Missouri Department of Natural Resources Comments on National Electric Transmission Congestion Study 2009

1. Page 34
   Working with the MISO, the Midwest Governors have supported the *Regional Generation Outlet Study* and wind development scenarios in the *2008 Midwest Transmission Expansion Plan*. MISO recently worked with the Southwest Power Pool (SPP), Tennessee Valley Authority (TVA), and PJM to conduct the *2008-09 Joint Coordinated System Plan* to explore the transmission requirements associated with 5 percent and 20 percent wind development scenarios for the Eastern Interconnection.

2. Page 37, Figure 3-4. Domestic Wind Resources Map
   The study confirms that Missouri has poor wind potential at the 50 meter height statewide. Commercial wind development is normally 100 meters or taller. Missouri's highest commercial contiguous wind areas are located in the northwest corner of the state. There are regions of commercial wind development opportunities along the Missouri-Kansas border extending to the Arkansas border. However, with the exception of Barton County, those areas are interspersed with poor wind areas and may not be as economically feasible as northwest Missouri.

3. Page 38, Figure 3-5. Wind Power Development in US
   The Department suggests the use of finer gradations to better illustrate areas of wind power development potential. This would likely show that wind potential would be higher in southwest and northwest Missouri as compared to the rest of the state.

4. Page 40, Figure 3-7, National Solar Radiation Map
   Missouri's solar radiation is in the range of 4-5.5 $KWh/m^2/day$, which is fair. The Department again suggests that the use of finer gradation in the solar radiation map would provide more useful information.

5. Page 42
   The Department suggests that an analysis of the potential for biomass energy development across the US would be useful. While biomass-based energy generation may not currently substantially contribute to production or congestion, future developments may increase the likelihood for increased biomass energy production. The production locations are likely to be concentrated in certain regions as there will be economic incentives to minimize transportation costs. Missouri should fare well in biomass production considering the agricultural and forestry activities in the state.

6. Page 42, Figure 3-9, US Geothermal Resource map

Missouri has a geothermal potential in the range of 100-150˚ C, i.e. 212-302˚ F, which is fair. The Department suggests that the geothermal resource map include ˚F in addition to ˚C for easier interpretation.

7. Page 43, Figure 3-10, Type I and Type II Conditional Constraint Areas
A small portion of northwest Missouri appears to be an area with Type I conditional constraints. DOE identifies this as an area where large quantities of renewable resources could be developed economically using existing technology with known cost and performance characteristics if transmission were available. This has, in fact, been the largest region of commercial wind development in the state. The lack of transmission capability does contribute to the higher costs of wind energy development in southwest Missouri. The Department suggests that southwest Missouri is an area with Type I conditional constraints as far as solar and wind power potential.

8. Page 53
    i. MISO and SPP manage transmission congestion over the short term using Transmission Loading Relief (TLR) curtailments. This may change over time with greater market experience. The study states that MISO and SPP use transmission reservations (including non-firm reservations) using Available Flowgate Capacity (AFC), i.e., combination of electrically-related transmission elements along a defined path, which are either confirmed or refused.
    ii. There are no transmission schedules in MISO or SPP, which are otherwise existent in New York and New England region.
    iii. There are no actual flows in MISO or SPP, nor are they existent in any other region in US.
    iv. Transmission loading relief actions are existent in MISO and SPP and all other regions in US.
    v. While there are locational marginal prices existent in MISO and SPP, they are otherwise non-existent in other regions of the US.
    vi. While MISO has shadow price data for binding constraints, SPP has no constraints in locational marginal prices, but shadow price data is available.

9. Page 55
The highest number of curtailments and the highest number of hours of curtailment occurred in SPP due to weather-related outages in 2007. In spite of the curtailments in SPP, more curtailment occurred in the MISO region (non-firm curtailments).

Reliability Coordinator	Number of TLR Curtailments (Level 3 and Above TLRs)	Number of Hours in TLR (for Level 3 and Above)	Non-Firm MWh Curtailed (TLR Level 3)	Firm MWh Curtailed (TLR Level 5 and Above)
Southwest Power Pool	14,817	14,895	42,1401	1,355
Midwest ISO	7,494	12,552	103,4746	25,474

Based on the number of congestion paths with high magnitude and frequency of non-zero shadow prices, MISO experienced more congestion than the New York or

New England region in 2007. In 2007, MISO experienced the greatest economic congestion and the general pattern of congestion increases from west to east.

10. Page 79
According to the Missouri PSC, the standard deviation of monthly average electricity prices between MISO and SPP was $3/MWh in 2007, implying there is little congestion hampering the flow between the two markets and reflects similar generation mixes.

11. Page 85
The study states Callaway Nuclear Plant 2 as proposed, but it has been cancelled.

Summary

1. Overall, the study does not identify any significant congestion in the Missouri region either in MISO or SPP territories.
2. There is need for a streamlined data collection effort/process across the US, so that there is reliable, consistent data available on prices, loads, etc.
3. Curtailments are high in MISO and SPP with non-firm curtailments peaking in the Midwest.
4. Transmission schedules need to be established in the Midwest.
5. No actual flows exist in the Midwest.
6. Locational marginal price data is not available in some areas; there needs to be a sustained effort to collect, streamline and benchmark this data.
7. Biomass and Geothermal energy generation potential may be understated and under-utilized in Missouri.