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

January 2011

Submitted by

**The Offices of Energy Security**
**And the Reliability Administrator**
**Minnesota Department of Commerce**

In Consultation with
**The Minnesota Public Utilities Commission**

**TABLE OF CONTENTS**

**Section** **Page**

# I. INTRODUCTION

Minnesota Statute §216C.054, the Annual Transmission Adequacy Report to the Legislature,[1] requires the Commissioner of Commerce, in consultation with the Public Utilities Commission, to prepare and submit this report annually to provide a nontechnical discussion of the "state" of Minnesota's current electric transmission system. This 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.

In keeping with the requirement that the "report must be in easily understood, nontechnical terms," acronyms and other jargon are avoided. Also, this report 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, some cites are footnoted to publicly available documents that provide detailed technical reports and data.

This report provides 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 United States, discussions are provided on current and future regional and national transmission planning efforts that could impact Minnesota's power grid.

# II. WHY TRANSMISSION MATTERS: OVERVIEW

Electricity is provided to consumers via three main steps: generation, transmission and distribution. As the link between the production (generation) of electricity and delivery (distribution) to consumers, transmission plays a vital role in helping to ensure that consumers have low-cost, reliable energy. While it is a critical component in providing electric service,

[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.

transmission accounts for a much smaller percent of utility costs than either generation or distribution facilities. For example, transmission may account for 10 percent of the costs of providing electric service while generation and distribution make up the other 90 percent.[2]

Transmission facilities currently in place have been designed primarily to interconnect a utility's generation and distribution facilities, and secondarily to interconnect neighboring utilities to each other to provide additional backup power. This design enables utilities to access other generation or transmission systems if something goes wrong on that utility's system. This interconnection with other electric systems provides a more reliable system overall than isolated systems and allows utilities to access lower cost power from other suppliers, or purchase power on a temporary basis rather than building a generation facility that may be use only intermittently. Transmission helps the entire system of interconnected utilities operate more efficiently than if each utility were operated on a stand-alone basis.

The interconnected transmission system is vast. Electrically, the transmission grid is split into three sections: the Eastern Interconnection, the Western Interconnection, and the Electric Reliability Council of Texas (ERCOT). These areas are shown in the attached map.[3]

Electricity follows the laws of physics: like water, it follows the path of least resistance. However, electricity has different properties that require different delivery systems than are used for water. For example, electricity placed onto the interconnected transmission grid could be withdrawn at any other place within the interconnection as long as there is no congestion. Moreover, the electrical system must be balanced, meaning that the amount of electricity being produced at any given time must essentially equal the amount of electricity being used by consumers. However, because electricity cannot be stored in a reasonable manner with current technology, the transmission system helps maintain this balance by allowing electricity to flow around the electrical system where possible. [4]

## III. TRANSMISSION, RELIABILITY AND POWER COSTS

Adequate transmission is one essential component to ensure that Minnesotans have reliable and reasonably priced electric service. When there are material shortages in transmission capacity in certain areas, there are more frequent power outages and lower power quality (that can affect

---

[2] Source: Northern States Power d/b/a Xcel Electric's compliance with the Commission's requirement *In the Matter of an Investigation into Informing Customers of the Costs of Generation and Delivery of Electricity*, December 15, 2010.

[3] Source and electronic link:
http://www.nerc.com/fileUploads/File/AboutNERC/maps/NERC_Interconnections_BW.jpg

[4] There are a number of technologies being developed to store un-needed electricity for later use. However, none of these technologies are commercially viable or operational at this time. One technology currently in use is known as "Pumped Hydro Power" which uses electricity at times when little power is being used for other purposes to pump large amounts of water into a reservoir. Later, when electricity is needed, this reservoir water is allowed to flow through a hydro-power turbine, generating electricity. This technology's use is restricted due to the need for a large amount of water needed to make it viable and the large facilities needed to store the water and generate the hydro-power. Currently, the largest Pumped-Hydro facility in the Eastern U.S. is located on the eastern shore of Lake Michigan. In addition, Northern States Power d/b/a Xcel Energy is testing use of a large battery facility to store power from wind energy for later use. Such batteries are still in the testing stage in the U.S.

sensitive equipment such as computers). Since Minnesotans rely heavily on reliable power, it is critical to ensure that electric service is as reliable as reasonably possible to minimize the cost to Minnesota's economy in lost production time and disruption and potential harm to the myriad systems that depend on electricity.

Another effect of inadequate transmission capacity is increased cost of power delivered on the system. When there is not enough transmission capacity, certain paths on the system become congested, causing operators of the electric system to decrease the amount of electricity from generators in those areas and increase generation in other areas to make up for the generation that could not be delivered from the congested areas. The entire electric system starts with the least-cost generators, adding power from generators that are increasingly expensive to operate. As a result, when transmission congestion causes adjustments to the generation facilities used to produce power, the cost of power goes up as more expensive generation replaces less expensive generation.

Both of these factors hurt Minnesota's economy. Lapses in power quality and reliability, along with higher costs, could potentially disrupt businesses, industries, hospitals, schools, public services and citizens who depend on computers and other electronics in their day-to-day lives and expect that power costs will be reasonable.

## IV. ROLES OF ENTITIES INVOLVED IN TRANSMISSION

Numerous entities affect the design and cost of Minnesota's transmission grid. While Minnesota's electric utilities are certainly involved in these matters, other entities affect the design and cost of the transmission system that serves Minnesota. The following is a list of major players; however, numerous other entities participate in various proceedings regarding transmission.

1. Because transmission lines located outside of Minnesota serve Minnesota customers, the utilities that own those facilities and states that regulate those utilities affect the cost and design of the transmission grid that serves Minnesotans.[5]
2. The Federal Energy Regulatory Commission (FERC)[6] regulates the wholesale rates that utilities charge for transmission service and the type of transmission services provided.
3. The Midwest Independent System Operator (MISO) operates the regional transmission system covering 13 states and the Canadian province of Manitoba.[7] FERC regulates MISO's rates.
4. The North American Electric Reliability Corporation (NERC) works with electric reliability councils and others to develop and enforce electric reliability standards of the transmission system as a whole.

[5] Similarly, the transmission grid physically located in Minnesota affects the electric service provided outside of Minnesota.
[6] http://www.ferc.gov/about/ferc-does.asp
[7] http://www.midwestmarket.org/page/About%20Us

5. The Midwest Reliability Organization (MRO), with members in eight states[8] and two Canadian Provinces, develops and ensures compliance with regional and international electric standards and performs assessments of the grid's ability to meet demands for electricity.
6. The Organization of MISO States (OMS) analyses and makes recommendations to MISO and to FERC regarding matters that affect regional transmission issues.
7. The Minnesota Public Utilities Commission requires Minnesota utilities to develop sufficient transmission to serve load and regulates the amounts of costs that Minnesota's investor-owned utilities charge to their retail customers for transmission. While the Minnesota Commission does not regulate the wholesale rates that Minnesota's investor-owned utilities charge to wholesale customers, the Commission does ensure that these utilities allocate transmission costs appropriately at the retail level, considering facts pertaining to retail customers.
8. The Office of Energy Security investigates matters before the Commission and makes recommendations. In addition, OES participates in several efforts by OMS.

## V. DETERMINING HOW MUCH TRANSMISSION IS ENOUGH

### *A. MINNESOTA'S TRANSMISSION SYSTEM*

When Minnesota's current transmission system was built, home computers were unheard of, air conditioners were few, and many current plug-in appliances would have been mentioned only in science fiction. Today's power grid 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.

While Minnesota's transmission system was previously built with more capacity than was immediately needed, Minnesota has been outgrowing its system, and the system has been aging. By the late 1990's, new housing continued to grow larger, households commonly had multiple televisions along with all of the other 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-

[8] Minnesota, Wisconsin, Iowa, North Dakota, Nebraska, nearly all of South Dakota, a small part of eastern Montana, a small part of northwestern Illinois, along with Manitoba and Saskatchewan.

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.

More transmission has been added and more will be needed. Moreover, 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 electronic devices. The lack of available space on the grid also means that there are some locations in the state where power quality may soon become 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.

Determining the amount of transmission infrastructure needed requires balancing the risks of building too much transmission or too little; however, the risks are not symmetrical. If too much transmission capacity is built, the system will be reliable but will cost more than is necessary to provide adequate service. However, if too little capacity is built, the cost of electricity may be cheaper but the costs to Minnesota's economy of power that is not reliable may be far greater than the cost of building transmission. As noted above, these costs may include lost productivity, damage to security systems, damage to computer systems and other effects.

To account for this asymmetry of impacts on cost and reliability, it is important to plan to meet not only the expected demand for power but also the demand for relatively high amounts of power along with growth in the demand for power over at least the number of years that it takes to build new transmission lines, from planning, through engineering analysis, working with landowners and erecting the lines.[9]

Distributed generation also has a role in ensuring reliable power, particularly when such resources are relatively low cost and are located in areas where such resources can address congestion on the transmission system.

The goal is to have a system that is ready to handle the demand for power and allow for growth in the economy. Attached is a schematic that shows how transmission should be built in light of the ongoing business cycles in the economy. The wavy line depicts a business cycle. If the transmission system were planned assuming that demand for power during a recessionary period (when the wave is at a low point) would continue in the future, the transmission system would be unable to accommodate recovery and growth in the economy. Even if the transmission system were planned to meet the demand for power during a reasonably healthy point in the business cycle (at the middle of a wave), the transmission system could not accommodate a boom period in the economy (at the height of the wave). Moreover, if plans for transmission ignore growth in the economy and the demand for power over time (depicted as the upward growth of the waves), then the transmission system may not be adequate in the future.

[9] Utilities have demand-side management tools to reduce demand on the system at peak times.

The Commission recognized these concepts in its May 22, 2009 Order in the certificate of need proceeding for the transmission capacity expansion project for 2020, or CAPX 2020:

> The fact that demand is less than forecast reflects a variety of factors, including both the current recession and abnormally cold weather. In evaluating the demand for facilities that are expected to last decades, however, the Commission must focus not on current levels of demand – reflecting fluctuations in the economy and weather - but rather on long-term trends.[10]

The Minnesota Court of Appeals affirmed the Commission's decision on June 8, 2010.

Thus, even though Minnesota is still in the process of recovering from the recent recession, once the economy recovers it will be necessary to ensure that the transmission system is ready to meet those needs. Prior to the recession, Minnesota's transmission grid was operating close to its limits with small amounts of unused space on the grid available in some locations to accept new power sources. Fortunately, work has begun to build significant transmission lines that the Minnesota Commission approved for use throughout Minnesota in the CAPX 2020 proceeding noted above. These transmission lines and other facilities (substations, etc.) will help ensure that power is delivered reliably and allow new generation facilities of significant size to connect to these areas of the transmission grid in the future.

Minnesota largely avoided serious problems with its transmission system due to having one of the strongest energy conservation programs in the country.[11] Minnesota's Conservation Improvement Program 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. However, these programs cannot put off addition to transmission indefinitely, particularly when more transmission is needed to accommodate new generation, as discussed below.

### *B. FEDERAL ACTIONS IMPACTING MINNESOTA'S TRANSMISSION GRID*

Additions to transmission are needed not only due to factors in Minnesota, but also due to federal and regional governmental actions directly impacting the use of Minnesota's transmission grid (as well as other states' grids). The following lists some of the major actions; however, the list is not complete since the actions are ongoing. 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

[10] Minnesota Public Utilities Commission's May 22, 2009 Order in Docket No. E017, et. al./CN-06-1115, page 11.
[11] 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.

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 plan for transmission facilities sized large enough not only to meet their customers' needs but also an unknown amount of other electricity transactions that may use the planned facilities. This change greatly complicated what was once a fairly straight-forward transmission planning process.

FERC 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. FERC 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 and utilities could voluntarily join.[12] 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. With this 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 can 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, or accommodate, such outages. MISO collaborates with its members and state governments to conduct more centralized planning efforts. These planning efforts are discussed further below.

### *C. STATE ACTIONS IMPACTING MINNESOTA'S TRANSMISSION GRID*

Enactment of Minnesota's Renewable Energy Standard has had a strong impact on how Minnesota's power grid is operated. Prior to the enactment of the Renewable Energy Standard, utilities tended to rely on 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 construct 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.

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

The Renewable Energy Standard requires utilities to purchase power from renewable sources. The largest source of new renewable energy in Minnesota is electricity generated by wind, as shown Chart 1 below. 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 place 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 on wind energy always being available to meet customers' needs. Methods had to be created 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.

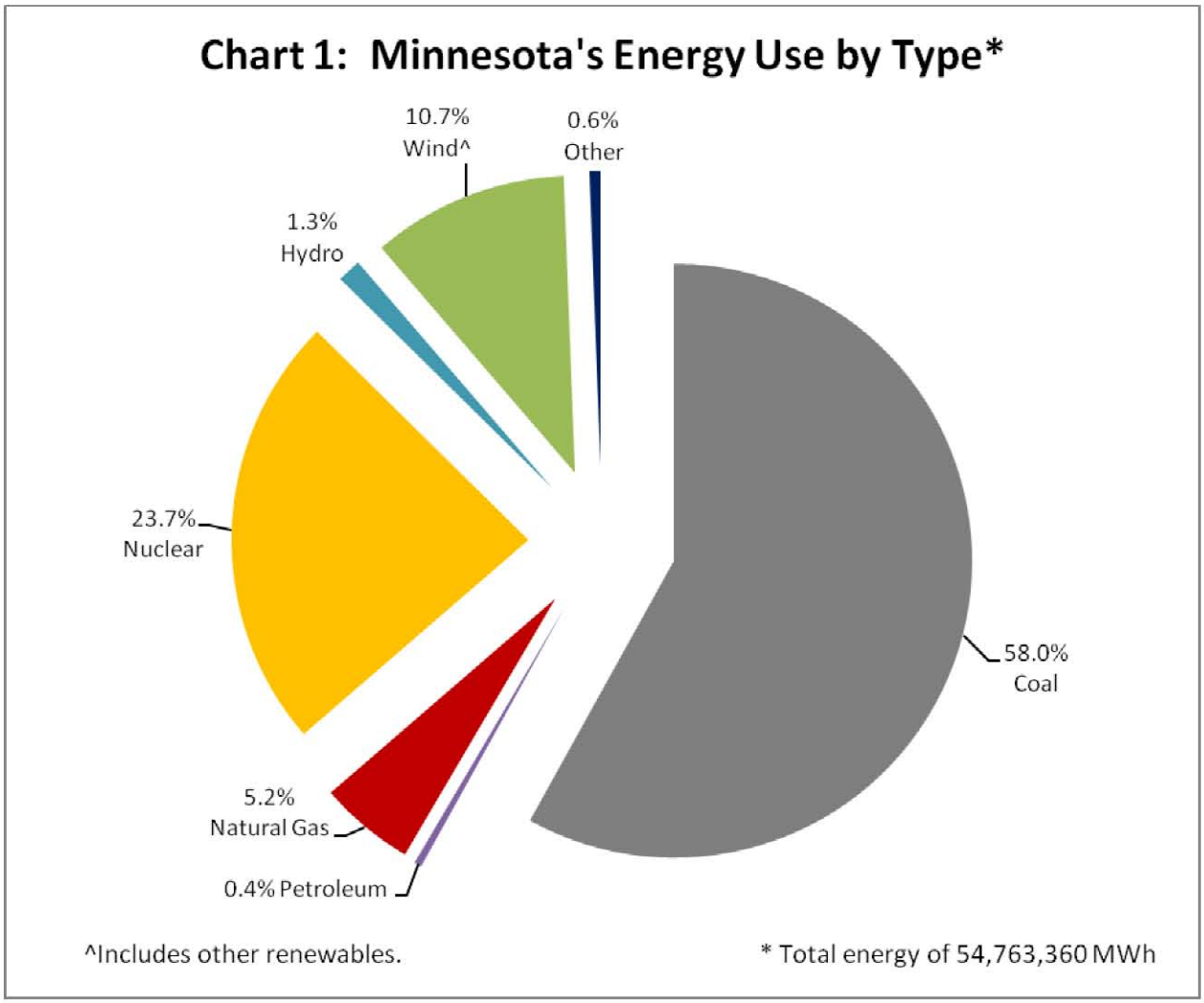


Chart 1: Minnesota's Energy Use by Type*
10.7%
Wind^
0.6%
Other
1.3%
Hydro
23.7%
Nuclear
58.0%
Coal
5.2%
Natural Gas
0.4% Petroleum
^Includes other renewables.
* Total energy of 54,763,360 MWh

Another effect stemming from the Renewable Energy Standard in Minnesota and surrounding states ties in with the effect of the federal government's "opening up" of Minnesota's and the nation's power grid, as discussed above, 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; utilities must also consider third parties' desires for using future transmission regardless of whether the third parties' transactions might benefit the utilities' customers or not. Thus, it is more difficult to determine the appropriate size and placement of transmission lines.

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 "Midwest transmission interconnection 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 for 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.

## VI. MINNESOTA'S TRANSMISSION SYSTEM – PLANNING FOR THE FUTURE

MISO is involved in numerous matters that are critical to the reliable and low-cost operation of the transmission system, including planning for contingencies if large generation plants or transmission components fail, conducting engineering analyses of the effects of changes in generation or transmission components on the system as a whole, planning for the transmission needs in the 13-state region, coordinating with other areas of the Eastern Interconnection System, monitoring the day-to-day (and minute-to-minute) operations of the transmission system, operating the system to call on the lowest cost generation facilities to operate, operating the system to address the effects of congestion on the transmission system, analyzing where the greatest congestion exists and so forth. The OES and Commission Staff participate in various MISO committees.

### *A. DISPERSED RENEWABLE GENERATION STUDIES – PHASES I AND II*

As discussed 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 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.

### *B. RENEWABLE ENERGY STANDARD TRANSMISSION STUDY*

During the 2007 Session, the Legislature ordered the utilities subject to Minnesota's Renewable Energy Standard to collaborate on a 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 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 of renewable power additions.

The most recent Minnesota transmission study was provided in 2009, when 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. The utilities will update these reports in 2011. The three 2009 reports[13] provided information on:

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

(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;[14] 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 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 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.

## VII. MINNESOTA BIENNIAL TRANSMISSION PROJECTS REPORT

Pursuant to Minn. Stat. 216B.2425, the Minnesota transmission-owning utilities together filed their Biennial Transmission Projects Report.[15] This comprehensive report covers specific small transmission "fixes" around Minnesota, as well as larger transmission that:

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

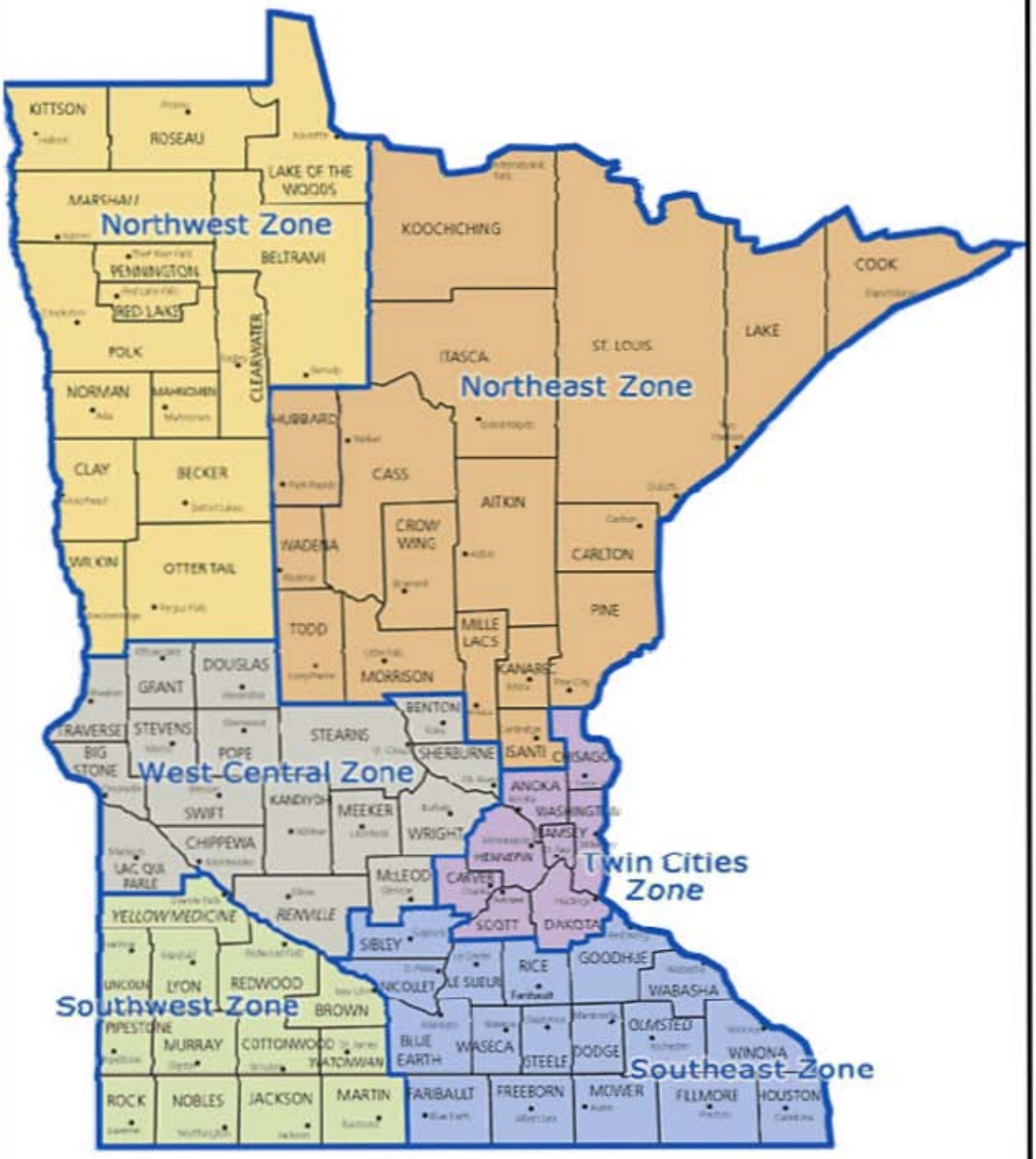
Detailed information (including maps) on all transmission actions is broken down into six geographic zones of the state: Northeast, Northwest, West Central, Twin Cities, Southwest and Southeast. The transmission-owning utilities operating in six geographical zones put that zone's report together. The six zones in the state are shown in the map below.

[14] 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

[15] 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

The transmission owning utilities in each region are:

1. Northwest Zone – Great River Energy, Minnkota Power Cooperative, Missouri River Energy Services, Otter Tail Power company and Xcel Energy
2. Northeast Zone – American Transmission Company, LLC, Great River Energy, Minnesota Power and Xcel Energy
3. West Central Zone – Great River Energy, Hutchinson Utilities Commission, Missouri River Energy Services, Otter Tail Power Company, Willmar Municipal Utilities and Xcel Energy
4. Twin Cities Zone – Great River Energy and Xcel Energy
5. 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. Southeast Zone – Dairyland Power Cooperative, Great River Energy, ITC Midwest LLC, Rochester Public Utilities, Southern Minnesota Municipal Power Agency and Xcel Energy


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

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 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.

## VIII. CHALLENGES TO TRANSMISSION PLANNING –POTENTIAL IMPACTS TO MINNESOTA

### *A. POTENTIAL NEW FEDERAL AND STATE RENEWABLE PORTFOLIO STANDARDS COULD LEAD TO MORE PRESSURE ON MINNESOTA'S TRANSMISSION GRID*

It is highly likely that proposals for new transmission lines will continue to be filed in Minnesota. However, planning for and constructing such facilities may be more complicated than in the past if a federal renewable energy standard is passed. While the interconnected nature of the electric system has already required planning for needs beyond Minnesota's borders, if a federal Standard is enacted, there may be more demand for renewable energy from more states. Because Minnesota sits at the edge of some of the best wind energy resources in the U.S., other states (east of Minnesota) may well look to import more renewable energy into their states from Minnesota or through Minnesota from its western "wind rich" neighboring states. Potential demand for such power is already affecting the planning process for transmission; for example, it may be necessary to build larger power lines than was previously the case. In any case, the fact that it is not yet known if national standards will be enacted adds more uncertainty to the transmission planning efforts currently underway.

### *B. NEW TRANSMISSION PROJECTS RAISE CONCERNS ABOUT LAND USE AND LAND RIGHTS*

In the last few years, a number of energy entities, including natural gas pipeline, electric utilities, and ethanol plants, have sought approval to construct new energy projects 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 noted in this report. 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.

### *C. 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.[16] The challenge went to the U.S. Supreme Court which 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. 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 would 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 federal grants to the States and regional grid operators to engage and collaborate in transmission planning across the U.S.[17]

### *D. ALLOCATING THE COSTS OF NEW TRANSMISSION PROJECTS 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, interconnected 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

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

[17] Further discussion on these efforts is discussed in the section entitled "National Transmission Planning Including and Impacting Minnesota."

every day. Deciding who pays for transmission is one of the largest challenges facing the states, utilities and the grid operator, which in turn affects all those who use electricity. 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 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.

## IX. 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 MISO or with MISO assisting in the technical aspects. This report discusses only the largest efforts presently underway with the strongest potential impacts to Minnesota.

### *A. THE REGIONAL GENERATOR OUTLET STUDIES –PHASES I AND II*

Like MISO's member utilities in Minnesota, member utilities in a number of other states have obligations to procure renewable energy to meet their own states' Renewable Standards. To plan effectively for future transmission needed to assist all of the member utilities with fulfilling their respective state mandates, MISO began a two-phase regional study early in 2009.[18] The first phase looked at the renewable mandate obligations and the available resources to meet those obligations in the utility members' service territories in the western half of MISO's cumulative service territory. This first phase included Minnesota.

The findings from Phase I reported that the approximate amount of energy needed to fulfill the existing renewable standards in the western half of MISO's cumulative service area, approximately 23,000 Megawatts, would 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 provided various general transmission plans (including maps) to meet different estimated scenarios (including potential federal renewable portfolio standards.)

The Phase II study basically was intended to mirror the methods of the Phase I study for the eastern half of the System Operator's cumulative service area. The Phase II study is not complete; 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

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

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.

The scenarios in these studies have generally shown major transmission lines 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.

### *B. THE UPPER MIDWEST TRANSMISSION DEVELOPMENT INITIATIVE*[19]

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 was 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.

MISO provided technical assistance to this effort including performing computer modeling and economic and engineering analyses and 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 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,
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 the first phase of this Initiative was concluded with the issuance of a report in September 2010 outlining a conceptual transmission framework located in the five states that could be used to support the electricity delivery needs in Minnesota and its four surrounding

[19] http://www.misostates.org/UMTDIList.htm

states for decades to come. The Executive Summary is located at: http://www.misostates.org/UMTDISummaryReportExecutiveSummaryFinal.pdf

### *C. COST ALLOCATION AND RESOURCE PLANNING EFFORTS 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 MISO States formed a regulator effort to lead and impact MISO'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 then-President of the Organization of MISO States, began actively meeting and working monthly throughout most of 2009 until the spring of 2010 to identify and collaborate on the myriad underlying assumptions that support MISO'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. This group concluded its work in spring 2010 with a number of recommendations for the Midwest Independent Transmission System Operator to use in its required filing to the Federal Energy Regulatory Commission.

### *D. THE MIDWEST INDEPENDENT SYSTEM OPERATOR'S REGIONAL EXPANSION CRITERIA AND BENEFITS TASK FORCE*

Similar to the two efforts lead by state regulators discussed above, MISO established a stakeholder task force to look into the same or similar transmission planning and transmission cost allocation issues. Although the topics and issues are 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 brought different interests, experiences and agendas to this process.

The task force met and worked monthly through most of 2009 and through the spring of 2010 and provided its own set of recommendations to MISO. As mentioned above, the Federal Energy Regulatory Commission imposed a July 2010 deadline on MISO to file a new all-encompassing cost allocation method along with all tariff "operating rules" and revised business practice rules needed to put into practice, operate and comply with a new cost allocation method. MISO made this filing on July 15, 2010. MISO incorporated aspects of both sets of recommendations from the states and stakeholders and introduced a new cost-allocation category for projects entitle "multi-value projects" to recognize that large transmission projects often have multi-benefits to the grid which would tend to justify a more-widely dispersed allocation of costs among customers on the grid.

This filing and new proposal garnered dozens of comments from stakeholders as well as industry observers around the US. The Federal Energy Regulatory Commission used all of this information in rendering its decision approving the proposal in December 2010.[20] MISO and its stakeholders are now re-focusing their efforts in enacting all of the aspects of this new proposal.

## X. 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.

### *A. 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 of 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 inform the Eastern Interconnection Planning Coalition study described below. Further information on the Joint Coordinated System Plan Study may be found at: http://www.misostates.org/Carp2MoellerJCSPRGOSUpdate.pdf.

[20] http://www.ferc.gov/eventcalendar/Files/20101216110046-E-1-Presentation.pdf

## *B. 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 result 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. The final executive summary of this study was 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/wind/systemsintegration/ewits.html.

## *C. THE EASTERN INTERCONNECTION PLANNING COLLABORATIVE (EIPC) AND THE EASTERN INTERCONNECTION STATES PLANNING COUNCIL (EISPC)*

From the experiences garnered from the Joint Coordinated System Plan Study and the Eastern Interconnection Wind Integration 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 provides for funding to the independent system operators, reliability organizations and stakeholders 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 into the future for the benefit of the entire eastern U.S.

The second part of the funding opportunity allows governmental energy leaders in each of the 40 eastern states and the District of Columbia 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 began. Both groups have, separately and collectively, been working on identifying currently existing generation and transmission facilities, or those slated to become operational within the next four years, to use as a starting point for modeling efforts to identify what would

be needed into the future under various sets of assumptions. One example would look at facilities needed to enact a national renewable portfolio standard. Another example would look at a marked increase in plug-in electric or hybrid vehicles. A number of such scenarios are being formulated for study which is slated to continue through 2011. After this modeling work is completed, transmission studies will be conducted to ascertain the most reasonable and cost-effective transmission options to fulfill the modeled scenarios. That work is slated for fall of 2011 through 2012 and into 2013.

Along with the generation and transmission planning work discussed above, the states' group has been charged by the Department of Energy with conducting a number of studies and whitepapers on topics directly related to generation and transmission planning in states, regions and nationally. The goal of these efforts will be to assist state and federal regulatory processes into the future. The largest of these studies, by far, will be to identify "no/low carbon energy generation zones" in each state in the eastern 40 states and the District of Columbia. This effort, slated to begin with the other studies and whitepapers during the spring of 2011, will require participation by numerous state and federal agencies and stakeholders in each states to identify areas that would support large-scale no/low carbon electric generation as well as densely-populated or protected areas where such generation could not be built even if identified as a resource area. In Minnesota, one such resource area would be the high-capacity wind areas in the southwest part of the state. These studies will likely continue through 2011 well into 2012. .

## XI. FEDERAL LAW AND POLICY DEVELOPMENTS EXPECTED TO IMPACT STATE, REGIONAL AND NATIONAL GENERATION AND TRANSMISSION PLANNING AND MINNESOTA

There are several federal policies currently in development that could potentially impact generation and transmission planning and Minnesota but two efforts stand out:

- The Notice of Proposed Rulemaking regarding Transmission Planning and Cost Allocation by the Federal Energy Regulatory Commission[21]
- The group of four Environmental Rulemaking processes regarding Power Plant Emissions currently underway by the Environmental Protection Agency[22]

During the spring and summer of 2010, the Federal Energy Regulatory Commission issued a notice seeking stakeholder comments on a broad-reaching proposed rulemaking regarding specific transmission planning and cost allocation processes. Some industry experts assert that these proposed rules go further than ever before into the "grey area" where state and federal jurisdiction overlap in law or practice.

The rules push for transmission planning and cost allocation between and across electricity planning and reliability regions (which would encompass large groups of states) as well as take steps meant to facilitate more open and competitive electricity markets. For the most part, Minnesota would not be directly or materially impacted by these rules with the exception of one

[21] http://www.ferc.gov/whats-new/comm-meet/2010/061710/E-9.pdf
[22] http://www.epa.gov/climatechange/anpr.html

specific proposal that would remove a Minnesota utilities' ability to control transmission construction in its own service territory. Instead, competing independent transmission companies could build transmission facilities in and across the incumbent utilities service territories without clear regard to the utilities' operations or their customers' needs. Minnesota explained its concerns in comments filed with the Federal Energy Regulatory Commission in September 2010.

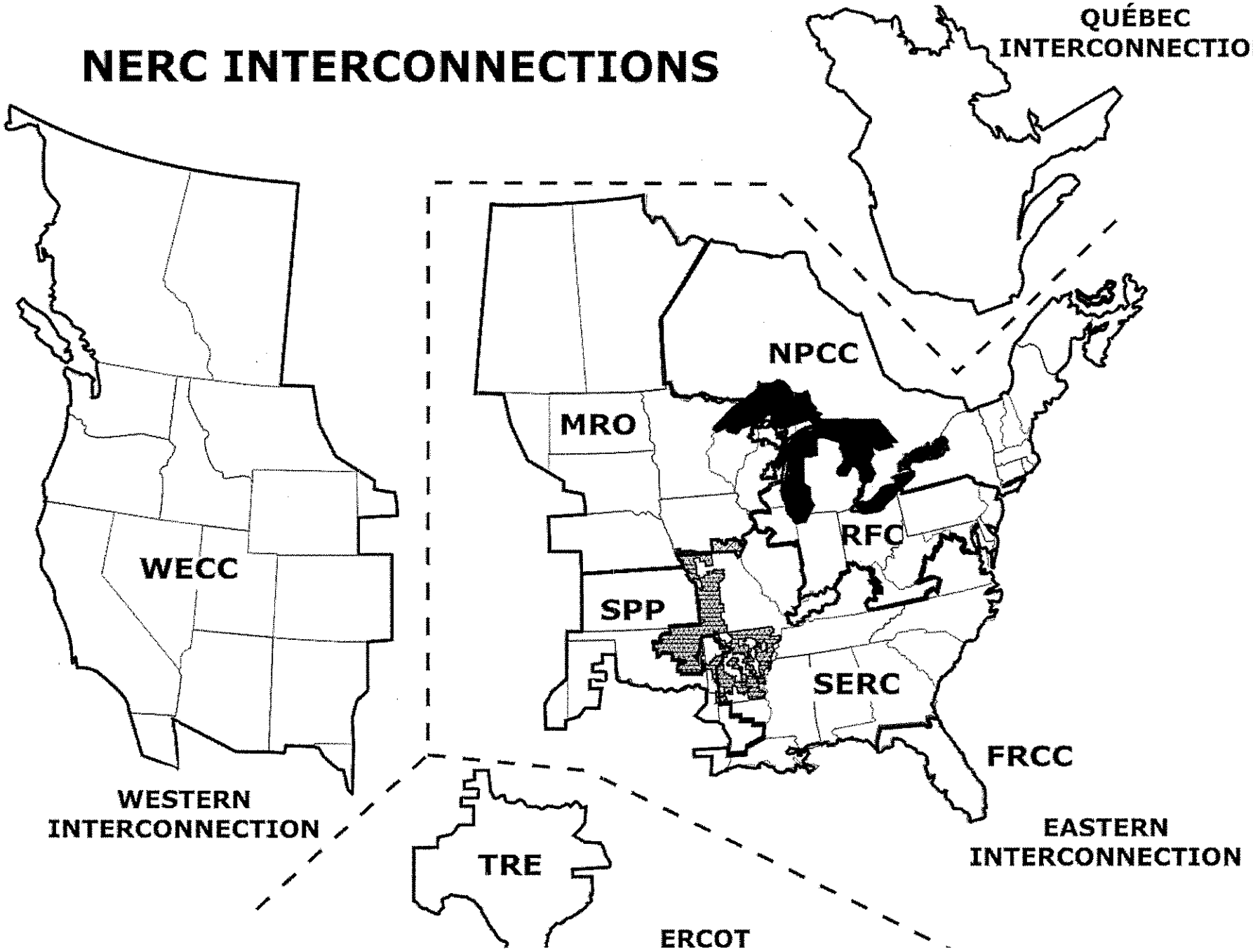
Also, during 2010 the Environmental Protection Agency received a ruling from the Federal Supreme Court instructing it to begin asserting its jurisdiction in controlling emissions produced by US coal-fired power plants. In some cases, the Supreme Court placed deadlines on the Environmental Protection Agency to pass rules to begin enacting such regulation. There are currently four separate-but-related rulemakings in process that directly or indirectly impact almost all of the thousands of these coal-fired "back bone" electricity generating facilities in the US today. Many of the oldest plants, using the least amount of emission-control equipment, will likely need to be shut down because the economics of retrofitting such old plants (some are around one hundred years old) would not be justified. Other plants will need to expend millions to be retrofit (or re-retrofitted) with state-of-the-art emissions control technology. All of which will mean the nation's air quality should improve but energy costs will be higher for customers. These rules are slated to become operational in the next 3-4 years.

## XII. SUMMARY AND CONCLUSIONS

In summary:

- Electricity has become increasingly important in Minnesota homes and businesses.
- Minnesotans and the economy depend on reliable 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 build transmission is affected by state and federal policies, rules and laws facilitating the construction of certain types of generation and transmission and restricting other types of electricity and transmission in the state, region and across the United States.
- Minnesota has been and will be involved in numerous regional and national efforts to ensure that electricity transmission is planned in a reasonable and cost-effective manner for the State's economic future and the needs of its businesses and citizens.

# NERC INTERCONNECTIONS




ATTACHMENT 1

**ATTACHMENT 2**