MINNESOTA'S ELECTRIC TRANSMISSION SYSTEM -- NOW AND INTO THE FUTURE

A Discussion Paper

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Submitted by

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I. INTRODUCTION

During the 2009 Legislative Session, a new law was enacted (Minn. Stat. 216C.054[1]) instructing the Office of Energy Security, in consultation with the Public Utilities Commission, to prepare and submit a report annually which provides a nontechnical discussion of the "state" of Minnesota's current electric transmission system. The new law also requires a report on transmission planning and other actions taken or in process to maintain electric service reliability as well as comply with the requirements of the State's Renewable Energy Standard. This discussion paper is provided in compliance with this new Statute.

In keeping with specific instructions received during Legislative Committee Hearings, the Offices of Energy Security and the Reliability Administrator have prepared this discussion paper "in English" – meaning that electric and transmission terms, acronyms and other jargon are avoided. Also, this paper only provides "broad brush" discussions of detailed engineering and scientific concepts and methods and does not attempt to provide documentation or justification for such concepts or methods. However, for any reader wishing to know more about such topics, sites will be footnoted to publicly available documents that provide detailed technical reports and data.

What this paper does provide is a general discussion of Minnesota's current transmission system, its challenges and actions being taken to alleviate challenges and ensure a strong system in the future. Also, since Minnesota's transmission system, or "power grid," is an interconnected system with its neighboring States and Canadian provinces, as well as all of the states in the Midwest and the eastern U.S., discussions are also provided on current and future regional and national transmission planning efforts that would impact Minnesota's power grid.

[1] The statute states: The commissioner of commerce, in consultation with the Public Utilities Commission, shall annually by January 15 submit a written report to the chairs and the ranking minority members of the legislative committees with primary jurisdiction over energy policy that contains a narrative describing what electric transmission infrastructure is needed within the state over the next 15 years and what specific progress is being made to meet that need. To the extent possible, the report must contain a description of specific transmission needs and the current status of proposals to address that need. The report must identify any barriers to meeting transmission infrastructure needs and make recommendations, including any legislation, that are necessary to overcome those barriers. The report must be based on the best available information and must describe what assumptions are made as the basis for the report. If the commissioner determines that there are difficulties in accurately assessing future transmission infrastructure needs, the commissioner shall explain those difficulties as part of the report. The commissioner is not required to conduct original research to support the report. The commissioner may utilize information the commissioner, the commission, and the Office of Energy Security possess and utilize in carrying out their existing statutory duties related to the state's transmission infrastructure. The report must be in easily understood, nontechnical terms.

II. MINNESOTA'S TRANSMISSION SYSTEM – HOW WE GOT HERE

Minnesota's Increasing Population and Dependence on Electricity

Minnesota's transmission grid is operating today close to its limits with small amounts of unused space on the grid available in some locations to accept new power sources. In other words, new transmission lines and other facilities (substations, etc.) need to be built in the near future in order for new generation facilities of significant size to connect to the grid and begin putting power into the grid.

Increasingly, Minnesota customers and industry need not only electricity, but also acceptable power quality, meaning evenly delivered power without power surges and other fluctuations that can impact computers and other sensitive electronics The lack of available space on the grid also means that there are some locations in the state where power quality is close to unacceptable. Further, in some Minnesota locations too much electricity is trying to flow on the lines causing "grid lock," and reliability problems in making sure the power can be delivered where it's needed. Such congestion also increases costs Minnesotans pay for power. In addition, with limited available space on transmission lines, utilities can be hampered in their ability to use existing transmission lines to mitigate or resolve potential power quality problems and reliability issues before they happen. As one could imagine, power quality and reliability lapses could potentially disrupt businesses, industries, hospitals, schools, public services and citizens who all rely on computers and other electronics in aspects of their day-to-day lives.

Although utilities make small fixes to their transmission facilities every year to prevent the worst potential reliability or power quality losses in particular local areas, most of the larger-sized transmission system in Minnesota is decades old. Today's power grid serving cities and rural areas was largely built between 30 and 70 years ago. The transmission facilities were sized to meet the then-current electricity needs of the population and economy of the day. For example, facilities built in the 1940s were first sized to meet the demands of that era – electric lights to small houses, street or yard lights, plus power to radios, a few kitchen appliances and that new innovation, the television and secondarily sized to meet needs forecasted in the coming decade or so. Facilities built during the late 1970s and early 1980s were sized to provide (to a much larger population) electric lights to larger houses, street, traffic and (rural) yard lights, electric heating (during the "energy crisis" of the late 1970s), radios, stereos and televisions, clothes washers and dryers, major and small kitchen appliances including that new innovation, the microwave oven. Again, they were also sized so that the system could meet needs well into the future. However, the future-needs sizing was primarily designed to make room for more consumers; it was certainly not known at that time that households would have home computers and the myriad other ways to use electricity in their homes and businesses which Minnesotans now enjoy.

By the 1980s, the construction of large new power lines was viewed by the public as undesirable and utilities were not anxious to enter into any further large, unpopular, construction projects. As a consequence, utilities focused on making small fixes or upgrades to specific existing lines as needed and operating their own transmission systems as efficiently as possible.

Meanwhile, Minnesota continued to grow in population, economy and technology – especially in technology. By the late 1990's, new housing continued to grow larger, households commonly had multiple televisions along with all of the other aforementioned electric devices, and personal computers were readily available and in day-to-day use. And today, in addition to all of the items listed before, Minnesotans now have a tremendous number of new appliances that are using electricity twenty four hours a day – for example, cable television converter boxes, DVRs, clocks, and gaming systems left plugged in. In addition, the number of computers used in a household and the size of televisions have negated some of the efficiency increases gained in refrigerators, dishwashers, and water heating. Finally, the number of devices requiring charging – cell phones, laptop computers, and portable music devices-- has exploded. Use of electricity to power vehicles looms on the horizon as yet another way to use electricity, creating more demand on the electric grid.

With Minnesota's population growth and all of these new electricity-dependent devices, one wonders why Minnesota did not run out of power grid space before now? The answer is innovation, technology advancements, and government actions.

First, utilities continued to use more and larger computers to continually increase their efficiency and effectiveness in communicating and monitoring their operations and transmission facilities on an hour-by-hour and minute-by-minute (to second-by-second) basis in order to get the best performance from their existing facilities.

Second, during the 1970s Minnesota and the nation experienced major shortages in energy, particularly petroleum products. It was the first time that such shortages in gasoline and natural gas had occurred since the war years of the 1940s and showed the State and the nation that energy should be used wisely (including not using or conserving energy) or using it more efficiently. Concern about future energy supplies spurred federal government action in a number of aspects, including creating standards for appliances' energy use, to which manufacturers responded by designing appliances that delivered an equal or better service while using less power.

Minnesota also responded in the late 1980s by enacting one of the strongest energy conservation programs in the country.[3] Minnesota's Conservation Improvement Program or CIP has, since its inception, conserved enough energy to push back by many years the need for building multiple major electric generation plants by offering industry, business and residents various programs to save energy in their day-to-day operations. As a consequence, while power usage continued to increase due to finding more ways to use electricity in our homes and businesses, the increases were smaller in the 1980s and 1990s than the increases experienced in the 1970s.

[3] The 2007 Minnesota Legislature greatly strengthened the State's conservation efforts with the passage of the Next Generation Energy Act. Minnesota Statutes 216B.242 now require utilities to set a goal of achieving energy savings equivalent to 1.5 percent of retail sales each year.

Besides Minnesota's increased population and the economy's dependence on electric machines, federal and state governmental actions directly impacted the use of Minnesota's transmission grid (as well as other states' grids).

Federal Actions Impacting Minnesota's Transmission Grid and Resulting Challenges

In the 1990s the Federal Energy Regulatory Commission declared that the nation's interconnected interstate transmission grid should be viewed as analogous to the interstate highway system and the interstate natural gas pipeline system and that the grid should be "opened up" to allow any generator of electricity, any electricity marketer or any purchaser of electricity to use whatever portions of the transmission system are available to complete their transaction. This federal decision impacted all of Minnesota's utilities that owned transmission because they could no longer plan and operate their owned transmission facilities solely to provide electric service for their customers. Now utilities had to begin planning transmission facilities sized large enough to meet their customers' needs plus an unknown amount of other electricity transactions that may use the planned facilities. Needless to say, this change definitely complicated what was once a fairly straight-forward transmission planning process.

The Federal Energy Regulatory Commission soon realized that the nation's newly-opened grid would likely not perform efficiently by leaving operations in the hands of hundreds of individual utilities scattered across the states. More centralized operations and control was obviously needed. The federal Commission created new entities that were under the jurisdiction of the federal Commission but independent of the utilities and the states. These new entities were structured as non-profits to which utilities could voluntarily join.[4] These new entities were generally called "independent (transmission) system operators" and were charged with operating the interconnected transmission facilities of their members as one single larger grid, thus providing more operating efficiencies. The other major charge for the independent system operators was to use the "open access" transmission grid to create and operate an open, centralized, easy-to-view, buy-sell market for electricity. Using this new market, instead of a buyer of electricity having to contact every individual seller of electricity to see if any electricity was available for purchase, buyers and sellers could go to the centralized market and carry out their transactions.

Since its creation, almost all of the Minnesota utilities have joined the Midwest Independent (Transmission) System Operator, known as the Midwest ISO or MISO. The Midwest Independent System Operator directs the reliable operation of the power grid and electricity market. Among its tasks, it reviews all outage data, as well as potential outage information and proposes plans to fix such outages. The utilities' joining MISO has resulted in new methods of operation for the utilities, new uses for their transmission assets, and much more complicated transmission planning. MISO has recognized these planning challenges and in the past few years has collaborated much more with its members and state governments to conduct more centralized planning efforts. These planning efforts are discussed further below.

[4] For further details, see FERC Orders 888, 888-A, 889, 2000, and the Energy Policy Act of 2005.

State Actions Impacting Minnesota's Transmission Grid and Resulting Challenges

Enactment of Minnesota's Renewable Energy Standard has had the strongest impact on how Minnesota's power grid is operated. Prior to the enactment of the Renewable Energy Standard, utilities tended to either construct and operate or purchase power from centralized power plants that were generally fueled by fossil or carbon-based fuels such as coal, oil and natural gas. These power plants tended to be large because larger power plants can produce power cheaper on a per-unit basis than smaller plants. These large plants tended to require a lot of land for roads, storage yards, water containment areas, substations, "out" buildings, etc. Rather than purchasing large parcels of land closer to customers, utilities tended to site these plants in fairly rural areas (at least "rural" at the time that they were built) and then constructed power lines to connect the power plants to customers. This approach was used because the costs of constructing transmission were, and still are, only a fraction of generation costs.

With the creation of the Renewable Energy Standard, utilities were now required by law to purchase power from renewable sources. The largest source of new renewable energy in Minnesota is, of course, electricity generated by wind. As most know, western, especially southwestern, Minnesota has some of the best of what is termed "wind resources" in the United States. The best wind resources in western Minnesota are part of a larger region stretching from Manitoba south to Texas in which wind blows fairly continuously and consistently throughout the year, and thus provides a good habitat for wind turbines.

However, the advent of wind turbine clusters or "farms" brought complications for Minnesota's power grid and for the operators of the grid – Minnesota's utilities and the Midwest Independent System Operator. First, no matter how good Minnesota's wind resource is, the wind does not blow 24 hours per day, seven days per week. That means that grid operators and energy service providers cannot count of wind energy always being available to meet customers' needs. As such, methods had to be derived to provide energy to customers at a moment's notice to compensate whenever the wind died down and turbines stopped spinning. In 2005 the legislature required a wind integration study, managed by the Reliability Administrator, to examine the reliability and cost impacts of wind energy. "Quick start" generators (such as natural gas-fired combustion turbines) and generators operating on the grid at any single moment have become two viable back-ups for wind power. That is, wind needs back-up generation that can adjust to its variable output. However, these back-up energy sources naturally add costs to the overall price of wind energy that utilities have to purchase for their compliance with the Renewable Energy Standard.

An even greater challenge stemming from the Renewable Energy Standard is that it has changed the way that utilities need to plan for their customers' future needs. As discussed above, with the federal government's "opening up" of Minnesota's and the nation's power grid to allow any electricity seller or buyer to use the grid to deliver the power purchased or sold, utilities cannot just plan future transmission configurations to provide for their own customers' needs. Now utilities had to also consider third parties' desires for using future transmission regardless of whether the third parties' transactions might benefit the utilities' customers or not.

Also, with the addition of the Renewable Energy Standard requirements, an explosion of independent wind energy generators began looking to site their wind farms in areas advantageous to their generation but not necessarily in areas where customers were located or where transmission was located or available for the generators' use. This explosion in proposed generation resulted in the formation of a massive backlog of grid interconnection requests made to the Midwest Independent System Operator. This backlog, termed the "interconnect queue," has been a source of much dialog and frustration among policy makers, regulators and all parties involved with generation and transmission. Much work has been put into trying to make the processing of the "queue requests" more efficient but the fact remains that, as discussed at the beginning of this paper, Minnesota's grid is close to its limits and has little additional space available to safely and reliably interconnect new generation. Combining this relative lack of grid space with interconnection requests that are at least ten times the total generation needed to fulfill Minnesota's entire Renewable Energy Standard means that there is no quick-and-easy fix for the queue situation. Large new transmission facilities must be built to support the needs of Minnesota and neighboring states.

III. MINNESOTA'S TRANSMISSION SYSTEM – PLANNING FOR THE FUTURE

Dispersed Renewable Generation Studies – Phases I and II

As stated above, Minnesota's grid appears to have very little further available space left to interconnect generation to the grid. But how do we know for sure how much space is left? During the 2007 Session the Legislature charged the Office of the Reliability Administrator with a two-phase project that (in Phase I) found locations on Minnesota's transmission grid which would be able to connect a total of 600 Megawatts of renewable generation in small projects dispersed around the state without having to spend a large amount of money on transmission upgrades. Then, in Phase II, the Office of the Reliability Administrator was charged with finding locations on Minnesota's grid where an additional 600 Megawatts of small projects could be connected and the cost to do so.

These were ground-breaking studies in that engineers from all of Minnesota's utilities, the Midwest Independent System Operator and other transmission and renewable energy engineers and experts came together to study the smaller as well as larger transmission grid in Minnesota. After intense study and modeling, the group agreed on the findings issued in the Phase I report issued on June 16, 2008 that it was very difficult to find any available space on the existing grid to allow even small projects to connect "for free." Nevertheless, the report did provide sufficient locational information to meet the 600 Megawatt statutory requirement.

The group then went on to continue its study efforts and, on September 15, 2009 issued its Phase II report that stated that the group found very limited locations that could accommodate even very small (10 to 40 Megawatt) renewable projects. In fact, in order to conduct the computer modeling required by the statute, it was necessary to assume that major portions of the CapX 2020 projects were built. In other words, before any work could be done, the experts had to assume that over $1 billion was already spent on new transmission lines in Minnesota to create more space on the transmission system. Even beyond having to make this major billion-dollar

assumption, the group's study showed that an additional $121 million of transmission "fixes" were needed before any more substantial dispersed renewable energy generation could be connected to the grid.

This group of experts convincingly showed that Minnesota's grid is, indeed, nearly at its limits and out of available space to be able to connect any more generation into the grid without substantial transmission spending.

Renewable Energy Standard Transmission Study

During the 2007 Session, the Legislature also ordered the utilities subject to Minnesota's Renewable Energy Standard to collaborate on a study report to the Public Utilities Commission that explained the utilities' transmission planning and their other efforts to fulfill their Renewable Energy Standard obligations (Minn. Stat. 216B.2425). The utilities submitted their report in compliance with the Statute on November 1, 2007. At that time, the utilities reported that their existing and planned transmission projects (including projects such as CapX 2020 and others) would be sufficient to allow the utilities to meet their obligations through the 2016 milestone.

Earlier in 2009, the utilities released reports on three other studies that they conducted to provide further information on how the utilities intended to fulfill their renewable obligations. These three reports[5] provided information on:

(1) assessing whether upgrading and rebuilding a transmission line between Granite Falls and the Twin Cities, plus upgrading smaller transmission, would provide further substantial generation interconnection benefits;

(2) re-assessing and validating the order in which transmission projects should be built to best meet the utilities' Renewable Energy Standard requirements. The study also conducted a key analysis to determine the operational impact of increasing wind generation in the region on the transmission system;[7] and

(3) looking at several specific transmission projects, taken individually and in combination, to determine how much additional generation can be added to the system, and where, as a result of the transmission additions. The results provide an

[5] These reports are available at: http://www.minnelectrans.com/reports.html

[7] One of the important conclusions of this study was the importance of working with utilities in Wisconsin to upgrade and build a larger transmission line across the Minnesota-Wisconsin border and then encouraging Wisconsin utilities to build a new transmission line from LaCrosse to Madison, Wisconsin. This would help Minnesota utilities meet their renewable obligations and allow generation to be delivered from Minnesota into and across Wisconsin which would not only benefit Minnesota's utilities and generators beyond 2016 but would also allow Wisconsin utilities to use such generation in fulfillment of their Wisconsin Renewable Portfolio Standard

estimated range of additional generation that can be added by these various combinations of transmission projects along with estimated locations of new generation.

In the Biennial Transmission Report filed November 1, 2009 (discussed in the next section) the transmission-owning utilities acknowledge that existing and planned transmission may not be sufficient to meet the 2020 Renewable Energy Requirement milestone or soon thereafter. However, the transmission owners are conducting studies to figure out how much of a transmission "gap" is expected using the best available information today. Also, the Midwest Independent System Operator is currently conducting regional transmission planning for that farther-out timeframe and the Minnesota transmission owners are actively involved in those studies which, in turn, should inform the Minnesota utilities' own studies in the future.

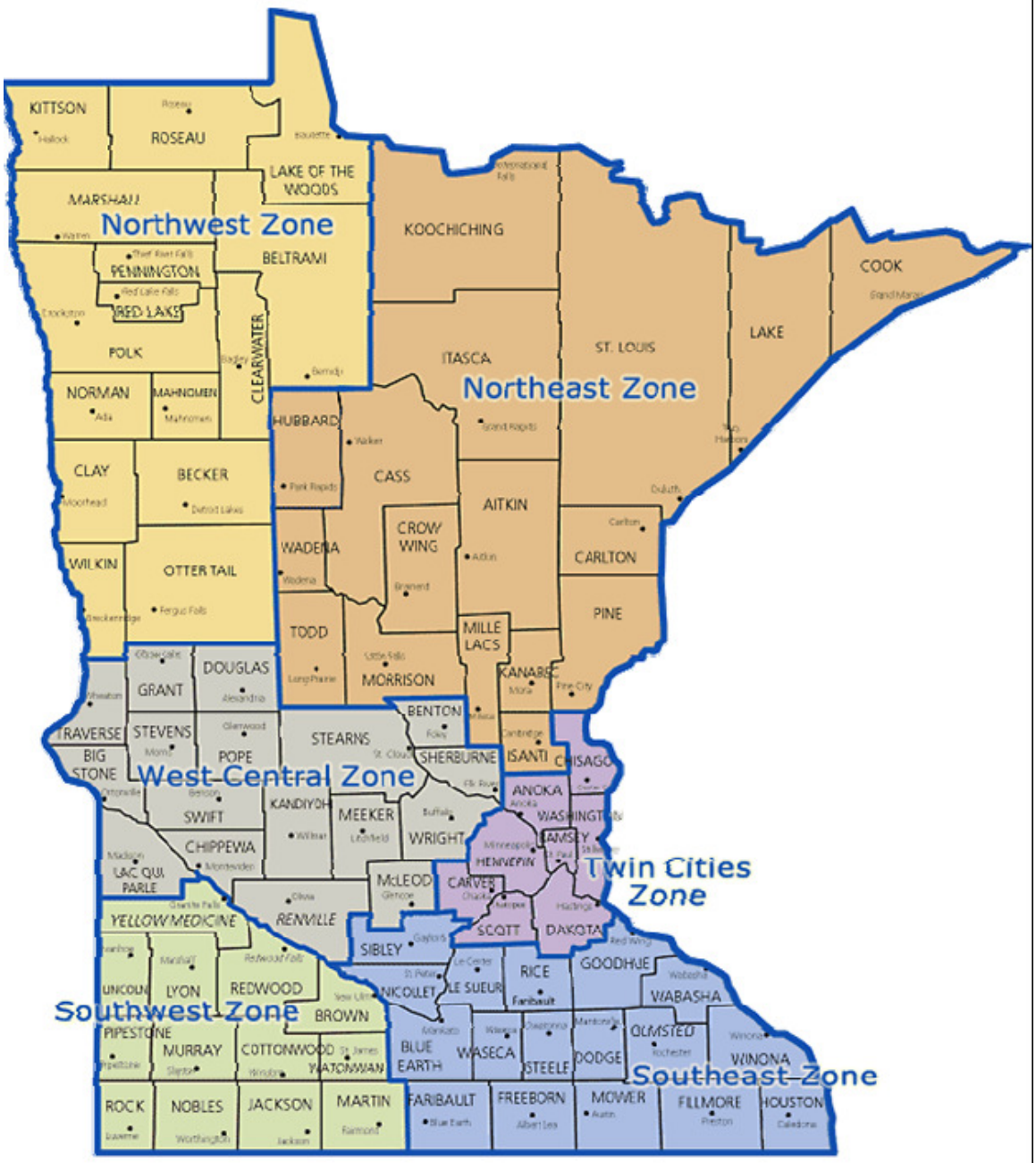
Minnesota Biennial Transmission Projects Report

Pursuant to Minn. Stat. 216B.2425, the Minnesota transmission-owning utilities together filed their Biennial Transmission Projects Report.[8] This comprehensive report covers specific small transmission "fixes" around the State, as well as larger transmission that:

- have been completed since the last Biennial Report in 2007,
- are currently in construction,
- are going through the regulatory process, or
- are planned in the future.

Detailed information (including maps) on all transmission actions is broken down into six geographic zones of the state. The transmission-owning utilities operating in each of the six zones then put that zone's report together. The six zones in the state are shown in the following map.

[8] The Biennial Transmission Projects Report is available by searching year 2009 and number 602 at the edockets website or is available for download directly from http://www.minnelectrans.com/reports.html


Northwest Zone
Northeast Zone
West-Central Zone
Twin Cities Zone
Southwest Zone
Southeast Zone
KITTSON
ROSEAU
LAKE OF THE WOODS
MARSHALL
BELTRAMI
KOOCHICHING
COOK
LAKE
ST. LOUIS
ITASCA
PENNINGTON
RED LAKE
POLK
CLEARWATER
NORMAN
MAHNOMEN
HUBBARD
CASS
AITKIN
CARLTON
PINE
CLAY
BECKER
WILKIN
OTTER TAIL
WADENA
CROW WING
TODD
MORRISON
MILLE LACS
KANABEC
DOUGLAS
GRANT
TRAVERSE
STEVENS
POPE
STEARNS
BENTON
SHERBURNE
ISANTI
CHISAGO
BIG STONE
SWIFT
KANDIYOHI
MEEKER
WRIGHT
ANOKA
WASHINGTON
RAMSEY
HENNEPIN
CHIPPEWA
LAC QUI PARLE
McLEOD
CARVER
SCOTT
DAKOTA
YELLOW MEDICINE
RENVILLE
SIBLEY
GOODHUE
WABASHA
LINCOLN
LYON
REDWOOD
NICOLLET
LE SUEUR
RICE
BROWN
PIPESTONE
MURRAY
COTTONWOOD
WATONWAN
BLUE EARTH
WASECA
STEELE
DODGE
OLMSTED
WINONA
ROCK
NOBLES
JACKSON
MARTIN
FARIBAULT
FREEBORN
MOWER
FILLMORE
HOUSTON

The transmission owning utilities in each region are:

1. The Northwest Zone – Great River Energy, Minnkota Power Cooperative, Missouri River Energy Services, Otter Tail Power company and Xcel Energy

2. The Northeast Zone – American Transmission Company, LLC, Great River Energy, Minnesota Power and Xcel Energy

3. The West Central Zone – Great River Energy, Hutchinson Utilities Commission, Missouri River Energy Services, Otter Tail Power Company, Willmar Municipal Utilities and Xcel Energy

4. The Twin Cities Zone – Great River Energy and Xcel Energy

5. The Southwest Zone – ITC Midwest LLC, East River Electric Power Cooperative, Great River Energy, L&O Power Cooperative (headquartered in Iowa), Marshall Municipal Utilities, Missouri River Energy Services, Otter Tail Power Company and Xcel Energy

6. The Southeast Zone – Dairyland Power Cooperative, Great River Energy, ITC Midwest LLC, Rochester Public Utilities, Southern Minnesota Municipal Power Agency and Xcel Energy

Although most of the smaller transmission fixes are planned for the years 2011-2016, some information on transmission upgrades planned for 2020-2026 is included as well along with pertinent assumptions and other data on the needs and timing of these longer-range projects. In addition, as mentioned above, the Minnesota transmission owners are actively participating in the longer-range regional transmission planning efforts currently underway which should inform their own Minnesota longer-range planning efforts in the future.

IV. CHALLENGES TO TRANSMISSION PLANNING – POTENTIAL IMPACTS TO MINNESOTA AS PART OF THE MIDWEST REGION AND THE U.S.

Potential new Federal and State Renewable Portfolio Standards could Lead to More Pressure on Minnesota's Transmission Grid

Almost everyone involved in the energy business today agrees that new transmission lines must be built in Minnesota, in the Midwest and in the U.S. However, planning for and constructing such new facilities presents even greater challenges than those discussed so far herein.

Minnesota utilities and the Midwest Independent System Operator are able to make a fairly solid estimate of the amount of energy that Minnesota's utilities will need to procure through the years in order to comply with Minnesota's "25% renewable energy by 2025" Renewable Energy Standard. However, more states are enacting new renewable portfolio standards (another name

for a Renewable Energy Standard) and, more importantly, Congress currently has bills in both houses that call for enacting a federal renewable portfolio standard (along with some type of greenhouse gas mitigation).

If a federal Standard is enacted, all of the states (many with very small or no standard of their own) will immediately need to begin looking for renewable energy sources to draw upon to comply with the new federal standard. Because of the interconnected nature of the transmission grid and the fact that, as discussed above, Minnesota sits at the edge of some of the best wind energy resources in the U.S., other states (east of Minnesota) are already or may well look to import renewable energy into their states from Minnesota or through Minnesota from its western "wind rich" neighboring States. For example, the Commission is currently reviewing a certificate of need petition for a wind farm proposed for customers in Indiana. These new standards would place additional challenges on transmission planning efforts. The fact that it is not yet known if new standards will be enacted just adds more uncertainty to the current transmission planning efforts currently underway.

New Transmission (and Other Energy) Projects Raise Land Use and Land Rights Concerns

In the last few years, a number of entities have sought approval to construct new energy projects in Minnesota. Among these projects were underground oil and natural gas pipelines, ethanol plants and wind farms. Now the largest transmission line project currently in any state regulatory process, the CapX 2020 package of transmission lines, is currently in the regulatory siting process in Minnesota. Since the siting process in Minnesota mandates a number of public meetings and hearings as well as other outreach efforts to potentially impacted residents and landowners, the laws and issues regarding land rights and land use are also receiving close scrutiny. In addition to wanting to know what benefit their area or the State would derive from the project, landowners and other impacted citizens naturally want to know what their rights are regarding such projects impacting their land so they may be assured that their rights are not infringed upon during the process.

To date, answers to impacted citizens and landowners have been identified during the regulatory processes. The answer to "what benefit does this project have for my area or my State" is a key question that is addressed in the State's Certificate of Need process (Minn. Stat. 216B.243) and land rights questions are addressed in various parts of Minnesota's Statutes. However, the questions may get harder to answer if large regional or national transmission projects come to fruition as a result of regional and national planning efforts now underway (as discussed further below.) Also, issues surrounding land rights and land use may be affected as to whether future projects continue under state jurisdiction or are preempted by the federal government.

Federal vs. State Jurisdiction over Transmission Siting and Construction and the Threat of Federal Preemption

As discussed above, the federal government "opened up" the interstate electric transmission grid in the 1990s. Certain eastern States challenged the federal government's jurisdiction over interstate electric transmission lines.[9] The challenge went to the U.S. Supreme Court which

[9] See New York, et al. v. FERC, et al. and Enron Power Marketing, Inc. v. FERC for further details.

upheld that the Federal Energy Regulatory Commission does, indeed, have legal and regulatory jurisdiction over electric lines used for interstate commerce (States retain jurisdiction over small power lines that distribute power directly to retail electric customers.) After the Supreme Court reached its verdict, the Federal Energy Regulatory Commission issued a policy statement saying that it would not "preempt" state regulation of transmission lines as long as transmission service is not detrimentally impacted by state actions. There are, in Washington DC, numerous influential interests who are currently advocating for the Federal Energy Regulatory Commission to preempt state siting authority, and several bills currently before Congress enable that preemption. If a national renewable portfolio standard or carbon management effort is seriously considered in Congress, it may well be accompanied by some additional federal siting preemption. However, the Federal Energy Regulatory Commission has not, to date, pressed its preemption ability although it is actively monitoring the regional planning efforts in which states are actively engaged (discussed below).

Also, in the 2000s, Congress stepped up federal jurisdiction over electric transmission lines in a slightly different way by enacting a law that provides the Department of Energy with the ability to designate "energy corridors" across states which would mean, among other things, that any transmission siting within a designated energy corridor with automatically go through federal, versus state, siting processes. Wind developers and states to the west of Minnesota, with an eye to selling electricity to eastern markets, proposed to the Department of Energy that it designate energy corridors across Minnesota. The Department of Energy did not take such designation actions but left the door open for later designations. Overall, the Department of Energy has not been particularly active in terms of naming many new corridors. Instead, the Department of Energy provided millions of dollars in federal grants to the States and regional grid operators to engage and collaborate in transmission planning across the U.S.

Allocating the Costs of New Transmission Projects to Those who Either Cause the Costs or Who Benefit from the Costs Poses Major Challenges

In every business transaction, some of the bottom-line questions are naturally, "Who will use it or benefit from it and how much will it cost?" From the answers to those questions, the logical next step is to look to charging the cost of "it" to those who use it or benefit from it. What seems like a fairly straight-forward concept is anything but straight-forward when the "it" in question is a package of large interstate transmission lines costing billions of dollars. The "how much will it cost" question is answered but the "who will use it or benefit from it" question becomes elusive, albeit important, because of the myriad uses and benefits to different parties that any new transmission line can provide to an integrated grid from moment to moment everyday. This is one of the largest challenges facing the states, utilities and the grid operator currently. Not only are the answers very difficult to find, but even more so, whatever answers are found are not agreed to by all parties. The controversy in these questions is probably the core challenge facing all of the regional and national planning processes that is discussed below. It also is a core challenge for project proposers because transmission proposers and investors are naturally reluctant to move forward with transmission construction until they have some answers on how they will be able to recoup their investment from those who use or benefit from the new project.

V. REGIONAL TRANSMISSION PLANNING INCLUDING AND IMPACTING MINNESOTA

There are currently many transmission planning studies being carried out for specific areas and for the entire cumulative region that the Midwest Independent System Operator serves. There are also correlated cost allocation efforts underway to come up with fair and workable ways to charge for projects that may arise from the transmission planning efforts. All of these efforts are either carried out within the structural framework of the Midwest Independent System Operator or with the System Operator assisting in the technical aspects. This report discusses only the largest efforts presently underway with the strongest potential impacts to Minnesota.

The Regional Generator Outlet Studies –Phases I and II

Like the System Operator's member utilities in Minnesota, member utilities in certain other states have obligations to procure renewable energy to meet their own states' Renewable Standards. In order to effectively plan future transmission needed to assist all of the member utilities with fulfilling their respective state mandates, the System Operator began this two-phase regional study early in 2009.

The first phase looks at the renewable mandate obligations and the available resources to meet those obligations in the utility members' service territories in the western half of the System Operator's cumulative service territory. This first phase includes Minnesota.

The Phase I study is now being wrapped up. The findings from Phase I report that the approximate amount of energy needed to fulfill the existing renewable standards in the western half of the System Operator's cumulative service area, approximately 23,000 Megawatts, will be able to be met from potential generation sources within the same general area but that future transmission would be needed to ensure delivery of the energy to the utilities that need it. The Phase I findings also provide various general transmission plans (including maps) to meet different estimated scenarios (including potential federal renewable portfolio standards.) These scenarios also differ by varying amounts of energy usage and if the resources in this area are called upon to provide renewable energy to other areas in the System Operator's cumulative service area or, in the event of a national renewable portfolio standard, into the eastern portion of the United States.

Even before the Phase I study was completed, the System Operator began the Phase II study. The Phase II study basically mirrors the work methods of the Phase I study for the eastern half of the System Operator's cumulative service area. The Phase II study will not be completed until later in 2010; however, preliminary study shows that the eastern half of the cumulative service area will require approximately 35,000 Megawatts of renewable energy to meet the states' mandates within that area. Some of the cumulative renewable obligation will be met by resources located within or close to those states. However, the remainder of the energy needed to fulfill the requirements may be imported from the Phase I states.

Like the Phase I study, the completed Phase II study will offer various transmission plans or configurations (with maps) that may be needed to transmit renewable energy within the eastern half of the System Operator's cumulative service area, as well as to deliver energy from the western half to the eastern half of the cumulative service area, all in order to fulfill the requirements of the energy mandates of states located in the eastern half of the System Operator's cumulative service area.[10]

In every scenario to date, major transmission is being proposed that would run through Minnesota in order to meet states' energy mandates in the Midwest or to meet potential federal energy mandates, if enacted. Not only would this change physically impact Minnesota but the questions regarding "who benefits from this transmission so who should pay for it" become critically important to Minnesota.

The Upper Midwest Transmission Development Initiative

In January 2009, regulators and policy makers from Minnesota and its neighboring four States, North Dakota, South Dakota, Iowa and Wisconsin met and formed the Upper Midwest Transmission Development Initiative. The purpose of this collaborative effort is two-fold:

- To lead and impact transmission planning for the benefit of the five States alone as well as part of the larger region, and
- To lead cost allocation efforts for projects slated for the benefit of the five States and to impact and inform regional cost allocation efforts.

The Midwest Independent System Operator has provided technical assistance to this effort including performing computer modeling and economic and engineering analyses and has incorporated the decisions reached collaboratively by the five States into the System Operator's own transmission planning efforts such as the Regional Generator Outlet Studies discussed above.

The Initiative's Executive Team and staff have also conducted their own fact finding and analyses in such areas as:

1. Identifying wind resource locations in each of the five States,
2. Assessing and adopting a set of over-arching principles and guidelines for transmission-project cost allocation,
3. Conducting an assessment of the laws and policies of each of the five States that could impact future transmission development,
4. Reviewing various transmission scenarios specific to the five States based on various sets of assumptions,
5. Conducting various analyses on different cost allocation methods that may be applied to proposed transmission projects,

[10] This study does not propose renewable generation resources to be located in the eastern states, since the System Operator is not able to require generation sources to be built; rather, the System Operator relies on the utilities to build generation, and uses that information regarding transmission needed to deliver the power.

6. Communicating information with stakeholders and gathering stakeholder input, and
7. Actively participating in the larger regional efforts discussed elsewhere in this section.

Work on this Initiative is progressing, with conclusions and further stakeholder discussion expected in the first quarter on 2010.

The Cost Allocation and Resource Planning Effort by the Organization of MISO States

Like the five-State effort discussed above, the rest of the states located in the System Operator's cumulative service area recognize the importance of leading and actively participating in transmission planning and cost allocation efforts that could potentially impact their States. As such, in early 2009 the regulators in the Midwest Independent System Operator States formed a regulator effort to lead and impact the System Operator's transmission planning efforts as well as the efforts underway to ascertain how the costs of these proposed transmission projects should be charged to member utilities and stakeholders in their states.

This group of state regulators and staff, under the leadership of the President of the Organization of MISO States, have been actively meeting and working monthly throughout most of 2009 and into 2010 to identify and collaborate on the myriad underlying assumptions that support the System Operator's transmission planning and to tackle the daunting transmission cost allocation issues that, as discussed above, are key to transmission development underlying successful fulfillment of the states' renewable energy mandates.

The Midwest Independent System Operator's Regional Expansion Criteria and Benefits Task Force

Similar to the two state-regulator led efforts discussed above, the Midwest Independent System Operator also established a stakeholder task force to look into the same or very similar transmission planning and transmission cost allocation issues. Although the topics and issues are very similar, the approach to these issues is far different from the regulator efforts, in that this task force is made up of member-utilities, energy generators and marketers, non-utility transmission owners, environmental groups, and consumer advocates as well as regulators. These differing groups of stakeholders bring very different interests, experiences and agendas to this process. All of these differences have complicated the task force's efforts regarding its charge to investigate cost allocation methods and models that will facilitate future transmission construction and operation.

The task force has been meeting and working monthly through most of 2009 and will be stepping up its efforts in 2010. The Federal Energy Regulatory Commission has imposed a July 2010 deadline on the System Operator to file a new all-encompassing cost allocation method along with all of the tariff "operating rules" and revised business practice rules needed to put into practice, operate and comply with a new cost allocation method. This is an extremely short amount of time to complete a very large body of complex work, making the issue of cost allocation the greatest challenge before the System Operator, its members, stakeholders and regulators at this time.

VI. NATIONAL TRANSMISSION PLANNING INCLUDING AND IMPACTING MINNESOTA

Traditionally, transmission planning and costing was done by each utility as the utility planned facilities to provide electric service to their customers into the future. With the advent of Independent System Operators, transmission planning began to be performed on a regional basis, recognizing that benefits could be gained by planning a regional system that can provide a number of benefits to customers in the region. In the past couple of years, larger-scale transmission planning has started to gain favor, and be performed, on close to a national level. The impetus for these wider geographic planning efforts stems from more states enacting renewable energy mandates and the attention that Congress is giving to a federal renewable energy mandate as well as potential carbon legislation in various forms.

The Joint Coordinated System Plan

As stated above, almost two years ago, the Department of Energy noted the number of states with existing or newly enacted renewable mandates and that it may be beneficial for some type of transmission planning to be initiated to ensure that renewable energy may be transmitted and delivered sufficiently to fulfill these mandates. The Department of Energy gathered the Independent System Operators in the Eastern-most 40 states (whose transmission is all interconnected) and other transmission stakeholders, to initiate a study using the initial assumption of "what if" these eastern 40 states had to purchase renewable wind generation from the wind-rich areas of the Midwest and transport it from the Midwest to the East Coast.

The participants studied various differing scenarios regarding this "what if" and derived a system of very large transmission lines (larger than Minnesota currently has in the state) to transport energy across the eastern half of the U.S. This report was completed and released. The studies' findings provoked a storm on controversy, particularly among the New England States. These eastern States complained that they did not like the Study's premise of only looking at delivering Midwest wind energy to the east coast. Rather, these states wanted to see scenarios that developed renewable energy closer to their states. The New England states then went on to release their own regional study touting on-shore and off-shore wind energy to fuel their renewable needs. It is assumed that this Joint Coordinated System Plan, the New England regional study and all other major such studies will be included in the Eastern Interconnection Planning Coalition study described below. Further information on the Joint Coordinated System Plan Study may be found at: http://jcspstudy.org/.

The Eastern Wind Integration and Transmission Study

The Department of Energy and the National Renewable Energy Laboratory noted the concerns expressed by the eastern states regarding the assumption in the Joint Coordinated System Plan that Midwest wind resources would be developed, along with very large transmission lines, to deliver wind energy to the eastern states rather than attempting to develop wind resources in the eastern states and along the East Coast. In response, the Department of Energy and the National Renewable Energy Laboratory gathered transmission engineers and wind experts from throughout the U.S. to conduct technical analyses.

Specifically, the study examined whether building all of the wind generation possible in the eastern states, both on-shore and off-shore, would alleviate the need for importing wind energy from the Midwest. The Eastern Wind Integration Study team found that even siting huge amounts of wind energy (approaching 70,000 Megawatts, the maximum remotely possible along the eastern seaboard and in the east-coast states) would cause severe grid imbalances in the eastern half of the nation. This means that that Midwest generation and very large transmission lines would still be needed just to maintain the integrity of the entire electric grid as well as to complete all of the states' renewable energy mandates. Siting the maximum east-coast wind generation without including Midwest generation with very large transmission lines caused massive power flow imbalances in the computer modeling which, in turn, could provide an indication on some rather severe unintended consequences, such as major black-outs all over the interconnected eastern U. S. It is expected that this study will also be included in the joint transmission planning effort discussed below. The final executive summary of this study was just issued on January 14, 2010 with the full report expected to be released the following week. Further information on the Eastern Wind Integration and Transmission Study may be found at: http://www.nrel.gov/ewits.

The Eastern Interconnection Planning Collaborative (EIPC) ("Module A") and The Eastern Interconnection States Planning Council (EISPC) ("Module B")

From the experiences garnered from the Joint Coordinated System Plan Study discussed above, the Department of Energy recognized the need for further work and collaboration among the various independent system operators and among the states. When Congress and the President enacted the American Reinvestment and Recovery Act with its accompanying funding, the Department of Energy put together a two-part funding opportunity. The first part (termed "Module A") provides for funding to the independent system operators and reliability organizations in the eastern 40 states (as well as separately in the western states, etc.) to collaborate on assessing transmission facilities existing today and then to conduct transmission planning scenarios to link and fortify the transmission grid in each state and region for the benefit of the entire eastern U.S.

The second part of the funding opportunity ("Module B") allows energy leaders in each of the 40 eastern states to gather as one entity to collaborate on transmission planning throughout the entire forty states. Prior to this time, certain groups of states had collaborated on transmission planning but collaboration among all of the states had never before been attempted.

In December of 2009, the Department of Energy awarded grants to both of these entities and the work has begun. Both groups have been meeting (primarily by phone and email) to set up their groups structures, work plans, etc. and plan to begin work in earnest as soon as the Department of Energy releases the funding, which is expected by late January, 2010. The grants are specified for a four-year period but the participants are already recognizing the benefits for extending their efforts over longer periods of time.

VII. SUMMARY AND CONCLUSIONS

In summary:

- Electricity has become increasingly important in Minnesota homes and businesses
- Minnesotans rely on power every day.
- Despite the fact that we are using the transmission system in a highly efficient manner, our use of electricity has strained the transmission grid which was not designed for the purposes for which it is currently being used and expected to be used in the future as we find more ways to use electricity.
- For these reasons, the time has come to build more transmission.
- The way that we guild transmission is affected by factors such as renewable power standards in the region and across the United States.
- Minnesota has been and will be involved in numerous efforts to build transmission in a reasonable and cost-effective manner.