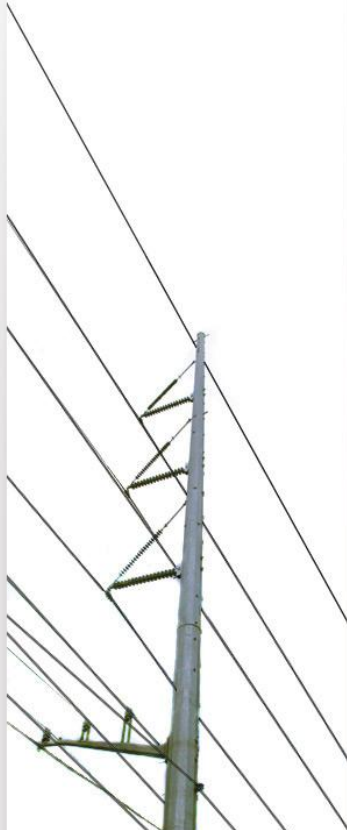




**Helping our members work together  
to keep the lights on...  
today & in the future**





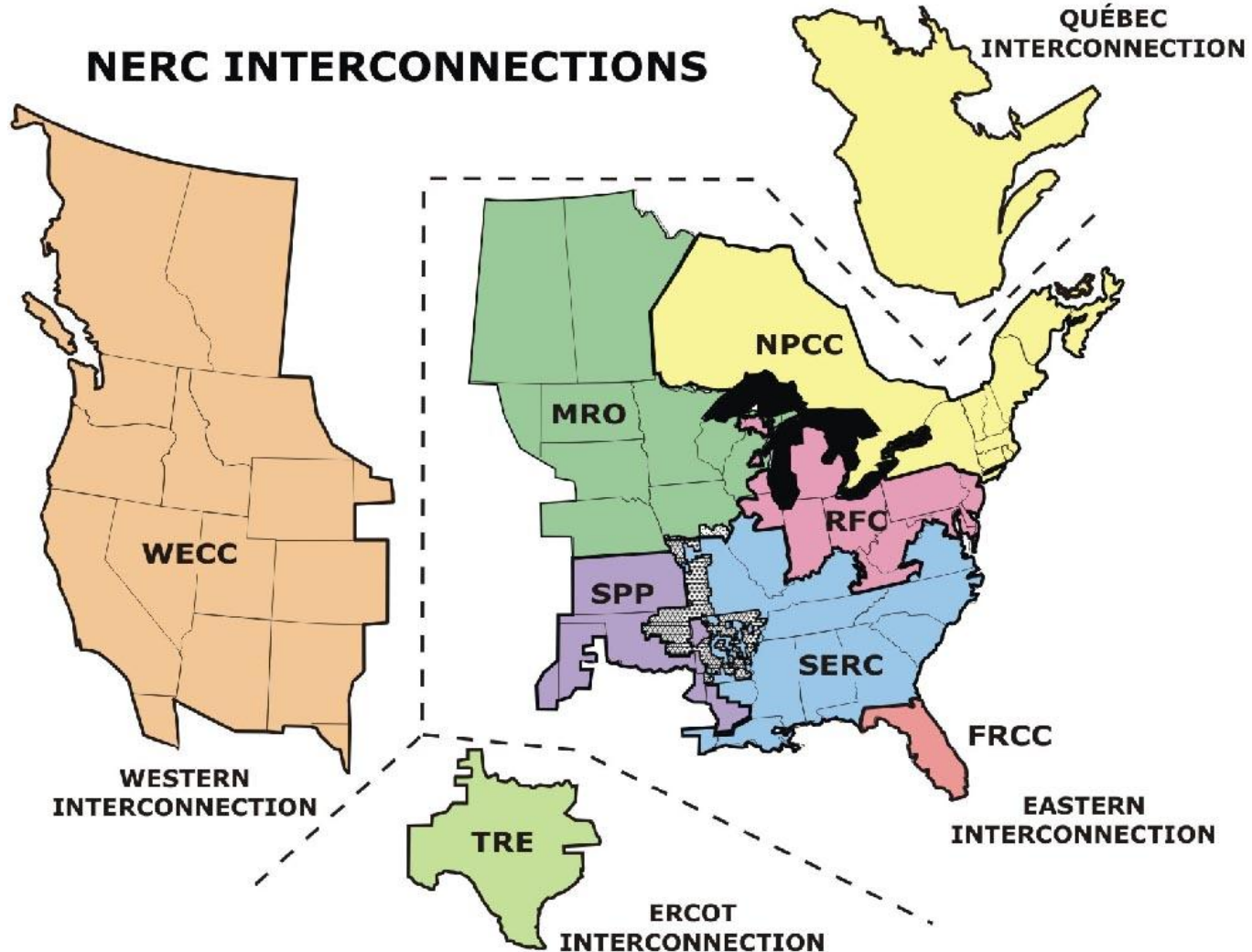
# **ISO Session and Panel Discussion**

**PJM/EPRI 2010 Energy Storage Summit**

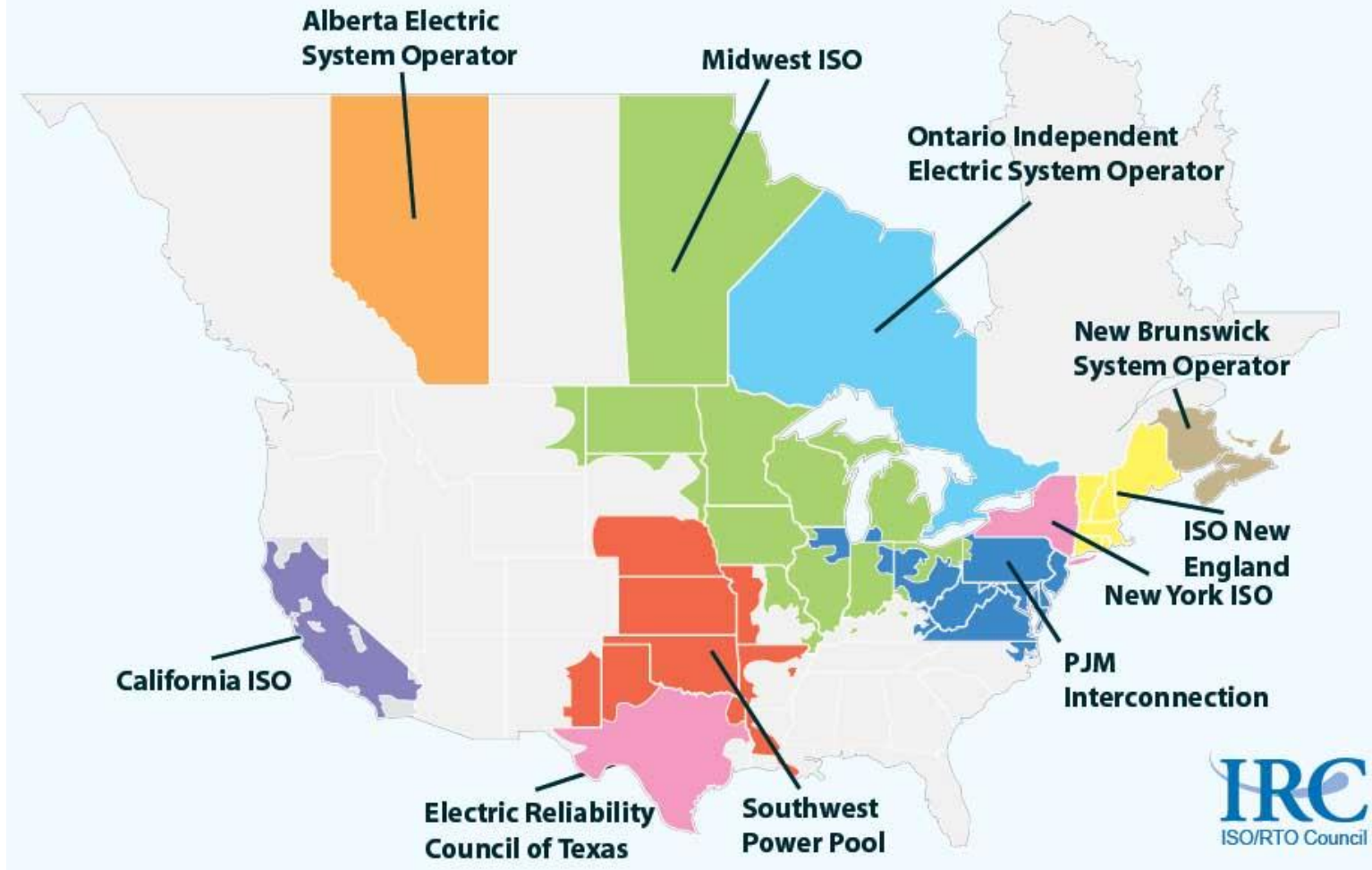
**Valley Forge, PA**

**April 20, 2010**

# 3 Interconnections / 8 NERC Regions

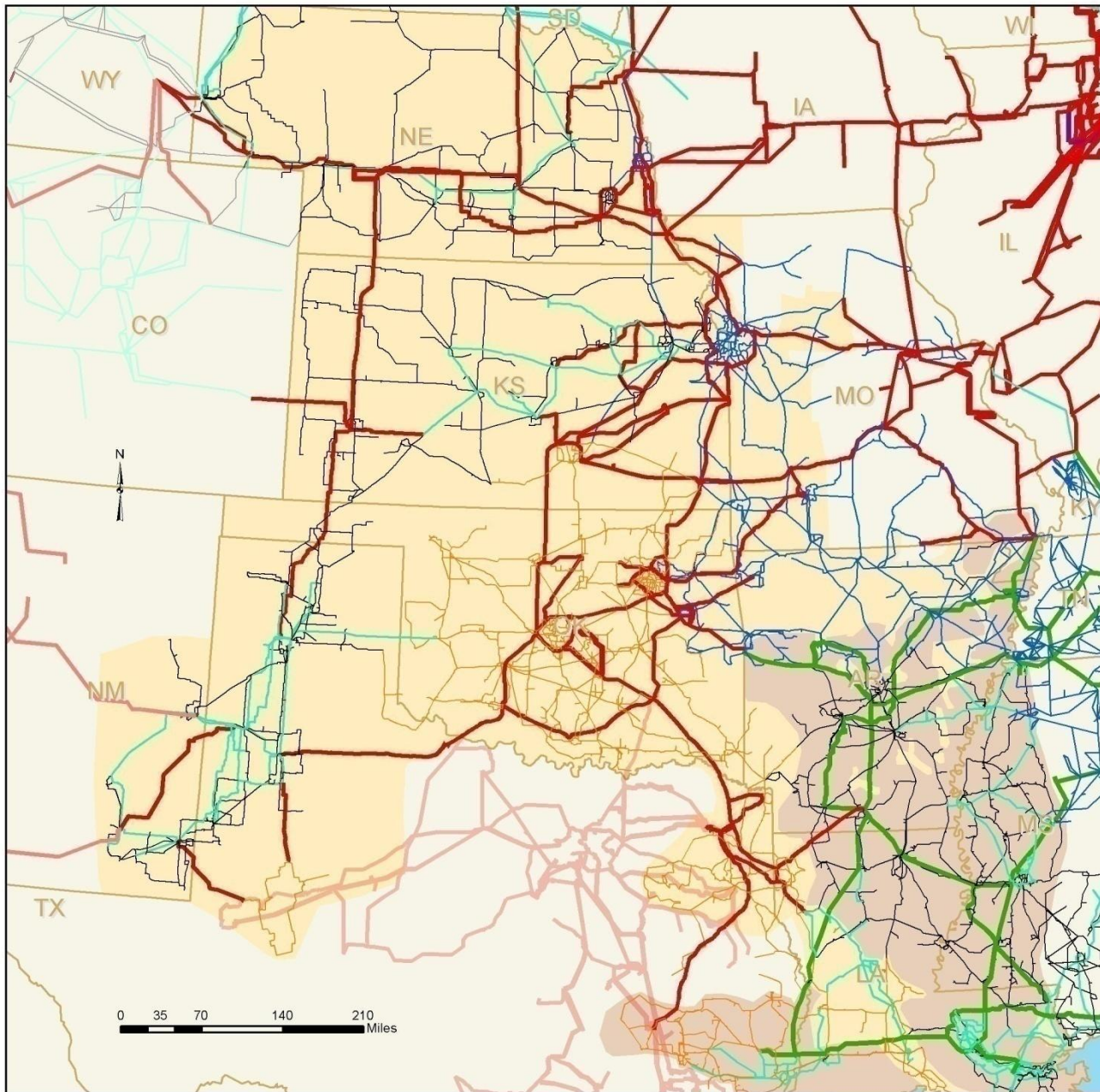


# Independent System Operator (ISO) / Regional Transmission Organization (RTO) Map







# **SPP Wind Developments**

- **4 GW in-service/under construction**
- **Stakeholders expect 11 GW of wind**
- **SPS Wind Penetration Study in 2008**
- **WITF Study in 2009 with action items in process, e.g., wind forecasting RFP. Support research and development, e.g., AMEC Net Available Power Forecasting**

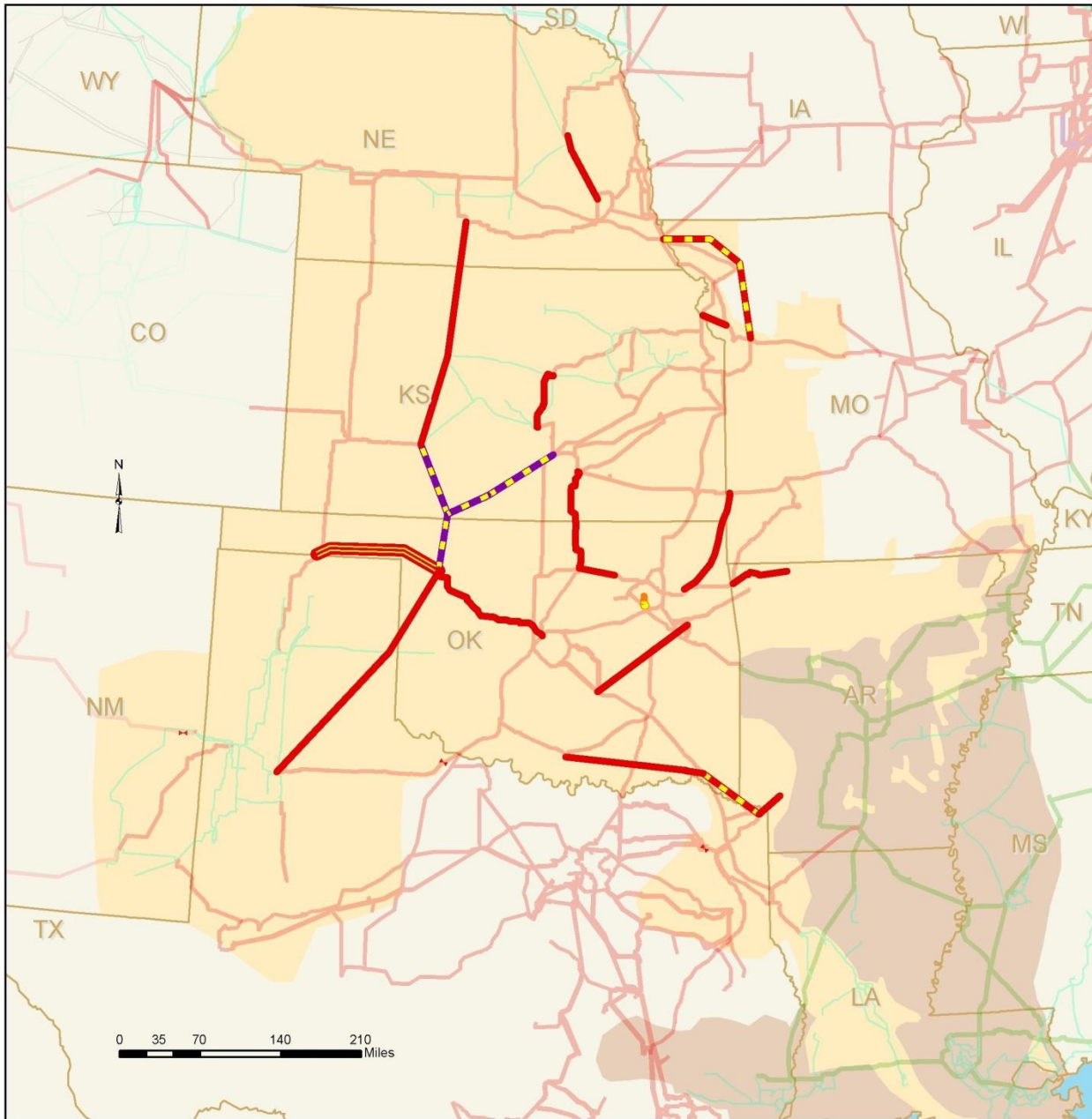


**SPP** Southwest Power Pool










**Current SPP Transmission System (2009)**

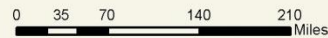
-  115 kV
-  138 kV
-  161 kV
-  230 kV
-  345 kV
-  500 kV
-  Southwest Power Pool
-  Entergy ICT





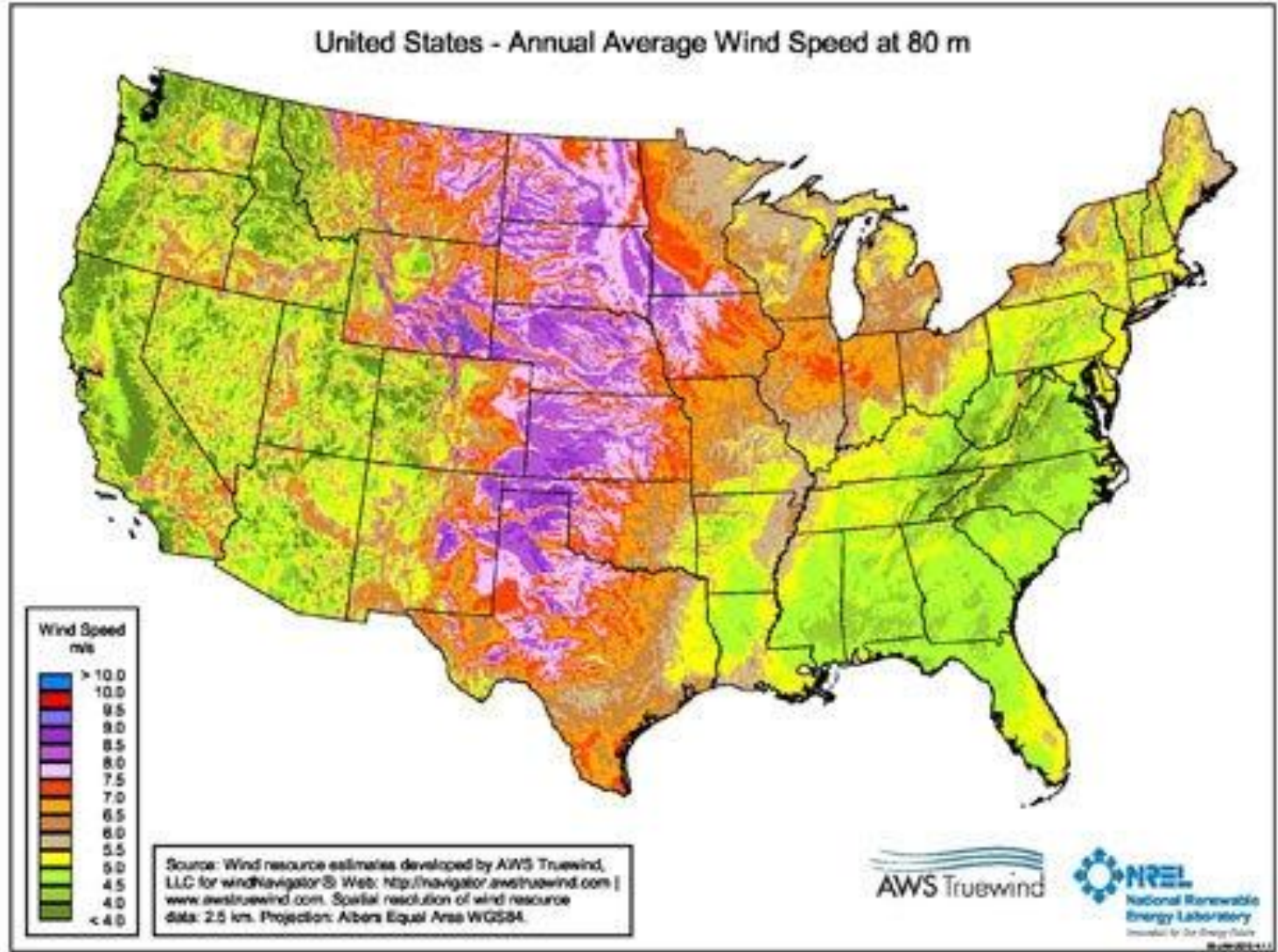
### Transmission Expansion (345kV +)

-  Single Circuit PP
-  Double Circuit PP
-  Committed to be Built (345kV+)
-  230 kV
-  345 kV
-  500 kV
-  765 kV
-  Southwest Power Pool
-  Entergy ICT



# Renewables are **BIG** in **SPP**

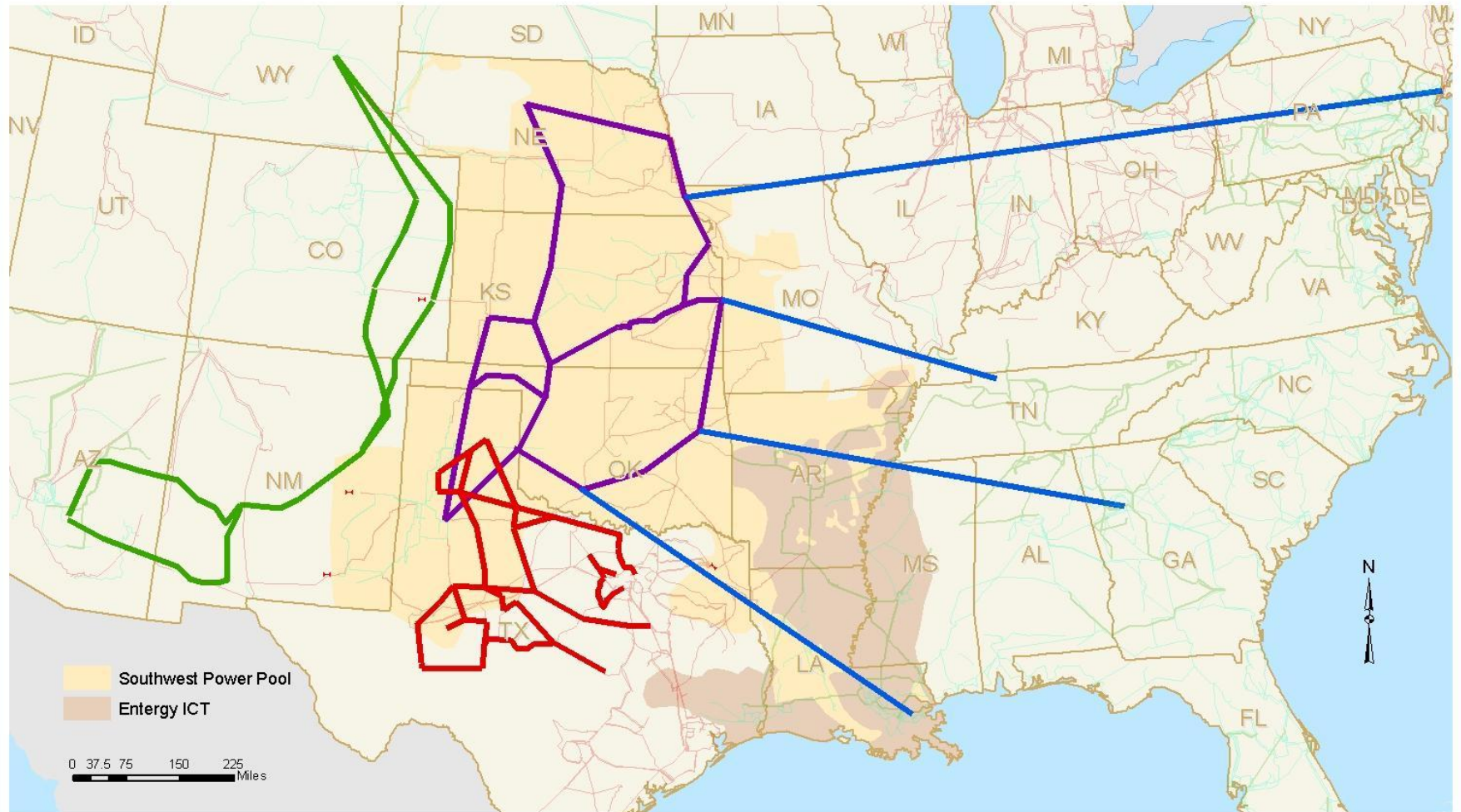
- Latest NREL data shows SPP states are Top 3, TX #1, KS #2 and NE #3, regarding potential wind development
- In 2009, GI queue included more wind than SPP peak load of roughly 50 GW
  - Current queue 30 GW+ with significantly more expected due to NM RETA, LR1048 in Nebraska, etc.
  - Eastern Wind Integration and Transmission Study (EWITS) projects 60-95 GW of wind development in SPP
    - Economic benefits with \$150B of transmission expansion despite significant curtailments of wind and 5 GW+ of additional reserve requirements in SPP
- **Solar is hardly on our radar screen yet**

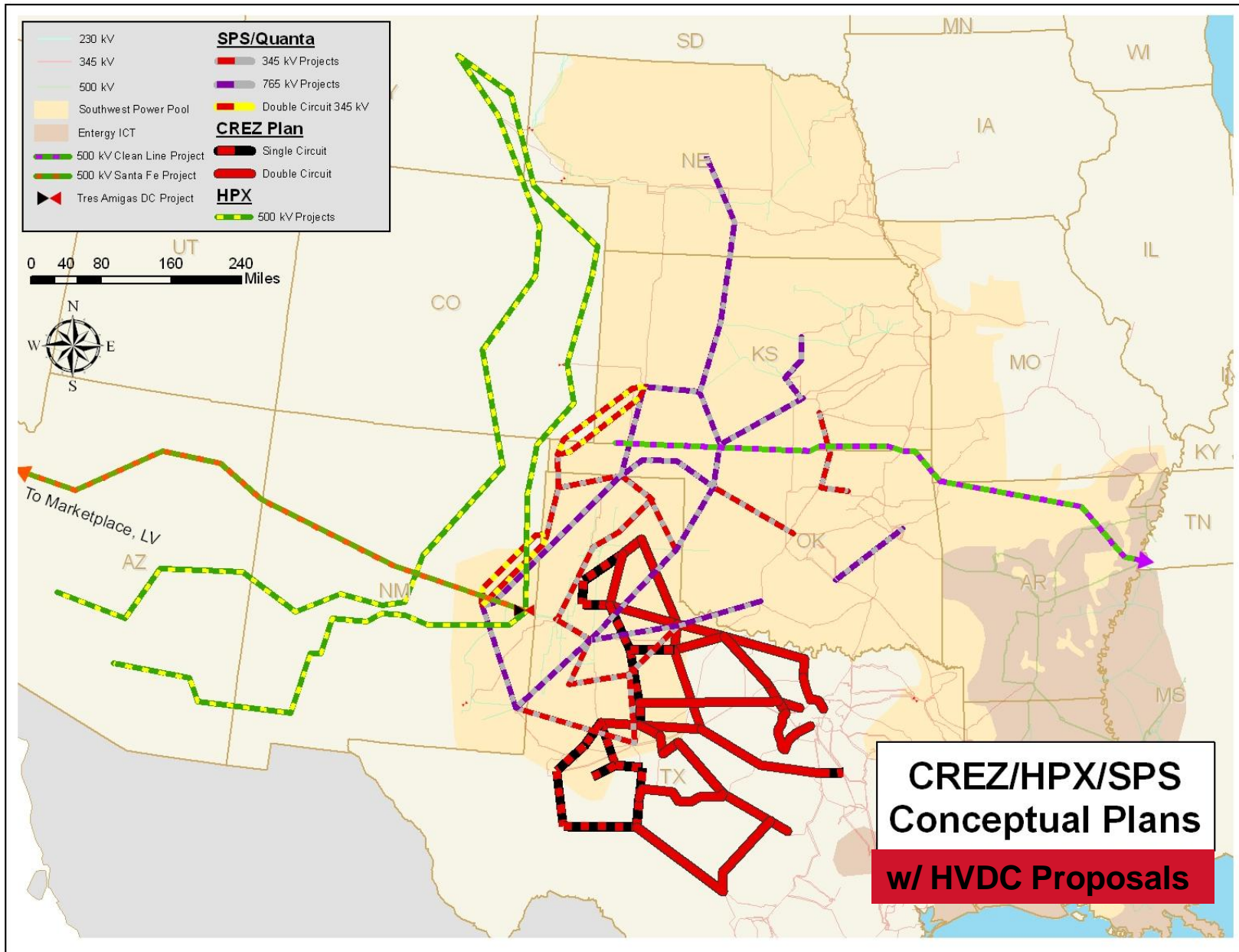




## **MAJOR TRANSMISSION EXPANSION IN AND AROUND SPP**

- JCSP
- SPP Draft Expansion (765 kV)
- CREZ Expansion (345 kV)
- HPX Expansion (500 kV)
- 230 kV
- 345 kV
- 500 kV





# **Value of Bulk Storage In and Around SPP**

- **Significant interest by developers & legislatures in KS due to favorable geologic formations**
- **Pumped storage projects along Missouri River have potential to facilitate wind development in upper plains of SPP and MISO/MAPP and improve joint EHV transmission projects**
- **Value to operations and markets depend on magnitude and timing of intermittent resource development, ancillary services and effective seams agreements**
- **Coordination and collaboration will be key**



**SPP** *Southwest  
Power Pool*



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