

Michigan Planning Consortium 765 kV Work Group

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Overview

- Michigan is an electrical island compared to other Midwestern states. It is important to the welfare of the state, its citizens and businesses that Michigan not become electrically isolated from the “mainland.”
- Results from the Michigan Public Service Commission (MPSC)’s Capacity Needs Forum and 21st Century Energy Plan study make it apparent that Michigan’s future power needs will soon outstrip its current power supply and transmission infrastructure.
- Transmission is a critical component to the future energy puzzle. A robust 765-kilovolt (kV) transmission grid will not only improve reliability and transmission capacity in its own right, it will magnify the benefits of all other solutions – including new generation – by better integrating them into a regional network of resources.
- Expansion of the existing 765-kV grid will enhance reliability, improve system efficiency and facilitate robust generation markets.
- 765-kV technology is a superior alternative to other transmission technologies for developing an EHV backbone for the long term needs of the grid.

Proposed 765 kV Project



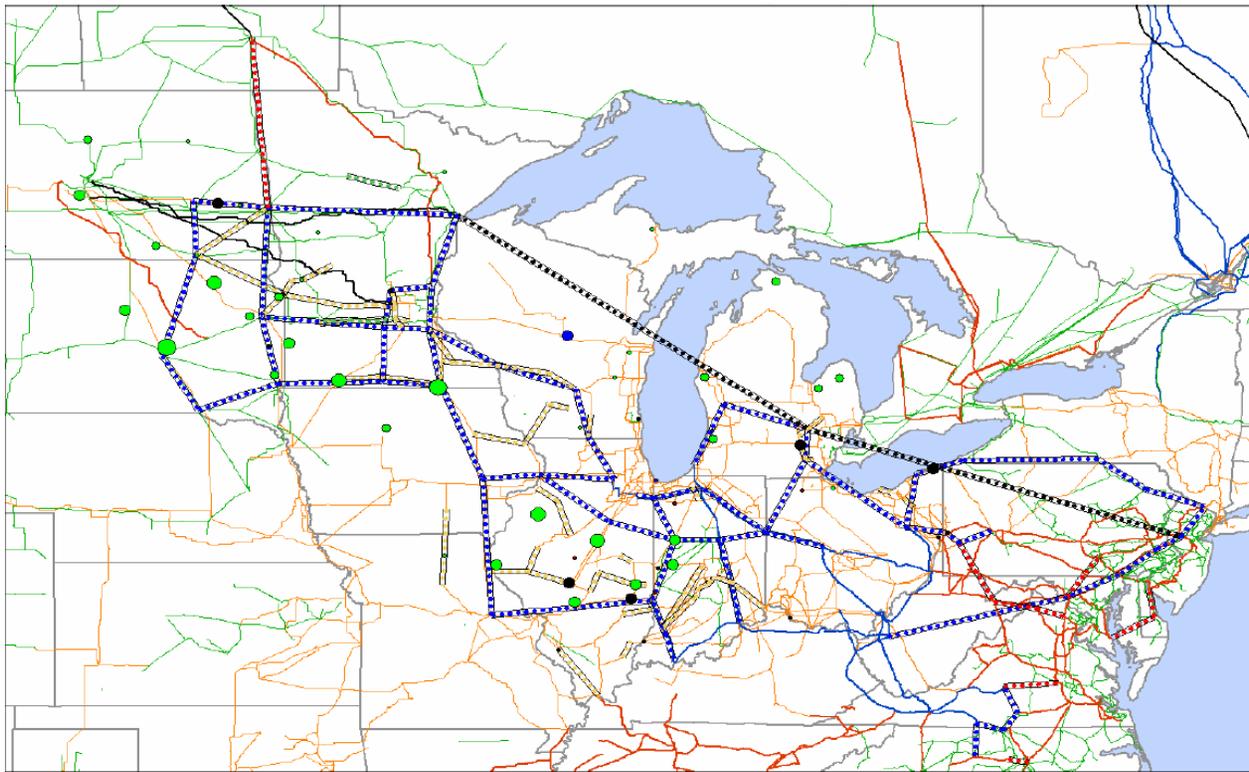
Regional Vision

- 765 kV transmission is being developed as an EHV overlay across much of the central US.
 - Michigan needs to develop plans for a 765 kV grid within the context of a Regional plan, to ensure that potential benefits are captured early in the lifecycle of backbone transmission development
 - An AC 765 kV system can be tapped at strategic locations, providing “off-ramps” to enhance local reliability as well as “on-ramps” to accommodate new generation.
 - This provides significant improvements in regional transfer capability by moving power up onto the transmission superhighway and down onto the lower voltage local transmission.
 - A robust transmission backbone will facilitate development of renewable generation resources in parts of the US without a significant amount of existing renewable capacity

Flexibility and Option Value

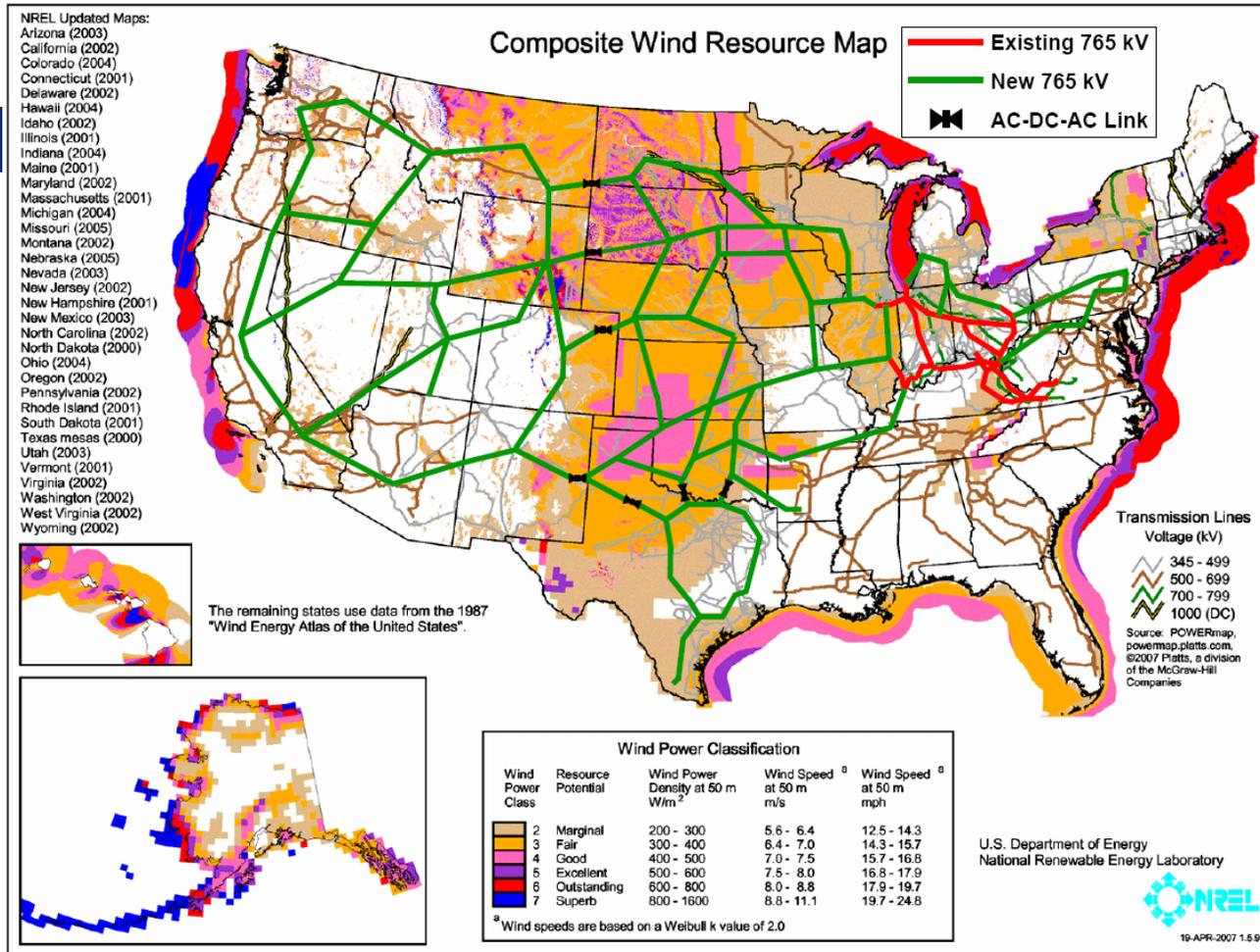
- The 765 kV project addresses future needs for transmission upgrades, providing a platform for further reinforcement of transmission networks, in the most cost-effective and efficient manner, with the least environmental impact
- This 765-kV expansion project has the ability to provide comprehensive transmission reinforcement necessary for Michigan over the next 20 to 30 years.
 - This plan would leverage the existing strong backbone transmission system and effectively utilize the existing ITC transmission system to provide reliable and low-cost electricity to Michigan.
 - This plan creates flexibility, allowing new transmission expansion proposals to further leverage the network backbone
- The 765 kV project provides options for electric power needs
 - Unloads existing transmission networks, allowing greater flexibility in the siting of new industrial loads and generation resources
 - Facilitates “Coal by Wire” – new coal plants built near coal mines to avoid the expense and waste of transporting coal by rail
 - Facilitates interconnection of vast amount of renewable resources across the region, and within Michigan

Midwest ISO EHV Overlay



Midwest ISO, GA/TD Summit Presentation, "Transmission Planning: Path Forward," November 2007
(http://www.midwestmarket.org/publish/Document/66d196_115dc8fa4a2_-7e230a48324a?rev=1)

Conceptual National EHV Overlay



American Electric Power, "Interstate Transmission Vision for Wind Integration"
 (<http://www.aep.com/about/i765project/docs/WindTransmissionVisionWhitePaper.pdf>)

Self-Healing Transmission Design

- A robust backbone transmission system is the key to security and reliability because a strongly integrated electrical grid is self-healing in nature.
 - Following a generator contingency outage, a strong 765-kV infrastructure enables other widely dispersed generators to instantly be called upon to meet demand, without human interaction.
 - Following a transmission line contingency outage, the power flowing on that line is immediately and automatically redistributed to other parallel transmission lines, also without human interaction.
 - In both examples, sufficient transmission capacity must exist to accommodate the resultant power flows.
- Because of its superior capacity, a 765-kV platform provides the greatest self-healing potential.
 - The existing Michigan transmission system is not adequate for large interstate or interregional power transfers.

Reliability

- Generation alone will not provide Michigan with many of the long term benefits that can be achieved with the addition of 765-kV transmission.
- The existing system does not have the reliability margins necessary to protect against events such as the Northeast blackout of August 14, 2003
 - Engineering analysis suggests that the geographic scope of the blackout would have been far less reaching had the 765-kV grid been extended into Michigan.
- The proposed 765 kV project would greatly increase Michigan's import capability.
 - It is expected that new 765-kV lines into and through Michigan would increase Michigan's import capability by approximately 4,000 MW.
 - Increased import capability would allow Michigan's customers to benefit from resources beyond the state's borders, especially during times of emergency power needs and system disturbances
 - Increasing the import capability minimizes the effects of Michigan being an electrical island.

Efficiency

- Expansion of 765 kV into Michigan makes more efficient use of existing generation resources and transmission lines throughout the Midwest
 - A 765 kV backbone in Michigan would reduce transmission system losses by over 300 MW by shifting power flows from away from higher impedance lower voltage lines
 - Fewer line losses result in lower generation levels, thus potentially resulting in lower emissions from fossil fuel generation resources – the ultimate green energy
- Diverse types of generation have developed in various regions of the country, resulting in significant regional differences in economics and fuel usage.
 - Wholesale energy purchases can enhance any state's electricity market by enabling more economical purchases from other regions.
 - An interstate transmission grid will facilitate such trade.
 - Regional Transmission Organization (RTO) scheduling procedures will always seek the lowest priced generation available and accessible via the transmission grid.
 - Accessibility of external generation resources is contingent upon the development of a robust regional grid

Midwest ISO Targeted Study Process

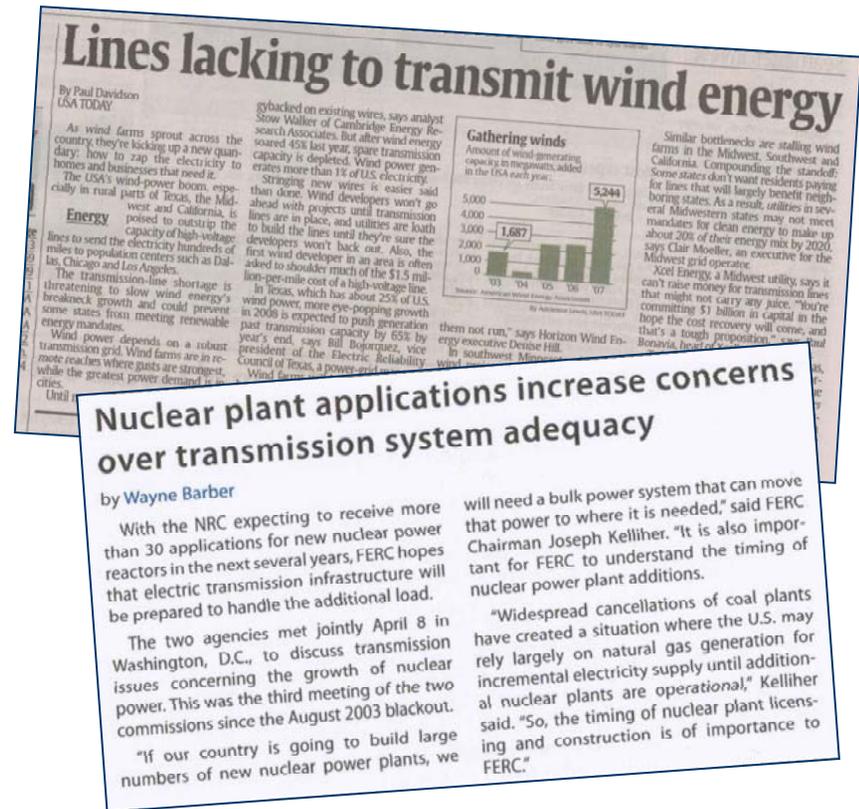
- ITC and AEP completed their feasibility study for the project in July 2007
- Midwest ISO performed a study in Spring 2008 to investigate a portion of the benefits of the project proposed by ITC and AEP
- Midwest ISO studied the project using its Regional Expansion Criteria and Benefits (RECB) methodology
 - RECB determines if the project would qualify for the current regional cost allocation within Midwest ISO
- The RECB process evaluates some of the economic benefits of the proposed facilities under different future scenarios
- The purpose of the study was not to approve or reject the project
 - Merely presented a first look at whether or not the project might qualify for the current regional cost recovery within Midwest ISO
 - Note: No proposed project has ever passed the MISO RECB II criteria

Study Assumptions for Future Generation

- The future generation portfolio used for the MTEP08 Futures studies was used as the starting point for all study models
- The study then evaluated the following scenarios:
 - Reference Future
 - Add 1500MW of wind generation in Michigan - in service before 2011
 - Add Fermi Nuclear Unit and Karn Coal Unit - in service by 2016
 - Renewable Future
 - Add 3000MW future expansion wind units, in addition to the 1500 MW of Michigan wind in the reference case, for a total of 4500MW wind resources
 - Add Fermi Nuclear Unit and Karn Coal Unit - in service by 2016
 - Environmental Future
 - Generation resource additional identical to reference case
 - Redispatches generation resources out of traditional economic merit in order to simulate the influence of carbon credits on dispatch order

Shortcomings of RECB II

- Methodology does not facilitate public policy initiatives which have evolved and have identified need for regional transmission
 - Renewable Portfolio Standards and other similar energy resource mandates will be difficult to achieve without investment in regional backbone transmission projects which will allow renewable resources to efficiently interconnect to the system
 - While not technically considered a reliability project, the project will increase reliability
 - The project will reduce the region's carbon footprint through more efficient utilization of existing generation resources, and potentially deferring the construction of new fossil fuel plants
- Regardless of the generation source or energy policy that states are pursuing, transmission plays a critical role in allowing it to happen



Project Benefits

- The 765 kV Project provides substantial benefits to the region
 - Midwest ISO economic benefits are highest under both the “Renewable Future” and “Environmental Future” portfolios of generation development
 - Investment in an energy superhighway, which carries the nation’s energy flows and is able to accommodate system growth for both load and generation well into the future
 - Reduction in overall transmission congestion, leading to a more robust and efficient wholesale energy market
 - Reduction in line losses, which means less burning of fuel and reduced air emissions – the ultimate green power
 - Carries power greater distances and facilitates renewable resources market
 - Provides greatest capacity increases with least land consumption
 - One 765 kV facility can carry as much power as six 345 kV lines
 - Reduced right-of-way need lowers cost as well as impacts to consumers and to environment

Project Benefits

- The 765 kV Project provides substantial benefits to Michigan
 - ITC Transmission and METC load zones can realize deferred installed capacity requirements to maintain a less than 1 day in 10 years loss of load expectation (LOLE)
 - Deferred capacity was shown to be close to 600 MW by 2021
 - Improved import and export capability at all load levels
- The study compared Michigan-specific benefits to the regional benefits of the proposed project, but did not quantify the specific benefits to other individual states in the region, so similar conclusions can not be drawn from the study

Next Steps

- Develop additional metrics and study parameters with which to study large inter-regional transmission projects that capture additional project benefits
 - Reliability benefits
 - Import capability
 - Deferred generation capacity
 - Loss reduction
 - Constraints relief
 - Advancement of public policy initiatives, such as renewable resource development
 - Focus on longer planning horizon
- Utilize other deliverables from the Michigan Planning Consortium to further refine this project's development