Another perspective adds that with higher voltages fewer lines and less right of ways and material are needed. From an environmental perspective higher voltages are more friendly for the reasons stated.
- .
- Rate recovery is an important issue impeding new transmission.
- Transmission is perceived to be expensive by some because of the sticker price. Another view is that it is only about 10% of the end delivered cost of a kWh. A 10% capital improvement to the MAPP transmission would add less than one percent to the delivered cost and would provide environmental and economic insurance while also complimenting the purposes of this conference.

### **Bill Grant, Izaak Walton League**

As background Mr. Grant described some of wind-related activities he has played a role in:

- Mr. Grant was involved early on in testifying in the case that led to Northern States Power (now Xcel Energy) building the 1st 100 MW of the wind generation eventually required of them.
- More recently he was involved in the settlement agreement with Xcel and Public Service of Colorado to create a certificate of need for a 345 kV transmission line to serve southwest Minnesota wind projects.

The principle barrier to additional wind power development in this and other regions is transmission access. Mr. Grant summarizes the primary issues with transmission in descending order of priority for the environmental community (Bill is this what you meant?):

5. Electromagnetic fields. After many studies there is no clear answer on harmful affects. This is not likely to be a driving issue.
4. Visual impacts of new lines particularly in natural and scenic areas. This issue is present in the Arrow Head to Chisago line case.
3. Physical impacts to ecologically sensitive areas.
2. Land use impacts and resulting loss of property value.
1. Use of transmission line – Is a new line going to serve local load or large bulk power transfers across regions? This affects how abutters perceive whether there are any benefits locally.

Regional reliability also needs to be addressed. Mr. Grant sees a struggle going on over transmission that facilitates generation which is undesirable by environmental interests. At the same time new wind projects need access to transmission in order to reach the market place.

There may be new opportunities to:

- “Green up” transmission lines, e.g. by connecting wind along the way.
- Compensate abutters for environmental impacts.

Another issue of importance is the capacity of the distribution network to put distributed wind on the system. For wind developers cost allocation of new transmission connections will be a big issue. In conclusion, the environmental community is not universally opposed to new transmission lines to the extent that they are moving clean power to market. Mr. Grant believes there are win-win solutions to be found.

*Group Discussion of Midwest Transmission and Wind Context:*

- What about biomass? Could it be a potential partner to wind for transmission lines? According to one participant biomass is about 15 years behind the cost curve of wind. Another believes it is a player, but points out that consideration has to be made for the impacts and costs of growing corn in the first place (assuming that is the fuel to be used). Another states Denmark uses residual hay as a biomass fuel.
- What is the level of green power required on a line to win environmental support? Mr. Grant states it needs to be developed, but it has to be greater than 1:1 green to non-green. Another participant points out that any new resources needs transmission.
- Also need to look at economics of new transmission lines. Transmission line applications often don't do as good a job as they could at making an economic case. Its fair to address rate payers' concerns with getting the most efficient use of their dollars for transmission projects. There is not sufficient cost recovery in some cases to build new lines.
- What is different about wind power in terms of system integration? This needs to be a part of the context for wind power in the region.
- It's a good start what MAPP wants to do with involving stakeholders, but other than regulators and utilities, outside stakeholders are not involving themselves in what some describe as a transmission planning process open to stakeholders. Others suggest that these planning processes are not as open they appear to be.
- What are the forums for diverse stakeholder exchange that would be seen as legitimate and lead to some outcomes? Various responses follow:
  - There are two kinds of decision makers: public and private. The way to get decision makers attention is to get their trusted technical advisors, to agree on the way to go. These are often professional engineers. Is there a parallel public decision making process, e.g. roads?
  - The only parallel public decision-making process is PUCs that consider economics. Transmission planners, in one view, only consider rate and tariff issues and do not consider environmental impacts or conservation. In another view this is only a perception and they infact spend extensive time on environmental considerations.
  - Another view is that MAPP is trying to change to open their process to be a more transparent forum. Right now meetings are open, but not well attended by those other than non-engineers, utilities or regulators. This is due in part to the technical nature of the proceedings which is difficult for some stakeholders to grasp.

**Technical Session One: Regional Transmission Studies in the Upper Midwest**

Moderator: Brian Parsons, National Renewable Energy Laboratory (NREL)

*Theme:* What do regional transmission studies tell us about opportunities and challenges for transmission improvements?

**PRESENTER: Bruce Biewald, Synapse Energy Economics**

**STUDY: Repowering the Midwest: The Clean Energy Development Plan for the Midwest**

[See attachment X for Mr. Biewald's slides.]

**ABSTRACT:**

This study investigated the potential for clean power opportunities in ten Midwestern states through 2020. The study found enough clean resources to level off electricity demand, reduce coal generation by 50 percent, add enough renewable resources to meet 22 percent of demand, and meet the CO<sub>2</sub> goals of the Kyoto protocol – all for only modest increases in electricity costs. The study demonstrates that there are real and viable alternatives to the recent emphasis on conventional supply-side policies in the debate over national energy needs.

The study identifies vast opportunities for wind power development in the Midwest, especially in the Great Plains states in the western part of the region. However, much of the demand for power resides in the eastern part of the region, where the larger population centers are. Our model identified the opportunities for transmitting wind power from the wind turbines to the load centers, assessed the constraints on the existing transmission system in the region, and developed rough estimates for the cost of transmission upgrades.

***Conclusions:***

- 8% renewable generation by 2010, 22% by 2020.
- 25 Gigawatts of wind generation installed by 2020.
- Meets Midwest portion of Kyoto GHG reduction target.
- Under study pan, 1.5% increase in price of electricity by 2010, 3.2% by 2020.
- Flat load growth in study period.

***Questions and Replies:***

Question: What are the next steps for Transmission work?

Reply: Project specific work and system impact studies are needed.

Question: What transmission investment costs were assumed?

Reply: \$500 per MW mile for a 230 kV line.

Question: What were the policy framework assumptions?

Reply: 1950s era coal-fired plants are retired.

**PRESENTER: Tom Wind, Wind Utility Consulting and MAPP Transmission Planning Sub-Committee.**

**STUDY: MAPP Transmission Planning Issues and Next Steps**

[See Attachment X for Mr. Wind's slides.]

Mr. Wind's presentation addressed steps involved in adding generation to the grid. Studies must be done to assess impacts to the grid.

### ***What Are the Rules for Adding to the Grid?***

- Transmission owning utility must abide by design standards to accept new generation on the system.
- New generation must not degrade reliability.
- Shouldn't make existing problems worse.
- Shouldn't result in over-scheduling lines.
- Shouldn't reduce the ability to transfer power across the grid.

### ***What Is Involved in Adding Generation to the Grid?***

- Technical studies to determine impact on:
  - Existing transmission line loadings
  - Voltage levels within guidelines
  - Stability of the grid
  - Existing constrained interfaces (bottlenecks)
  - Consent of adjoining transmission system owners

### ***Technical Studies***

- All new additions must be studied
- Simplest studies cost a few thousand dollars
- Most detailed may involve up to a 1/2 person-year of study
- In MAPP, must be approved by MAPP Design Review Subcommittee.

The key bottle necks for transmission are the North Dakota export and Fort Col\_\_\_\_, IA.

### ***Discussion and Questions:***

- No one is coming forward willing to pay for new transmission and MAPP doesn't build a line until they receive a specific request.
- What about market issues? Does cheap power on the line add demand on the system?
- Are the problems greater for moving power within the system or exporting power out of the system? Reply: the problem is adding new generation to the system.

### **Charlie Grunewald, Xcel Energy and MAPP Transmission Planning Committee**

- Any proponent can make an interconnection request and MAPP has an obligation to provide a plan and how much it will cost.
- A modest charge on electric bills could contribute to prudent improvements to the system.
- Transmission is only 10% of the consumer's electricity bill is transmission. Increasing the transmission system by 10% would only result in a 1% increase in MAPP consumer rates.
- There is not one forum for addressing these issues. To get a rate surcharge for transmission improvements would take going to 6 different state PUCs and that hasn't been tried yet.

## **Western Area Power Administration (WAPA) Studies**

**PRESENTER: Ed Weber, WAPA**

**STUDY: Getting Wind Out of the Box: How Much Dakotas Wind Power Can the Current Transmission System Handle? (Phase I Study)**

[See Attachment X for Mr. Weber' slides.]

Mr. Weber presented WAPA's power-flow analysis of local facility limits in the Dakotas. The scope of study is to determine the maximum level of wind integration at 12 selected sites using local facility limits as the screening criteria. The study did not consider regional stability effects of the sites. The study concludes that several sites are severely constrained. Additional study is needed. Additional points made by Mr. Weber:

- MAPP is considering a several upgrades at \$200,000 per mile.
- Currently there are 41 study requests in the queue, including FPL's 250 MW wind study request. Because of the rising cost of energy in California, MAPP now has 800 MW of study requests from the West.
- A limiting factor in energy export from South Dakota is there is only one 230 kV line from Watertown, SD to Minneapolis. A reason why there are no large transmission lines connecting southeastern North Dakota and Minneapolis is that the route would go through vacation areas of Minnesota lake country (e.g. Lake Geneva).
- A Phase III study will look at system impacts of large generation added near Jamestown, SD (300 MW of wind.)
- Mr. Weber listed the transmission services charged in three regions and noted that the single highest impediment to MAPP joining the Midwest ISO (MISO), is MISO's license plate pricing which would shift costs to lower-density areas:

North Dakota:	\$3.50 per MW hour
Minneapolis, MN:	\$2:00 per MW hour
New York:	\$1:00 per MW hour

### **Participant Discussion:**

- Eminent domain is not a viable option to facilitate transmission line construction.
- How long are policy makers going to wait to build new transmission lines? Are they going to wait for a crisis on the scale of California? Reply: One alternative to building transmission lines is to ship coal via rail to generation plants closer to load.
- Do all interconnection studies have to go through the same long queue process? E.g. small wind projects. Reply: the same reliability standards are applied to all applicants: what is the impact on the system?
- It's a question of real physics vs. contract path –it's a question of electron displacement.
- The PJM ISO unofficially fast tracks small projects.

**PRESENTER: Jay Haley, EAPC Architects Engineer.**

**STUDY: Update on the Griggs-Steele Transmission Plan (Phase II Study)**

[See Attachment X for Mr. Haley's slides.]

The Griggs-Steele Wind Development Group made an interconnection request to add 130 MW of new generation at the Pickert substation in Steele County of North Dakota with the intention of wheeling the power to Xcel Energy on WAPA transmission lines. The point of delivery is the WAPA/Xcel interface. WAPA conducted the preliminary studies with funding assistance from the U.S. Dept. of Energy. The study identified the upgrades that would be required on the MAPP system to WAPA lines as well as to third party lines.

### ***System Impact Study Status***

- Turbine model developed by Enron/PTI
- Baseline developed by WAPA
- There is sufficient ATC to accommodate Griggs request
- Preliminary range of costs estimated for system upgrades
- Third-party impacts unresolved
- Facilities study not started yet

### ***Overall Project Status***

- Did not win Xcel bid for 80 MW
- Working with developer on other PPA options
- Looking at other interconnect/transmission options
- Continuing with wind resource assessment
- Conducting economic impact study

### ***Conclusions***

- There's a need for better turbine models for use in transmission modeling
- There's an overflow in the transmission queue
- There's a shortage of transmission modelers/expertise
- Current FERC rules hinder new transmission customers
  - Transmission modelers are working on quicksand
  - System Impact Study is obsolete before its completed
  - Procedural timeframe is wider than window of opportunity for some wind developments (This point was stressed by Mr. Haley.)

### ***Group Discussion of Regional Transmission Studies: What are the opportunities, what are the challenges?***

Discussion first focused on summarizing the challenges and problems with the current transmission system:

- Lack of available transmission capacity (ATC) is the problem.
- The MAPP system is not robust enough to be flexible to absorb new generation easily.
- There is a shortage of transmission planners.
- FERC is trying to graft a competitive system and robust transmission system with an archaic constrained system. The power grid is not in place to enable deregulation. Its time to re-assess FERC policies.
- Market power abuse is almost inevitable in the context of RTO formation.
- A fast-tracked market approach can't succeed under the present situation.
- Competitive markets and transmission planning are on a head-on collision.

- The time frames of transmission planning and wind power development opportunities can be mis-matched.
- We need a transmission planning process that responds to public and environmental needs.

***Specific proposals:***

- One alternative is to by-pass the transmission planning process by building small and or distributed generation. Discussion lead to observations by most that all generation alters transmission flow patterns regardless where it is connected.
- In the old days transmission planning resulted in the transmission being built that was needed. We need a regional authority that can plan and mandate transmission being built and have the authority to insure adequate cost recovery.
- A system wide tariff to pay for transmission upgrades and additions would result in a modest charge to all customers and be relatively painless. Though, some would say that consumers do not want to pay more for electricity.
- Another participant expressed concern that restructuring should not result in 6 cent generation and 3 cent transmission being converted to 3 cent generation and 6 cent transmission. While this is a hypothetical example, his point is that there is a big struggle over cost-shifting. He is concerned that calls for granting incentives and risk premiums to build transmission obscures the fact that it's difficult to build transmission because of NIMBY and other issues, not entirely because of financial issues.
- According to one participant transmission costs about \$0.006 kWh and transmission rates seldom change.
- Some expressed interest and support for merchant transmission lines as a possibly faster solution. Others responded that virtually every line being proposed is a private line. A merchant DC line would still have to get into the MAPP study queue at the proposed point of integration.

**Announcement of McKnight-Energy Foundations Wind Transmission Initiative**

Bill Grant, Izaak Walton League

Mr. Grant announced a new initiative of the McKnight and Energy Foundations entitled “**Wind on the Wires: Developing a Road to Market for Wind Power in the Upper Midwest.**” The new initiative is a partnership of business leaders, local leaders, clean energy advocates, and wind energy experts dedicated to overcoming barriers to moving wind energy to market in the Upper Midwest. The initiative will focus on overcoming two main hurdles: removing bottlenecks in the transmission system and providing wind energy with equal access to the transmission lines. In the first area the emphasis will be on identifying the highest priority transmission upgrades and working with utilities, state and federal regulators, and local communities for their completion. In the second area the initiative will work to reform state and federal regulations so wind energy has fair access to the transmission system. For more information contact Bill Grant, chair of the Wind on the Wires Steering Committee, (651) 649-1446, billgrant@iwla.org , or go to: [www.windonthewires.org](http://www.windonthewires.org)

**Technical Session Two: Presentation of Related Transmission Studies**

Moderator: Ed DeMeo, NWCC and UWIG

*Theme:* What do related transmission studies tell us about opportunities and challenges for transmission improvements?

**PRESENTER: Rodolfo Koessler, ABB Power Transmission and Distribution Company.**  
**STUDY: Transmission Alternatives for Expanding North Dakota's Electricity Export Capability**

[See Attachment X for Mr. Koessler's slides.]

Mr. Koessler prefaced his slide presentation with the following facts on North Dakota transmission lines:

- North Dakota has a DC line that does not have synchronizing power;
- Two AC lines stop in the middle of the state;
- Basically, you have a system with a lot of generation and not a lot of transmission. The Lignite Vision 21 Study hired ABB to assess what transmission would be needed to add 500 MW of export power to North Dakota (NDEX).

**Scope of Study:** (feasibility, upgrade, and addition study): Analysis of transmission system requirements for seven potential sites for a new 500-MW coal-fired generating unit in North Dakota.

**Study Recommendations:** The studies have identified facilities for increasing the North Dakota export level from its present limit of 1950 MW to 2450 MW and to 2800 MW. Estimated costs have been identified for these common facilities. Individual (confidential) site reports contain the facilities required for each specific site.

**Abstract:** For each of seven sites, alternatives were developed for exporting power from a 500-MW coal-fired plant in North Dakota to the Minneapolis/St. Paul area. The seven sites are described below by the nearest power system feature.

- Site #1 – Beulah Mine near Coyote Station
- Site #2 – Center Mine near Milton Young Station
- Site #3 – Falkirk Mine near Coal Creek Station
- Site #4 – Freedom Mine near Antelope Valley Station
- Site #5 – Great Northern Properties near Belfield Substation
- Site #6 – Gascoyne Mine near Hettinger Substation
- Site #7 – LUSCAR near Tioga Substation

The transmission facilities common to all sites for increasing the NDEX to 2450 MW and transmitting the power to Minneapolis/St. Paul include, among other reinforcements, a 409-mile, 500 kV line from Antelope Valley to Split Rock. 299 miles of this 500 kV line will be the result of upgrading the existing A. Valley to Broadland line, which was built for 500 kV, but is currently operated at 345 kV. The remaining 110 miles will be new construction. The common facilities also include construction of a new 70-mile, 345 kV circuit between Split Rock and Lakefield Junction.

The studies also examined transmission reinforcements required to accommodate approximately 350 MW of existing queued OASIS transmission reservations. The results show that with 35% series compensation of the proposed Antelope Valley-Split Rock 500 kV line and 25% series compensation of the Leland Olds-Groton-Split Rock 345 kV line (among other reinforcements), the resulting 2800 MW NDEX transfer level could be accommodated.

Costs for increasing NDEX capability were estimated at:

- Costs for NDEX Upgrade to 2450 MW \$130,529,000
- Costs for NDEX Upgrade to 2800 MW \$153,039,000

With the above reinforcements, the North Dakota System meets MAPP criteria, but requires automatic tripping of the new unit following outage of the proposed A.Valley-S.Rock 500 kV ckt. (for multi-phase faults and high NDEX transfer levels). Additional reinforcements would be required in order to avoid such tripping. For example, the studies show that with 35% series compensation of the Antelope Valley-Split Rock 500 kV line, 65% series compensation of the Leland Olds-Groton-Split Rock 345 kV line, and 65% series compensation of the Leland Olds-Ft. Thompson 345 kV line, no generation tripping would be required (2800 MW NDEX transfer level). Thus, in this case, the “tradeoff” for no such tripping is an increased cost (estimated at \$9,000,000) and an increased exposure to Subsynchronous Resonance (SSR) problems. The above are only some of many potential alternatives that could be developed. The analyses were limited to the technical performance to meet MAPP criteria. The evaluations did not consider contractual obligations, analysis of any potential SSR problems, or other commercial and environmental aspects.

Participant Discussion:

- Getting transmission for 500 MW of coal is just the start of the problem. The air shed could not absorb this much fossil generation, particularly for SOX.
- What about wind and coal together? This topic was tabled for a later discussion.

**PRESENTER: Tom Wind, Wind Utility Consulting**

**STUDY: Delivering Wind Energy to Large Midwestern Metropolitan Areas: A Comparison of Methods**

The primary objective of this study is to determine the relative economics of wind generation at both close-to-load and remote sites. Local sites are closer to the electrical load and will require less transmission infrastructure. Remote sites have much better wind resources but they would require significantly more transmission infrastructure to deliver the electric energy to area loads or to remote load centers. Transmission constraints also affect the cost of the required transmission facilities. The impact of a future renewable energy credit-trading program will be assessed, since this will eliminate the need to deliver renewable energy to specific locations.

Study recommendations are not available yet, but Mr. Wind did present some comparison data on the cost of producing and transmitting wind energy from three locations:

<u>Location</u>	<u>Cost</u>
Wind spot with 150-500 MW of capacity near Chicago	???

Wind spot with 150-500 MW of capacity in Iowa	\$7/MW hour or less
Wind spot with 150-500 MW of capacity in South Dakota	\$14/MW hour or less

Additionally, Mr. Wind pointed out that a DC transmission system with dedicated power will operate at the same capacity factor as a wind farm. [Tom, what does this mean?]

Discussion:

- What are the cost assumptions for transmission construction?
- A problem with a DC-only scenario is if you lose a pole you have to trip all the generation. Another scenario is hooking DC lines into AC which has technical challenges.

**PRESENTER: Dr. Richard Rosen, Tellus Institute.**

**STUDY: Arrowhead-Weston Transmission Line Addition: Issues and Responses**

[See Attachment X for Dr. Rosen’s slides (waiting to receive)]

**Abstract:** Reviewed the reliability and economic basis of the Arrowhead-Weston transmission line as proposed by Applicants (Wisconsin Public Service Corp. and Minnesota Power Company). Also reviewed the claims made in the Final Environmental Impact Statement by the Wisconsin Public Service Commission Staff.

Dr. Rosen testified in the WI PUC hearing over the above mentioned line proposal that would have added 800 MW of transmission capacity by constructing a 240 mile 345 kV line from Deluth, MN to Wausau, WI at a cost of \$210 million. He presented his institute’s reasons for opposing the project:

- The proponent’s main argument in favor of the line was that it would improve reliability. Tellus argued that most of the local load in the area to be served by the line (Eastern WI) could be served by local generation additions at a lower cost.
- Further, they argued that the applicants didn’t examine the overall picture of linked issues, e.g. the trade-off between coal or hydro in Minnesota and Manitoba, Canada being served by the line vs. more local and/or clean generation that would require less transmission lines being built.
- Mr. Rosen drew three lessons from the case:
  1. Integrated Resource Planning (IRP) principles should have been applied by the applicant –both analytic and process. Applicants did not pursue issues with popular support such as conservation investments and renewables that would have generated support for the line, if justified.
  2. Applicants need to involve all stakeholders in the planning process up-front.
  3. A regional planning process is necessary for transmission investments, but having state energy and environmental policy frameworks in place will help bound the planning process to consider only feasible options.

***Participant Discussion***

- One MAPP participant agreed that transmission planner need to do a better job at considering economic factors in addition to their emphasis on reliability.

- Another MAPP participant commented that transmission planners are concerned with not appearing to be unduly influenced by a particular form of generation as transmission is a common carrier by national intent.

### **Technical Session Three: Presentation of Additional Energy Transport Plans**

Moderator: John Dunlop, American Wind Energy Association (AWEA)

*Theme:* What do energy transport plans tell us about transmission opportunities and challenges?

**STUDY: Transmitting Windpower from the Dakotas to Chicago: A Preliminary Analysis of a Hydrogen Transmission Scenario; prepared by Bruce Biewald of Synapse Energy Economics for Environmental Law and Policy Center as part of Repowering the Midwest.**

**PRESENTER: Barclay Gibbs, Synapse Energy**

[See Attachment X for Mr. Barclay's slides]

**Scope of Study.** Looked at the relative costs of transportation of energy from wind generation in the Dakotas to load centers to the east, focused upon a hydrogen pipeline scenario.

**Abstract:** This study considers the transmission of wind generated electricity from the Dakotas to load centers near Chicago via hydrogen pipeline. The economics of this option work under some conditions, and it is worthy of further consideration. In particular, with improvements in fuel cell cost and efficiency, high natural gas prices, aggressive carbon policy the economics can become attractive. The considerable storage capability of the pipeline also offers benefits. The future success of the hydrogen transmission scenario is intimately linked to the future success of the auto companies in commercializing hydrogen-fueled vehicles.

#### ***Preliminary Conclusions:***

- The Hydrogen Transmission Scenario (HTS) appears to be in the "ballpark" when compared to the Electrical Transmission Reference Scenario and the Business as Usual Scenario.
- The HTS may deserve deeper analysis to evaluate the benefits of timing the electricity market (and environmental benefits).

Additional assumptions not listed in the presentation:

- Did not factor in selling at peak prices
- Used gas prices at \$2-6 per 1000 BTU
- Carbon policy not considered

**STUDY: Northern Plains Wind Wire Project Concept to Deliver 3000 Megawatts of Wind Energy from Wyoming to Chicago via DC Line**

**PRESENTER: Tom Wind for Ken Hach, Clipper Energy**

Tom Wind stepped in for Ken Hach who was unable to attend. Mr. Wind reported that Clipper Energy has 1000's of acres of land under lease options for wind turbines. [Note: I need to clarify which line is being proposed by Clipper and which is being proposed by Jim Nichols.]

A 3,000 MW DC transmission line is proposed from the Powder Basin in Wyoming to Zion, IL where a 3,000 MW nuclear power plant has been decommissioned.

Jim Nichols, a county commissioner from Lake Benton, MN and wind energy advocate, attended the second day of the meeting and gave a presentation of the above proposed transmission line, which is summarized here. Mr. Nichols is the chief proponent of the transmission project that would transmit coal-fired electricity from Wyoming to loads in Chicago. The line would be a conduit for wind energy inter-connected at numerous windy sites along the way. Mr. Nichols reports that he has received letters of support from the county commissions of South Dakota and Minnesota adjoining the proposed route to consider granting rights of way for the project along county roads. In exchange Mr. Nichols will insure that 100 MW of capacity are reserved for wind projects in each assenting and adjoining county. The project is estimated to cost \$1.2 Billion to build. It will cost \$0.08 per kWh to carry electricity on the line. Since wind has a capacity factor of approximately 1/3, it would cost wind generators \$0.24 per kWh. Because of this cost it is important to find partners to maximize the use of the line.

### ***Participant Discussion***

- A concern is that the AC tie-in to DC is expensive and technically challenging.
- Another concern is that building a transmission line along county roads is likely to encounter concerns of local home owners with physical and visual impacts as well as fears of EMS.
- Another perspective offered is that the group has talked about squeezing a few MW's of wind onto the transmission system. What we need to do is think about large DC transmission lines for wind energy. Ac lines are more expensive.

**Wednesday May 2, 2001**

**Panel Discussion : Key Issues, Perspectives, and Proposals for Consideration on Transmission Studies and Regional Needs**

Moderator: Abby Arnold, RESOLVE

*Panelists will be asked to present their interests and concerns followed by questions and response. What are the key elements of the region's expected energy future?*

**Wind Industry – John Dunlop, AWEA**

The wind industry is a small player in the vastly complex transmission arena. But we need to prepare to position ourselves to capitalize on the low cost advantages of wind power. Wind needs to familiarize itself to engage with the transmission planning process.

**Environmental – Michael Noble, Minnesotans for an Energy Efficient Economy**

- We should emphasize integrating transmission issues with national environmental and energy policy goals. No one would have imagined 2 years ago there would be a resurgence of interest in the nuclear power industry. This could impact wind power.
- One type of planning analysis is how do we get the next 500 MW of wind into the Upper Midwest. But another question is how can we get wind power to supply 10-15% of national energy needs in the next 10-15 years? Eventually climate change will be a primary national policy goal. Right now the national debate on energy doesn't include enough consideration of wind power.
- We need to aggressively address intermittency and scheduling. We need to aggressively advocate for exceptional treatment of wind because of its environmental benefits. We need to be concerned with the relaxation of air quality regulation, because it discounts the environmental benefits of wind.

**Regulatory – Jim Burg, Chairman, South Dakota Public Utilities Commission and Landowner**

- We're still operating on the paradigm of forcing more expensive wind into the system, because it is cleaner. This has changed, because now wind can compete. We shouldn't ask everyone to adjust to wind. Instead, we should package a firm product that everyone needs transmission for. That's why I don't think distributed is the way to go for wind, because of cost. There is a real opportunity to mitigate hydro capacity by integrating wind right into the hydro infrastructure, including the transmission built to serve large hydro.
- If wind in the Dakotas were just charged the average imbedded transmission cost then it would be fine, but if wind has to pay the marginal demand charge for transmission than its going to hurt wind. This is what is being debated in RTO formation processes. Low population areas like the Dakotas may end up with higher per capita transmission costs rather than spreading the costs evenly out among all users in the region.

*At this point the meeting departed from a panel format and continued for the remainder of the day as a discussion on issues and options to address the issues.*

## **Group Discussion: Reflection and Discussion on Options to Address Issues**

Moderator: Abby Arnold, RESOLVE

*Themes:*

- Have we identified the relevant issues?
- Which of the issues, opportunities, and challenges identified are not addressed by the current studies?
- What are some options we think all could live with that address the key issues?
- Are there possible options that have elements all parties could agree with?
- Are there outstanding questions that need further analysis and discussion?

*The order of discussion has been adjusted here to group similar issues together rather than a sequential summary of the discussion.*

### ***Suggested Framework of Issues for Discussion:***

- Transmission upgrades
- Transmission additions
- Regional transmission planning and decision making forums
- National transmission policy (e.g. FERC, Congress)
- Integration of transmission, energy, and environmental policy goals

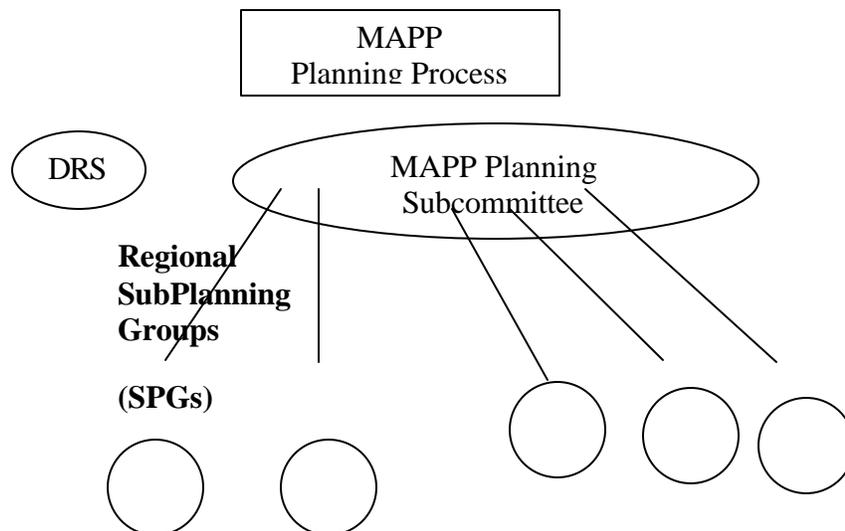
### **FERC AND RTO POLICY ISSUES**

- FERC rate design hearings are an opportunity to insure fair treatment of wind. Another participant points out that when it gets to FERC its too late. Wind advocates need to be involved at the RTO formation level.
- One participant cautioned against appearing to seek special treatment for wind which could make enemies. Rather we seek fair treatment and a level playing field.
- FERC requires non-discriminatory treatment of all generation, so wind should get in the queue for transmission service and follow the MAPP process. Another participant responded that FERC prohibits “undue discrimination” which means that some discrimination is allowed. We could even make the case that addressing intermittency is not undue discrimination.
- There are two show stoppers for wind: 1) there are not enough transmission planners to get the job done; and 2) We need to rationalize transmission tariffs to eliminate rate pancaking, and penalties. What does that mean? --No rate pancaking, one price from point A to point B, and no scheduling penalties.
- Texas is a good example of treating wind fairly. ERCOT allows a 50% scheduling deviation from firm transmission reservations. Furthermore, we need to understand the markets into which we are trying to sell. For example in Chicago and Milwaukee wholesale power markets, who are the customers? We should work to get the installed cost of wind to equal the variable cost of natural gas and then wind will be seen as very competitive.

### **MAPP AND MISO POLICY ISSUES**

- Maybe we seek different treatment for wind, because of special circumstances and the fact that it is a different resource. MAPP planners can determine the rules. Maybe we can take advantage of wind’s intermittency with non-firm rates.

- The rules are written for the worst case scenario which doesn't occur 95% of the time. How can we change the policy for wind? In the near-term we are trying to squeeze onto the system. Maybe we need some interim rule changes that allow more wind on an intermittent basis. In the long term we need to package wind with firm power.
- A wind developer needs to come to MAPP with a "new proposal" that specifies how to treat wind differently.
- Abby suggests that a group of technical people from MAPP Design Review Subcommittee (DRS) and NWCC develop a list of questions and concerns about the MAPP process.
- The DRS review process is key. These are busy people who aren't going to fight wind's alligators. Wind people have to bring a proposal to DRS. One issue is the level of study should be proportionate to the potential impact of proposed generation on the system.
- At the same time we have to be mindful of tripping the system over the edge. This transmission infrastructure is one of the most complex systems humans have ever made.
- MISO is making decisions right now in Indianapolis that will affect wind development in the Dakotas. Maybe we need a category for generation between firm and non-firm.
- A participant involved with MAPP planning made several points:
  - MAPP has a planning process and rules which are transparent and available to anyone on their website. The process is grounded in North American Energy Reliability Council (NERC) reliability criteria which are set in "concrete." The rules are unlikely to change. Wind developers ought to plug into this process and get input into the MAPP Long Term Plan.
  - MAPP plans for firm generation. Wind either has to create firm products or deal with non-firm use of the transmission system.
  - The MAPP transmission system is fully constrained which is unfortunate for wind. Adding 1-2 turbines in a distributed fashion means that some other generation has to back off.



### CROSS-CUTTING ISSUES

- Various sized wind projects are being planned or proposed without consideration of the transmission infrastructure needs. Some wind projects can't be built because of the over

constrained transmission system. At the same time new transmission lines are sometimes blocked from being built or held up by opposition groups with concerns over environmental and social impacts or for concerns over economic justification. In sum, it is hard both technically to plan and get transmission lines approved and then win political acceptance to build the lines.

- From an environmental perspective any new transmission project should adopt a metrics that integrates wind and renewables in a way that meets society's environmental goals.
- Distributed wind has the potential to add 800 MW in the Midwest. There is a wind tariff being developed in MN based on 2 MW or less.
- One participant called attention to several issues not being discussed that should be flagged for later discussion:
  1. Investment rate of return on transmission construction that insures adequate cost recovery;
  2. Public awareness, education, and acceptability of transmission lines; and
  3. State to state issues.
- Other issues added to this list of issues needing further discussion were:
  1. Wisconsin is facing potential power shortages
  2. The urban-rural split on transmission rate tariffs is preventing resolution of RTO formation. Who pays for new transmission additions is a critical question.

#### WIND INTEGRATION WITH OTHER FIRM RESOURCES

- Every form of generation needs transmission. What are the opportunities for wind to form alliances with other generation? We need a study that explores the integration of wind with other firm resources, but we don't yet know who to partner with and what the ratio of renewable to fossil generation should be. Wind gets penalized in regulatory and market arenas, so it needs to explore partnering with other resources.
- If you mandate 10% renewable energy it will turn utilities off. You need to work with coal and hydro utilities to solve the problem together.
- Its great to have lofty goals and the wind industry does, but we have to recognize that other resources are more dominant now. For example, 90% of new generation is natural gas. Wind needs to fit in.

#### MERCHANT TRANSMISSION ISSUES

Ed Weber discussed his meeting with a large merchant transmission company.

- They are the only merchant transmission company that has a tariff filed with FERC. They own and operate transmission rights. They do not buy and sell energy.
- They are looking to partner with entities in the Midwest. They are particularly experienced with DC lines. Right now they are in the approval process with MAPP

#### SPECIFIC PRODUCT AND ACTIVITY IDEAS

- Based on the discussion, a DOE official suggested that case studies could be written on how wind can be integrated with other resources.
- Would a pro-forma 100 MW Wind Study reviewed by DRS along with the criteria on how this will be evaluated be a useful activity? Another idea is to modify the Griggs Steele project proposal. Some expressed support for this idea and one participant suggested that a

range of different scale projects be examined in the pro-forma study. Another perspective is that the pro-forma study address environmental benefits of wind. The pilot project should be aligned with the ultimate goal of achieving net environmental benefits in terms of air quality and green house gas reductions.

- Another idea to explore is integrating wind into the Lignite Council Vision 21 500 MW coal plant transmission study proposal. Could 500 MW of wind be added to that study?
- If DRS could send a signal on what criteria need to be met to facilitate the accelerated review of wind projects this would be an opportunity to work with DRS on what those criteria should be and how to meet them. A set of guidelines could be created for wind power that enhances its chance for successful review. For example a 1 MW diesel project took DRS one day to review, while a 900 kW wind project took several months because of where on the system it was proposed. There are three question MAPP will consider for any new project:
  1. What are you going to set on the system?
  2. Where are going to set it on the system? (source)
  3. Where are you sending it to? (sink)
- Applying the green tags concept to transmission would involve these questions and issues:
  - Is there capacity and demand to sell the output locally?
  - Green tags changes the pricing of wind power not the system operation.
  - Changes the transmission question. Dispatch locally and market across the grid as a virtual green product.
  - Where do you back off the thermal plant?

### **Group Discussion: Possible Next Steps To Collaborate To Resolve Transmission Issues**

Moderator: Abby Arnold, RESOLVE

- Who else needs to be involved in this discussion?
- Who are the key policy makers, decision makers, organizations that need to play a role in addressing and resolving transmission issues?
- What are the existing decision making forums?
- What is the role for the NWCC Transmission Work Group, and others represented at the workshop?
- Is there a need for a follow-up workshop? If so who should be involved and how should it be structured?
- Who will do what by when?

After a break workshop planning committee members presented three proposals for NWCC activities based on the previous discussion. Charlie Smith, chair of the NWCC Transmission Subcommittee, presented the preliminary ideas.

1. Develop a process to work with stakeholders to resolve issues for a single critical transmission line addition or upgrade. The process needs to deal with the issues of reliability (is the improvement really needed?), economy (does the improvement make economic sense?), environment (is the improvement sensitive to environmental concerns including the mix of generation served by the line?), and public process (are the needs and concerns of all stakeholders being fairly addressed?).

2. Develop a model of the overall transmission planning process, including the process, decision makers, roles, and responsibilities. The purpose would be to help wind developers and advocates better understand the process of getting transmission built for wind power.
3. Develop a prototype application to the MAPP TPSC or Regional Transmission Committee for a non-firm (or flexible-firm?) rate for transmission access and use. This class of service would be in between the two extremes currently offered, would be interruptible, and would be available on a scheduled basis for extended periods (years).

Charlie Smith commented that:

- NWCC is not an advocacy group and not an organization with big study resources.
- The purpose has been to identify issues that need to be addressed and serve as a stakeholder collaborative to accelerate wind development.
- The NWCC spent a lot of time developing the consensus RTO Principles.
- A key requirement of Order 888 is a transmission planning process and NWCC has tried to engage that issue through dialogue.
- The ideas generated are within the scope and capability of the NWCC, but we need to be mindful of what is realistic for the NWCC to take on.

### *Discussion*

- The environmental community would likely prefer to focus on upgrades of existing transmission lines. There will likely be a debate on what type of generation is served by the improvement, i.e. what is the coal to wind ratio? Putting power lines through resort areas like Lake Geneva, MN is near impossible.
- Tom White of the MAPP TPS invites the NWCC to provide input on the planning process. He also recommends that wind link up with projects that have new transmission associated with them.
- We've accomplished a lot in two days, but we need to attract even more diverse participation especially from the environmental, industry, and utility perspectives.
- We should not spend time on small increments of wind on the system, we need to focus on big breakthroughs.
- The three options only begin to capture the value of these discussions we've had. A follow-up workshop in the Fall would be very useful.

*NOTE: Subsequent to the meeting NWCC transmission proposals were discussed and developed further among NWCC members at the May 10th NWCC Business Meeting and discussions afterwards. The three ideas were under consideration over the summer. Check back with the NWCC Transmission Working Group for the latest proposal.*