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JUN 10 2010

May 12, 2010

**PUBLIC SERVICE COMMISSION**

Mr. Darrell Nitschke, Executive Secretary  
North Dakota Public Service Commission  
600 E. Boulevard Ave., Dept. 408  
Bismarck, ND 58505-0480

RE: Pre-filed Direct Testimony of Jeffrey R. Webb  
Otter Tail Power Company & Northern States Power Company  
Advance Determination of Prudence — CapX2020 Group 1 Application  
Case Nos. PU-09-676 and PU-09-678

Dear Mr. Nitschke:

Enclosed for filing in the above-entitled matter are the original and seven copies of the Direct Testimony of Jeffrey R. Webb on behalf of the Midwest Independent Transmission System Operator, Inc., along with an Affidavit of Service by Mail and E-Mail.

Sincerely,



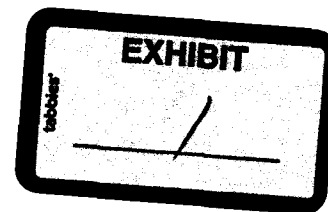
Keith L. Beall

KLB/elb  
Enclosures

Cc: See Affidavit of Service by US Postal Service and E-Mail

50 PU-09-678 Filed 06/10/2010 Pages: 25  
Exhibit 1  
Emineth & Associates Court Reporters

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**STATE OF NORTH DAKOTA  
PUBLIC SERVICE COMMISSION**

**Otter Tail Power Company  
Advance Determination of Prudence -  
Application CapX2020 Group 1**

**Case No. PU-09-676**

**Northern States Power Company  
Advance Determination of Prudence -  
Application CapX2020 Group 1**

**Case No. PU-09-678**

**PRE-FILED DIRECT TESTIMONY**

**OF**

**JEFFREY R. WEBB**

**MIDWEST INDEPENDENT TRANSMISSION SYSTEM OPERATOR, INC.**

**May 12, 2010**

**DIRECT TESTIMONY OF JEFFREY R. WEBB**

1 **Q: Please state your name, title and business address.**

2 A: My name is Jeffrey R. Webb, and I am the Director of Expansion Planning for the  
3 Midwest Independent Transmission System Operator, Inc. (hereinafter the  
4 “Midwest ISO”). My business address is P.O. Box 4202, Carmel, Indiana.

5 **Q: What are your duties with the Midwest ISO?**

6 A: My duties include directing the evaluation of reliability studies in support of  
7 development of the Midwest ISO Transmission Expansion Plan, and the overall  
8 coordination of planning study results into a cohesive regional transmission  
9 expansion plan.

10 **Q: Please describe your education and professional background.**

11 A: I hold a bachelor’s degree and a master’s degree in electrical power engineering  
12 from Rensselaer Polytechnic Institute. I have also taken a variety of courses and  
13 seminars in utility planning and engineering during my career. I have taught  
14 courses in circuit analysis, distribution system analysis and electric power system  
15 analysis at the Illinois Institute of Technology. In addition, I have served on  
16 national and regional groups dedicated to ensuring transmission system reliability. I  
17 have served as a member of the Planning Committee of the Mid-America  
18 Interconnected Network (“MAIN”) a Regional Reliability Organization that has now  
19 merged to form the Reliability First Corporation. I have served as past Chairman of the  
20 Transmission Task Force, the Data Bank Group, and Standards Compliance Task Force  
21 of MAIN. I have served as a member of the NERC Planning Committee  
22 representing the RTO sector, and the NERC Planning Standards Subcommittee

1 (“NERC PSS”). As a member of the NERC PSS, I have participated in the  
2 development of the NERC Reliability Standards related to transmission planning. I  
3 facilitate a number of stakeholder groups related to transmission planning at the  
4 Midwest ISO including the Planning Subcommittee and the Regional Expansion  
5 Criteria and Benefits Task Force that developed the present transmission investment  
6 cost allocation mechanism in place today under the Midwest ISO Energy Markets  
7 Tariff. Throughout my career, I have analyzed and planned electric transmission  
8 and distribution systems, with a focus on transmission. I began my professional  
9 career working for Commonwealth Edison Company (“ComEd”) in 1976 as a  
10 transmission planning engineer. Between 1988 and September of 2000, I held a  
11 variety of supervisory and management positions in the bulk power planning area of  
12 ComEd, including Technical Studies Supervisor, Bulk Power Planning Supervisor,  
13 System Planning Engineer, and Transmission Planning Manager. As Transmission  
14 Planning Manager, I led a department responsible for analyzing the transmission  
15 lines, substations, and interconnections that form ComEd’s bulk-power  
16 transmission network in order to determine when modifications and reinforcements  
17 are necessary to maintain adequate, efficient and reliable service to customers. My  
18 Responsibilities as Transmission Planning Manager included ensuring that  
19 ComEd’s transmission grid could meet regional and national adequacy and  
20 reliability standards, and whenever appropriate, developing and analyzing cost  
21 effective available alternatives for modifications or expansion that best meet those  
22 requirements. I have provided testimony before the Illinois Commerce Commission in  
23 several dockets involving transmission line certification, and before the Wisconsin

1 Public Service Commission involving certification of the Arrowhead to Weston 345 kV  
2 transmission line. I have also provided testimony before the Minnesota Public Utilities  
3 Commission regarding these same CAPX transmission facilities.

4 **Q: What is the Midwest ISO?**

5 A: The Midwest ISO is the nation's first Federal Energy Regulatory Commission  
6 ("FERC") approved Regional Transmission Organization ("RTO"). It encompasses  
7 approximately 1.1 million square miles of member transmission systems from  
8 Manitoba, Canada to Kentucky and from western Pennsylvania to North Dakota.

9 **Q: What are the Midwest ISO's responsibilities?**

10 A: As an RTO, the Midwest ISO is responsible for operational oversight and control,  
11 market operations, and planning of the transmission systems of its member  
12 Transmission Owners. Among many other responsibilities, the Midwest ISO also  
13 monitors and calculates Available Flowgate Capability ("AFC"), and provides tariff  
14 administration for its Open Access Transmission Tariff ("OATT"). The Midwest  
15 ISO is the Reliability Coordinator for its footprint, providing real-time operational  
16 monitoring and control of the transmission system. The Midwest ISO operates a  
17 real-time and a day-ahead locational marginal price based energy market in which  
18 each market participant's offer to supply energy are matched to demand and are  
19 cleared based on a security constrained economic dispatch process. In addition, the  
20 Midwest ISO operates a market for Financial Transmission Rights ("FTR"), which  
21 are used by market participants to hedge against congestion costs, and an ancillary  
22 services market which provides for the services necessary to support transmission  
23 of capacity and energy from resources to load. The Midwest ISO is responsible for

1 approving transmission service, new generation interconnections, and new  
2 transmission interconnections to and within the Midwest ISO footprint, and for  
3 ensuring that the system is planned to reliably and efficiently provide for existing  
4 and forecast uses of the transmission system. The Midwest ISO is the Planning  
5 Coordinator for the footprint and performs planning functions collaboratively with  
6 its Transmission Owners with stakeholder input throughout, while also providing an  
7 independent assessment and perspective of the needs of the transmission system  
8 overall.

9 **Q: What is the purpose of your testimony in this proceeding?**

10 A: The purpose of my testimony is to describe the planning functions performed by the  
11 Midwest ISO, and the planning process, including a summary of findings based on  
12 analyses of the proposed CapX facilities within that process. In addition, my  
13 testimony describes the impact of the proposed CapX facilities on regional system  
14 performance.

15 **MIDWEST ISO TRANSMISSION EXPANSION PLAN**

16 **Q: What does the Midwest ISO do as far as its regional planning function**  
17 **obligations under FERC Order 890?**

18 A: The Midwest ISO adheres to the nine planning principles outlined in Order 890. In  
19 so doing, the Midwest ISO provides an open and transparent regional planning  
20 process in which, on an annual basis, the Midwest ISO calls for, collects and then  
21 reviews and evaluates for need and effectiveness the multiple transmission  
22 expansion proposals provided by member transmission Owners, Stakeholders, and  
23 the Midwest ISO planning staff. This process results in recommendations for

1 expansion that are critically needed to support the reliable and competitive supply  
2 of electric power by this system, and to support energy policy mandates in effect  
3 within the Midwest ISO footprint. The collective review and analyses is reported  
4 on in what is generally known as the Midwest ISO Transmission Expansion Plan  
5 (“MTEP”).

6 **Q: Does the MTEP planning activity result in a transmission construction and**  
7 **upgrade plan for the entire Midwest ISO footprint?**

8 A: Yes. The Board of Directors of the Midwest ISO approves updates to the MTEP  
9 annually. Since start of operations at the Midwest ISO, we have produced six  
10 region plan reports known as MTEP 03, MTEP 05, MTEP 06, MTEP 07, MTEP 08,  
11 and MTEP 09. The most recently approved MTEP is MTEP 09 that was approved  
12 by the Board of Directors on December 3, 2009. The approved MTEP 09 Plan can  
13 be viewed in its entirety on line at:  
14 [http://www.midwestiso.org/publish/Folder/254927\\_1254c287a0c\\_-](http://www.midwestiso.org/publish/Folder/254927_1254c287a0c_-7e5f0a48324a?rev=1)  
15 [7e5f0a48324a?rev=1.](http://www.midwestiso.org/publish/Folder/254927_1254c287a0c_-7e5f0a48324a?rev=1)

16 **Q: What is the purpose of MTEP?**

17 A: The objective of the MTEP is to identify transmission system expansions that will  
18 ensure the reliability of the transmission system that is under the operational and  
19 planning control of the Midwest ISO; to identify expansion that is critically needed  
20 to support the competitive supply of electric power by this system; and to identify  
21 expansion that is necessary to support energy policy mandates in effect within the

1 Midwest ISO footprint. In addition, since February 3, 2006<sup>1</sup> the Midwest ISO  
2 tariff has provided for the regional and subregional allocation of the costs of  
3 transmission expansions that meet the tariff requirements for such cost sharing. As  
4 such, each MTEP is required to set forth the appropriate cost sharing provisions  
5 applicable to each expansion project that is accepted and approved by the Midwest  
6 ISO Board of Directors.

7 **Q: What does it mean for a project to be approved by the Midwest ISO Board of**  
8 **Directors as a part of the MTEP?**

9 A: In accordance with the *Agreement Of Transmission Facilities Owners To Organize*  
10 *The Midwest Independent Transmission System Operator, Inc. a Delaware Non-*  
11 *Stock Corporation* (“TOA” or “Midwest ISO Agreement”), approval of the  
12 Midwest ISO MTEP Plan by the Board certifies the MTEP as the Midwest ISO’s  
13 plan for meeting the transmission needs of all stakeholders subject to any required  
14 approvals by federal or state regulatory authorities.

15 **Q: Please describe the MTEP process.**

16 A: The Midwest ISO uses a “bottom-up, top down” approach in developing this plan.  
17 The “bottom-up” portion relies on the ongoing responsibilities of the individual  
18 Transmission Owners to continuously review and plan to reliably and efficiently  
19 meet the needs of their local systems. The Midwest ISO then reviews these local  
20 planning activities with stakeholders and then performs a top-down review of the  
21 adequacy of and appropriateness of the local plans in a coordinated fashion with all

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<sup>1</sup> The FERC approved the Midwest ISO RECB I proposal on February 6, 2006 in Docket No. ER06-18-000 (114 FERC ¶ 61,106 (2006)).

1 of the other local plans to most efficiently ensure that all of the needs are cost  
2 effectively met. In addition, the Midwest ISO considers, together with  
3 stakeholders, opportunities for improvements and expansions that would reduce  
4 consumer costs by providing access to new low cost resources that are consistent  
5 with and required by evolving energy legislative policies. Our planning process  
6 focuses on and examines congestion that may limit access to the most efficient  
7 resources, and considers improvements that may be needed to meet applicable  
8 statutory energy requirements. In the initial stages of the MTEP process, the  
9 Midwest ISO Transmission Owners (“TOs”) provide the Midwest ISO with  
10 proposed transmission plans necessary to ensure system performance meets the  
11 applicable planning criteria of the TO. The TOs provide detailed descriptions of the  
12 projects, anticipated service dates and estimated costs, and summary support and  
13 rationale for the need for the projects as well as details regarding alternatives  
14 considered. The Midwest ISO then prepares several models of the power system to  
15 assess and determine a recommendation of a coordinated transmission system  
16 expansion plan. These models include power flow simulation models, economic  
17 generation expansion models, and production cost models. This recommended plan  
18 is then subjected to stakeholder scrutiny and feedback to further define and refine it  
19 before it is eventually presented to the Midwest ISO Board for review and approval.

20 **Q: In preparing the MTEP regional plans, what considerations are taken into**  
21 **effect by the Midwest ISO?**

22 A: There are numerous considerations in planning for a regional transmission system,  
23 however two considerations are crucial. First, the security of the transmission

1 system must be maintained, that is, the transmission system must be able to  
2 withstand disturbances (generator and/or transmission facility outages) without  
3 interruption of service to load. This is achieved, in part, by assuring that  
4 disturbances do not lead to cascading loss of other generator and transmission  
5 facilities. Second, the transmission system must be adequately planned to be able to  
6 accommodate load growth and/or changes in load and load growth patterns, as well  
7 as changes in generation and generation dispatch patterns without causing  
8 equipment to perform outside of design capability. In addition to these two crucial  
9 considerations a third consideration is the identification of transmission constraints  
10 that may otherwise limit access to potential future generation development  
11 scenarios, along with devising and implementing solutions to those constraints.

12 **Q: What planning horizon does the Midwest ISO consider and employ in its**  
13 **planning process?**

14 A: We plan the system to meet objectives I've outlined above in the (i) short (1-5 year);  
15 (ii) intermediate (6 to 10 year); and (iii) long-range (10 to 20 year) planning horizons.

16 **Q: What factors come into play in developing transmission plans over each of these**  
17 **planning horizons?**

18 A: All of the considerations I have mentioned are considered to various degrees over the  
19 entire planning horizon. However, generally speaking, the short term planning tends  
20 to focus on ensuring system reliability and efficiency in meeting load growth with  
21 existing generation, or generation that is emerging as committed generation via the  
22 generation interconnection request process under the tariff. Planning for the

1 intermediate and longer term horizons must consider and incorporate generation  
2 expansion patterns that are not as definitive as for the earlier periods.

3 **Q: How does the Midwest ISO plan for this entire period in a manner that will**  
4 **produce near term plans that will be consistent with an efficient and reliable**  
5 **overall plan that also accommodates longer term needs?**

6 A: The planning process is a series of continuous cycles, and we work the development  
7 of plans for these various time periods in parallel, with input and guidance from many  
8 stakeholders. Results of analyses of needs for the short-term planning cycle tends to  
9 inform the longer-term planning process, becoming the foundational plans upon  
10 which the longer-term plans are developed. In turn, once longer-term planning  
11 concepts are developed and sufficiently analyzed to demonstrate preferable options,  
12 these preferable options guide the construction of more near-term projects as the  
13 planning cycles proceed.

14 **Q: Please describe the Midwest ISO efforts to develop a long range transmission**  
15 **plan for the region?**

16 A: This effort is underway and has been since late 2006. We described the evolving  
17 planning process in our MTEP 06 report<sup>2</sup> and have been working with stakeholders  
18 to develop long-term planning concepts that are based on several different possible  
19 “futures”. These futures differ in certain basic assumptions that could impact  
20 decisions about the most prudent transmission expansion that should be developed to  
21 most efficiently and reliably deliver future generation to meet future demand levels.

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<sup>2</sup> The MTEP 06 can be viewed at:  
[http://www.midwestiso.org/publish/Folder/3e2d0\\_106c60936d4\\_-75230a48324a?rev=2](http://www.midwestiso.org/publish/Folder/3e2d0_106c60936d4_-75230a48324a?rev=2)

1 Multiple possible futures have been developed, and are reviewed and modified over  
2 time with input from stakeholders including each of the respective state regulatory  
3 commissions. Among the variables that help to define these futures are: 1) explicit  
4 legislative or regulatory requirements for resource portfolios; 2) capital costs of  
5 resource technologies; 3) load and energy growth forecasts; 4) fuel price and  
6 availability; 5) environmental costs and initiatives; and 6) economic conditions such  
7 as inflation, discount rates, wind credits etc. Preliminary transmission concepts have  
8 been developed that are postulated to be necessary and sufficient to meet the  
9 projected demand, generation fuel mix that is economic and meets regulatory  
10 assumptions, and generation siting assumptions. Each of these concepts are currently  
11 being evaluated for relative value in terms of energy costs, and performance in  
12 reliably delivering projected generation to load under the various future scenarios.

13 **The CapX2020 Projects**

14 **Q: How do the CapX2020 projects that are the subject of this Docket fit into the**  
15 **Midwest ISO's long-range planning concepts?**

16 **A:** These four projects fall into what we would call the short to intermediate-term  
17 planning horizons, meaning that they will be needed within the next 5 to 7 years. In  
18 addition, there are fundamental near-term local reliability needs that are the primary  
19 drivers for three of the four projects, and the fourth is needed to reliably deliver new  
20 generation developments for the near to intermediate-term as well. As such, in  
21 developing our long range planning concepts we have included these projects as a  
22 part of the base plans upon which the longer term plans are being developed and  
23 analyzed.

1 **Q: Do the longer-term conceptual plans that have been developed to date indicate**  
2 **that any of the CapX projects should be built any differently than as being**  
3 **proposed?**

4 A: No, they do not. Because the CapX facilities have been shown to be needed as soon  
5 as they can be constructed to support continued reliable system performance, they  
6 have been considered as pre-requisite infrastructure to the longer term regional plans  
7 under consideration. Moreover, the CapX facilities are consistent with conceptual  
8 plans being developed in long range planning studies such as the Regional Generation  
9 Outlet Study (RGOS).

10 **Q: What is the status of the CapX projects that are the subject of this docket with**  
11 **respect to the MTEP regional plan?**

12 A: These projects were introduced to the regional planning process in MTEP 05, which  
13 had a planning horizon through the summer peak of 2009 and which was published  
14 in June of 2005. They were described as proposed plans in MTEP 05 that were  
15 expected to have a service date beyond the 2009 planning horizon. The process  
16 required that they be analyzed to verify their need and final design. They were  
17 included again in MTEP 06 and MTEP 07 which provided recommended regional  
18 plans for the years 2011 and 2013 respectively. In MTEP 06, the Bemidji 230 kV  
19 line project was approved by the Midwest ISO Board of Directors (BOD) as a part  
20 of the regional plan<sup>3</sup>. In MTEP 07<sup>4</sup> the Fargo, La Crosse, and Brookings projects

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<sup>3</sup> The Midwest ISO is required as part of its FERC Order 890 requirements to pursue and establish a regional transmission plan.

<sup>4</sup> The Midwest ISO MTEP 07 Plan was approved by the Board of Directors and published December 2007.

1           were listed as Appendix B projects meaning that full analysis of the projects had not  
2           yet been completed and the projects were not yet being recommended to the  
3           Midwest ISO BOD for approval. The Fargo and La Crosse projects were  
4           recommended to the Midwest ISO BOD for approval in MTEP 08 and were  
5           thereafter approved by the BODs as part of MTEP 08 in December 2008.

6   **Q: What is the status of the Brookings project?**

7   A: The analysis of the Brookings project was incomplete at the time of MTEP 08 and  
8           thus it could not be presented and recommended for BOD approval. The Owners  
9           described in a letter received on November 14, 2008 that retention of this project in  
10          Appendix B<sup>5</sup> would allow time for the project's construction configuration to be  
11          finalized by studies that were underway at that time by the sponsoring utilities and  
12          by the Midwest ISO. In addition, a significant function of the Brookings project is  
13          to provide outlet for a significant amount of additional renewable generation. Cost  
14          treatment for such projects has been the subject of considerable stakeholder  
15          deliberations over the past two years. For example, the Upper Midwest  
16          Transmission Development Initiative ("UMTDI") sponsored by the governors and  
17          utility regulators in Iowa, Minnesota, North Dakota, South Dakota, and Wisconsin;  
18          the Cost Allocation and Regional Planning ("CARP") group of the Organization of  
19          Midwest ISO states; as well as the Reliability Expansion Criteria and Benefits  
20          ("RECB") Task Force have each been analyzing policy, planning, and assessing  
21          cost allocation issues for regional transmission during this period of time. As noted

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<sup>5</sup> [Appendix B is the portion of the MTEP process that provides a listing of proposed projects that are known to be a solution to an identified system expansion need.]

1           above, the MTEP process requires that projects presented and considered for  
2           approval by the BOD must be classified with respect to cost allocation. Therefore,  
3           because the actual cost treatment of the Brookings project was not yet certain at that  
4           time, it was decided the appropriate action was to defer the request for approval  
5           until cost allocation policy decisions and potential tariff revisions impacting the  
6           treatment of this project were clarified.

7   **Q: In your opinion, have these lingering issues related to the Brooking project**  
8           **been resolved to the point that it can be presented for approval in the near**  
9           **future?**

10 **A:** Yes, in part. The Applicants have determined that the most cost effective design for  
11 the Brookings line is for the line to be built in a double circuit compatible  
12 configuration and approximately half of the line will be initially constructed as  
13 double circuit. The Midwest ISO supports this decision. With respect to the policy  
14 decisions and supporting tariff provisions that would provide the required certainty  
15 regarding the cost allocation treatment of this line, the Midwest ISO is finalizing  
16 these provisions in anticipation of a July 15, 2010 filing with the Federal Energy  
17 Regulatory Commission ("FERC"). In that filing, it is anticipated that the Midwest  
18 ISO will request that the FERC apply the regional cost sharing provisions to any  
19 applicable transmission projects approved subsequent to the filing date. It is  
20 further anticipated that these regional cost sharing provisions would then meet the  
21 cost allocation prerequisite to allow the Brookings project to be considered under  
22 the MTEP process.

23

1

2 **RELIABILITY PLANNING CONSIDERATIONS**

3 **Q: What factors must be considered in planning, operating and maintaining an**  
4 **adequate, efficient, and reliable transmission system?**

5 A: A transmission system must have capacity sufficient to meet projected power flows  
6 while maintaining required voltage levels and system stability.

7 **Q: How do you determine if a transmission system meets these criteria?**

8 A: An engineering evaluation of the system as a whole, as well as of critical individual  
9 system components (transformers, lines, switchgear), under both normal and  
10 contingency conditions (conditions where one or more system components are out of  
11 service) must be regularly performed. Power system simulation models are  
12 developed for use in these analyses. Models are checked to ensure that rated  
13 capacities are not exceeded and that voltage levels are maintained above the  
14 minimums required for safe operation of the system and above the minimums  
15 required for supply of adequate voltage to customers. The model system is tested for  
16 both generator and voltage stability following severe disturbances.

17 **Q: Why is it necessary to provide capacity to meet projected power flows?**

18 A: Several reasons. First, overloaded equipment threatens the system's ability to  
19 continue to provide adequate and reliable service to its customers. Overloaded  
20 equipment can fail and cause brownouts and blackouts (which, for major transmission  
21 components, can be widespread and extended) as well as potentially dangerous  
22 conditions. In addition, overloads reduce the service life of equipment and tend to  
23 increase the probability of component failure in the future. Obviously, these are

1 unacceptable outcomes and thus why we do planning so that such overloading or  
2 other problems do not occur or are minimized.

3 **Q: Why is it necessary to ensure that voltage levels are maintained?**

4 A: Transmission voltages must be maintained within specified tolerances both to ensure  
5 that adequate customer voltage is maintained and to ensure that relays and other  
6 voltage-sensitive equipment operate properly. Customer voltage is dependent on a  
7 number of variable factors, which include transmission voltage level, load magnitude,  
8 and load power factor.

9 **Q: Why is it necessary to ensure that system stability is maintained?**

10 A: Certain conditions could cause a generating unit to lose synchronism with the rest of  
11 the system or cause bulk power voltages to decline rapidly in an uncontrolled manner.  
12 These severe contingencies, while unlikely, must be tested for to ensure that the  
13 transmission system is strong enough to prevent their occurrence, or that in such  
14 instances protective systems act to regain control of the system. Without these  
15 measures in place, such disturbances could affect the secure operation of wide areas  
16 of the inter-connected transmission systems.

17 **Q: Why do you study contingency conditions as well as normal operating  
18 conditions?**

19 A: Generating units and major transmission system components cannot be assumed to be  
20 in operation 100% of the time. In addition to scheduled maintenance requirements,  
21 unscheduled outages can and do occur. Therefore, a level of reliability must be  
22 maintained appropriate to the number of customers at risk to possible system failures,  
23 balanced by providing service at a reasonable cost. For example, in accordance with

1 the NERC standards, the transmission system must, at a minimum, continue to  
2 operate adequately with any single line or transformer in an area out of service. In  
3 addition, where the behavior of the transmission system in an area is heavily  
4 dependent on the output of a particular generating unit or units, it is necessary to  
5 consider the ability of the system to continue to operate when those generating unit  
6 are unavailable.

7 **Q: Does the Midwest ISO regularly assess the adequacy and reliability of the**  
8 **transmission system within its area?**

9 A: Yes. The Midwest ISO constantly monitors data on the power flows and voltage  
10 levels on all major components of its transmission system. In addition, planners  
11 regularly request and collect data on the forecast loads and prepare system models  
12 that extend over the planning horizons discussed above.

13 **Q: What, if any, actions are taken based upon these studies?**

14 A: When the data and analysis shows that a change is required, Midwest ISO planning  
15 staff employees work with member Transmission Owners on transmission expansion  
16 plans and assess the options that the Transmission Owners are considering. When a  
17 proposed local plan exists that appears to be effective in addressing identified system  
18 needs, the Midwest ISO tests the effectiveness of these plans in meeting applicable  
19 planning criteria. The Midwest ISO then considers other potentially feasible means  
20 of meeting the need that are consistent with sound engineering and system planning  
21 practices. Depending on the nature of the need, there may be many or few such  
22 alternative plans. We then determine which of the alternatives are technically and  
23 legally feasible, consistent with the Midwest ISO and the member Transmission

1 Owner's coexistent obligations to provide efficient and reliable service to its  
2 customers. Where there is more than one such option, we assess the advantages and  
3 disadvantages of the various alternatives and select as the proposed plan the preferred  
4 option that would efficiently provide adequate and reliable service to the end use  
5 customers.

6 **Q: How is the effectiveness of a proposed project evaluated against system**  
7 **reliability criteria?**

8 A: Among the models prepared are power flow models that are used primarily to  
9 identify system contingency conditions that may result in reliability of service  
10 below acceptable reliability criteria. These models are generally developed for the  
11 five-to-ten year planning horizon. In order to evaluate the need and effectiveness of  
12 proposed projects, the Midwest ISO tests models both without and with the  
13 proposed projects to see if there are projected reliability issues that demonstrate the  
14 need for possible expansions, and to see if proposed expansions are suitable  
15 solutions to issues identified. Similar tests are applied to any alternative proposals  
16 until the preferred alternative is selected.

17 **MIDWEST ISO ANALYSIS OF AREA RELIABILITY NEEDS**

18 **Q: Has the Midwest ISO performed an analysis of the need and effectiveness of**  
19 **the CapX2020 projects that will support the inclusion of these projects into the**  
20 **regional plan?**

21 A: Yes, an analysis has been performed that is consistent with the general processes  
22 and descriptions provided above.

23

1 **Q: Please describe that analysis.**

2 A: The Midwest ISO performed reliability analysis of the area affected by the  
3 proposed projects by evaluating several different power flow models of the  
4 Midwest ISO transmission system. This analysis was conducted between 2006 and  
5 2008 leading up to the approvals of the proposed projects in MTEP 06 and MTEP  
6 08 as I noted above.

7 **Q: What assumptions were applied about generation, load and system topology in**  
8 **those models?**

9 A: Modeled generation included existing generators plus any new generators that had  
10 proceeded through the Midwest ISO generation interconnection queue process and  
11 had executed Interconnection Agreements. The Load that was modeled was  
12 provided by the Midwest ISO Transmission Owners through power flow models of  
13 their respective systems.

14 **BEMIDJI 230 KV PROJECT**

15 **Q: What did the study show with respect to the Bemidji proposed transmission**  
16 **project?**

17 A: Analysis of the upper Red River Valley area during the MTEP 06 study period  
18 revealed a large number of contingent conditions that could lead to serious loss of  
19 load in the area unless the transmission system was upgraded. The Red River  
20 Valley area is geographically large with limited local generation resources. Serious  
21 voltage degradation occurs for hundreds of combinations of line loss events which  
22 fall within the NERC reliability standards testing protocols.

1 **Q: How would system performance standards be maintained without the**  
2 **proposed Bemidji project?**

3 A: Significant shedding of load would be required to avert voltage instability under  
4 any of these many contingent conditions.

5 **Q: What alternatives to the Bemidji project were considered?**

6 A: Several alternative ways of providing a new line source into the area were  
7 considered and evaluated, but each of these were found to be more costly than the  
8 proposed solution and not as effective.

9 **TWIN CITIES TO FARGO 345 KV PROJECT**

10 **Q: What did Midwest ISO studies show with respect to the Twin Cities – Fargo**  
11 **proposed transmission project?**

12 A: Our studies evaluated three general load serving area along the path of this  
13 proposed line; the Red River Valley Area (“RRV Area”), the Alexandria Area, and  
14 the St. Cloud Area. In the RRV Area our models demonstrated that under peak load  
15 conditions, and absent the construction and operation of the Twin Cities – Fargo  
16 line, there are numerous contingency conditions involving the forced outage that  
17 will result in loadings on other existing facilities beyond their safe design  
18 capability. In addition, other conditions will result in transmission level voltages  
19 below design criteria, and for certain conditions could result in voltage instability  
20 with resultant wide-area loss of load. Each of these conditions fall within the  
21 conditions prescribed by the North American Electric Reliability Council  
22 (“NERC”) to be tested for and for which the system should be designed to maintain  
23 stable operation.

1 **Q: What kind of problems did the Midwest ISO identify in the Red River Valley**  
2 **area?**

3 **A: The Red River Valley is a winter peaking area that relies on power**  
4 **transported into the area** on the single Jamestown-Maple River 345 kV line and  
5 other 230 kV transmission lines in the area. The Midwest ISO analyzed the loss of  
6 the single 345 kV line supporting the area at Maple River near Fargo, along with one  
7 of these 230 kV lines and found that this condition could lead to an unstable decline  
8 in voltages in the region, with the potential for uncontrolled loss of large amounts of  
9 load across the region.

10 **Q: How does the proposed line resolve these conditions?**

11 A: The proposed project provides a second 345 kV supply to the Maple River 345 kV  
12 bus in the Fargo area, so that the system will remain secure for contingent loss of  
13 the single existing 345 kV supply to the area.

14 **Q: Were alternative transmission upgrade solutions considered?**

15 A: Yes. The addition of voltage support equipment in the area such as capacitor banks  
16 were also reviewed and considered. However, the area already has a very large  
17 amount of such voltage support devices. When a system is so heavily compensated  
18 with such support devices, it can become susceptible to voltage collapse without  
19 much advance ability or warning of the collapse. Our analyses indicated that by  
20 2016, unacceptable voltage instability could occur. A system in this state is  
21 sometimes referred to as voltage “brittle” and is a concern, because operators may  
22 have little indication that there is a critical voltage condition existing and be unable  
23 to take appropriate action. In addition to considering the addition of capacitors in

1 the area, the Midwest ISO considered the addition of a second 230 kV line between  
2 the Boswell, Wilton, and Winger substations. This line addition was estimated to  
3 cost about \$161 M and would not provide any relief to other areas along the route  
4 of the proposed line such as in the Alexandria and St. Cloud areas.

5 **Q: Please describe the reliability issues in the Alexandria area that the Midwest**  
6 **ISO identified would also be resolved by the proposed transmission line.**

7 **A: The Alexandria area is described electrically by the demand at 12 substations in**  
8 **and around Alexandria. This area is served by three 115 kV transmission lines:**  
9 Inman to Elmo; Douglas County to Long Prairie, and; Grant County to Elbow Lake.  
10 The Midwest ISO looked at the conditions projected for this area over the short to  
11 intermediate planning horizon. Midwest ISO analysis of this area showed that  
12 within the next few years, there could be severe line overloads as high as 154% of  
13 design capability, and critically low voltages of 52% of design in this area for loss  
14 of two of the three 115 kV lines I mentioned. These conditions will worsen as load  
15 grows in the area. At these voltage levels, service to the load in the area could not  
16 be sustained.

17 **Q: How does the proposed Twin Cities to Fargo line resolve the reliability**  
18 **problems identified in the Alexandria area?**

19 **A:** The project extends a 345 kV line supply from Monticello through St. Cloud to  
20 Alexandria, and then continues this line to connect to the Fargo area 345 kV  
21 substation. At the Alexandria substation, a new step down transformer will be  
22 installed that will directly inject into and support the heavily stressed 115 kV system  
23 in the area.

1 **Q: After the project is installed, what are the resulting loading and voltage levels on**  
2 **the Alexandria area 115 kV lines?**

3 A: For the worst single line loss condition I described, the post-project voltage is  
4 increased from 89.5% to 100% of nominal. For the double line outage condition line  
5 loadings are reduced from 160% to under 65% of rating, and voltage is improved  
6 from 47% to 100% of nominal, providing a more secure system and margin to  
7 accommodate load growth in this area.

8 **Q: Did the Midwest ISO consider alternative solutions to resolving the Alexandria**  
9 **area reliability issues you identified?**

10 A: Yes. Redispatch of generation is not an option since there is very little generation  
11 available in the area to support the load. We considered the addition of capacitor  
12 banks in the Alexandria area as a means of improving voltage conditions. We also  
13 considered additional support to the area by extending new 230 kV lines into the  
14 area. None of these alternatives provided adequate resolution to the voltage and  
15 loading problems anticipated for the Alexandria area.

16 **Q: Are there any other reliability issues needing resolution for which the proposed**  
17 **Twin Cities to Fargo line provides the best solution?**

18 A: Yes there are. The St. Cloud area is vulnerable to a number of different  
19 contingency conditions that can cause overloading of existing supply lines, low  
20 voltage conditions, and loss of load service. Under the present configuration at the  
21 Granite City substation, if there was a loss of the Benton County to Granite City  
22 tower line involving both circuits, the St. Regis load of approximately 89 MW  
23 would be automatically isolated from supply, and in addition, the St. Cloud to Sauk

1 River line would overload to 133% of rating. Lesser overloads would also occur on  
2 three other 115 kV lines between St. Cloud and W. St. Cloud and between W. St.  
3 Cloud and Granite City. Low voltage will also occur on several 115 kV buses, for  
4 example, the Crossroads 115 kV bus would have a voltage of 86.8% of design. If  
5 the Granite City substation was re-configured such that the St. Regis load could be  
6 maintained for this outage, this additional load during the contingency condition  
7 would cause line overloads approaching 233% of rating, unless an additional source  
8 of power is introduced into this area. Obviously, none of these are acceptable  
9 conditions.

10 **Q: Are there other conditions of concern in the St. Cloud Area?**

11 A: Yes. We also project that for near-term conditions, in the event of the loss of two  
12 Benton 230/115 kV transformers the St. Cloud to Wakefield 115 kV line would  
13 overload by 42% of its design rating, as would the St. Cloud to Benton County line  
14 by 6%. Voltages at eighteen 115 kV buses would be below design with one as low  
15 as 81%.

16 **Q: Describe how the proposed project will mitigate the St. Cloud area reliability**  
17 **issues you have identified.**

18 A: The Twin Cities to Fargo 345 kV line will be tapped at a new Quarry substation on  
19 the west side of the city of St. Cloud, and a new 345/115 kV transformer will be  
20 installed to support the area. After this project is in service, the Granite City  
21 substation can be reconfigured to maintain the St. Regis load connection for the  
22 double line outage conditions I have described. The post contingency line loadings  
23 are improved from 133% with the St. Regis load not served, to less than 65% with