



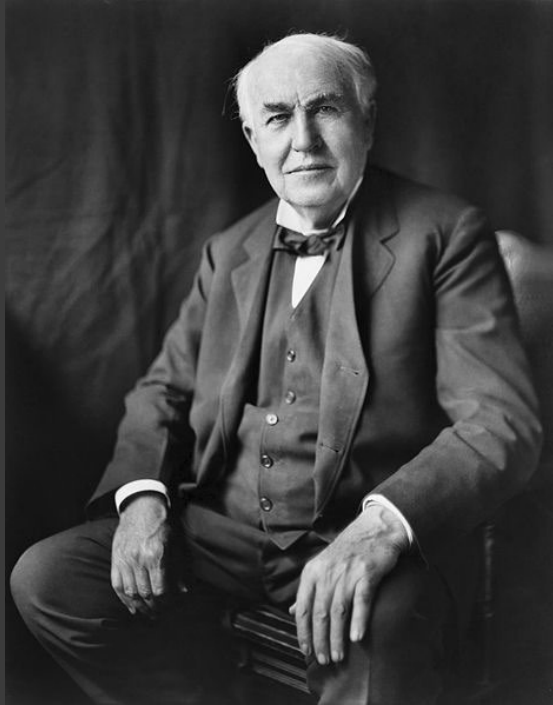
Transmission

Transporting Energy by Wire

Matthew Stoltz

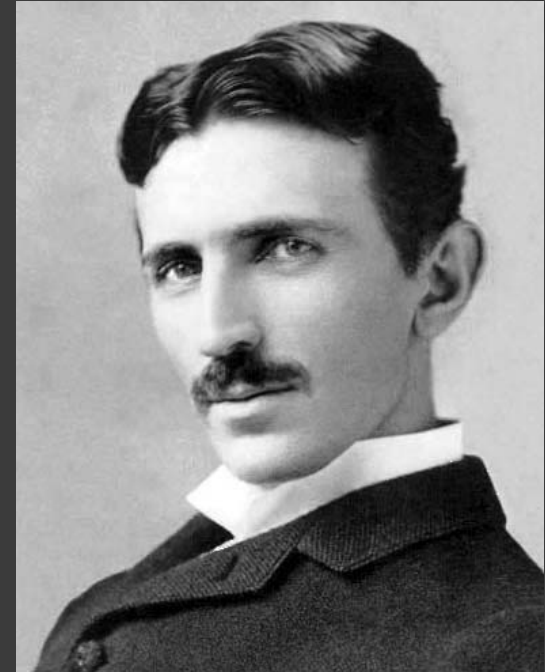
Mountrail Williams Electric Cooperative

Question: Who is the father of the today's electric transmission system?



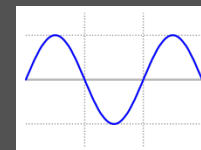
1. Thomas Edison

Direct Current “DC”

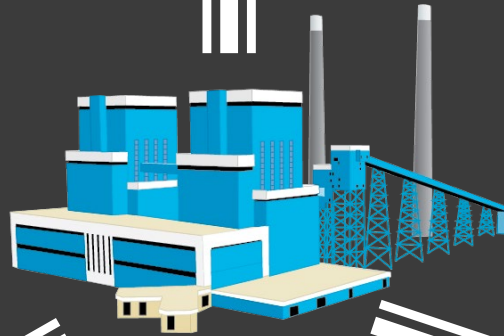


2. Nikola Tesla

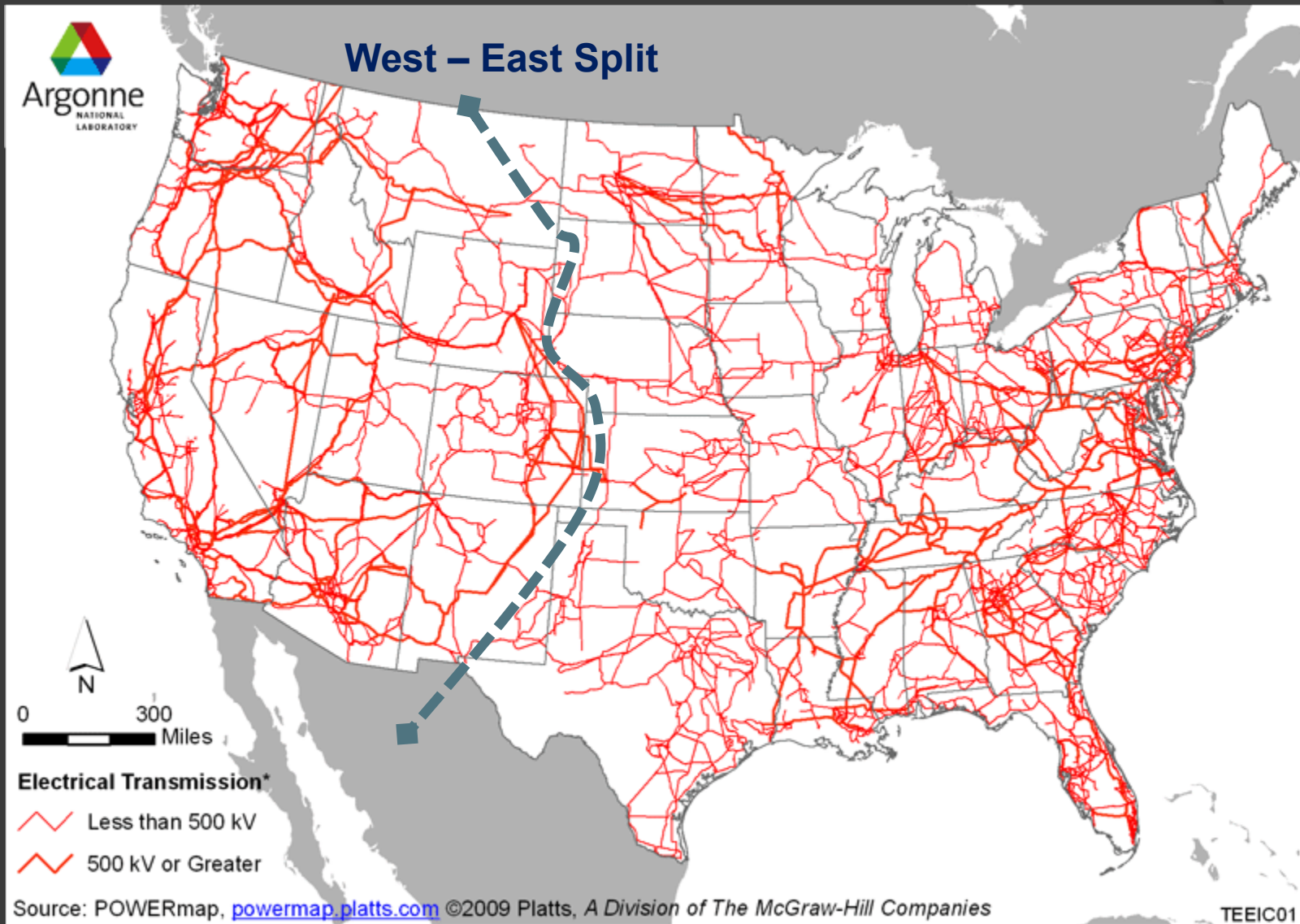
Alternating Current “AC”



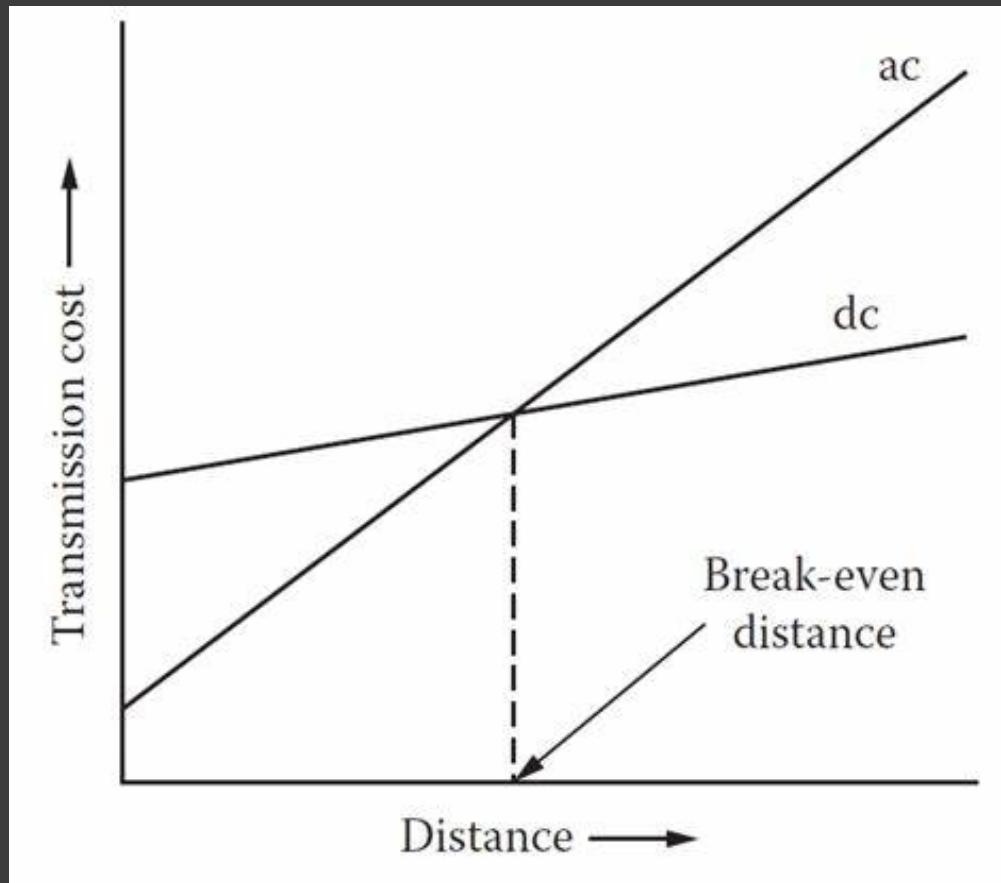
Growing the Transmission Grid



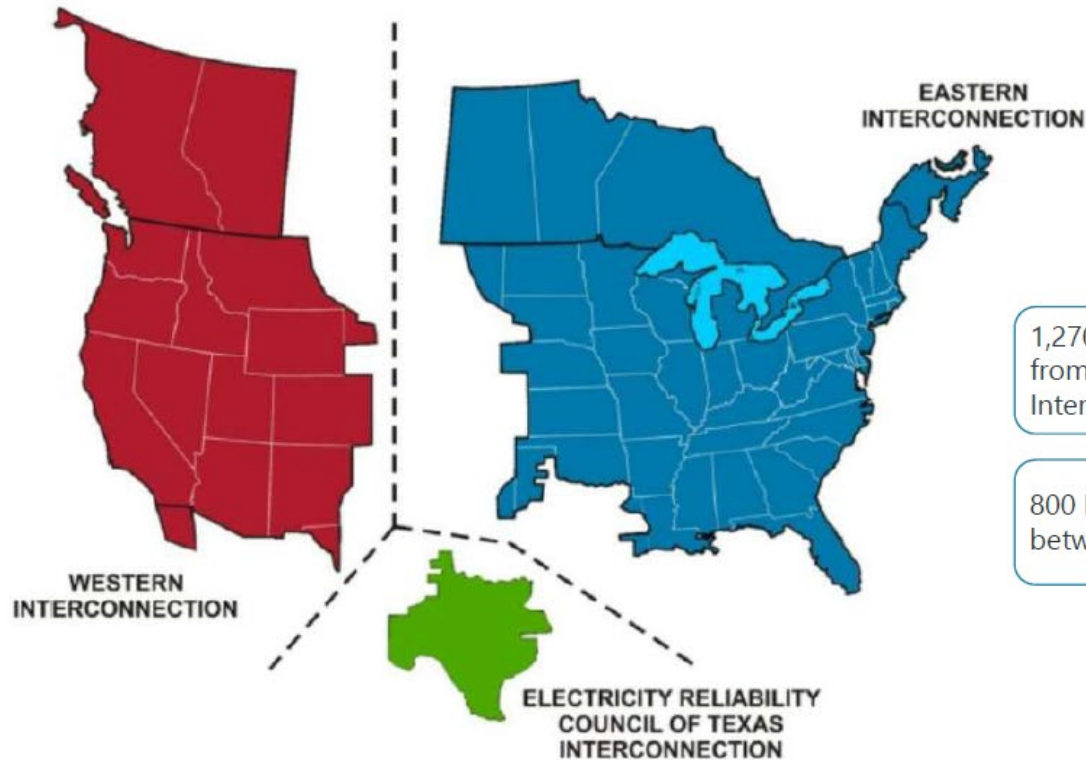
The High Voltage “Grid”



AC vs DC Transmission Lines



THREE ELECTRIC INTERCONNECTIONS



1,270 MW potential transfer capability from Western to Eastern Interconnection

800 MW potential transfer capability between SPP and ERCOT

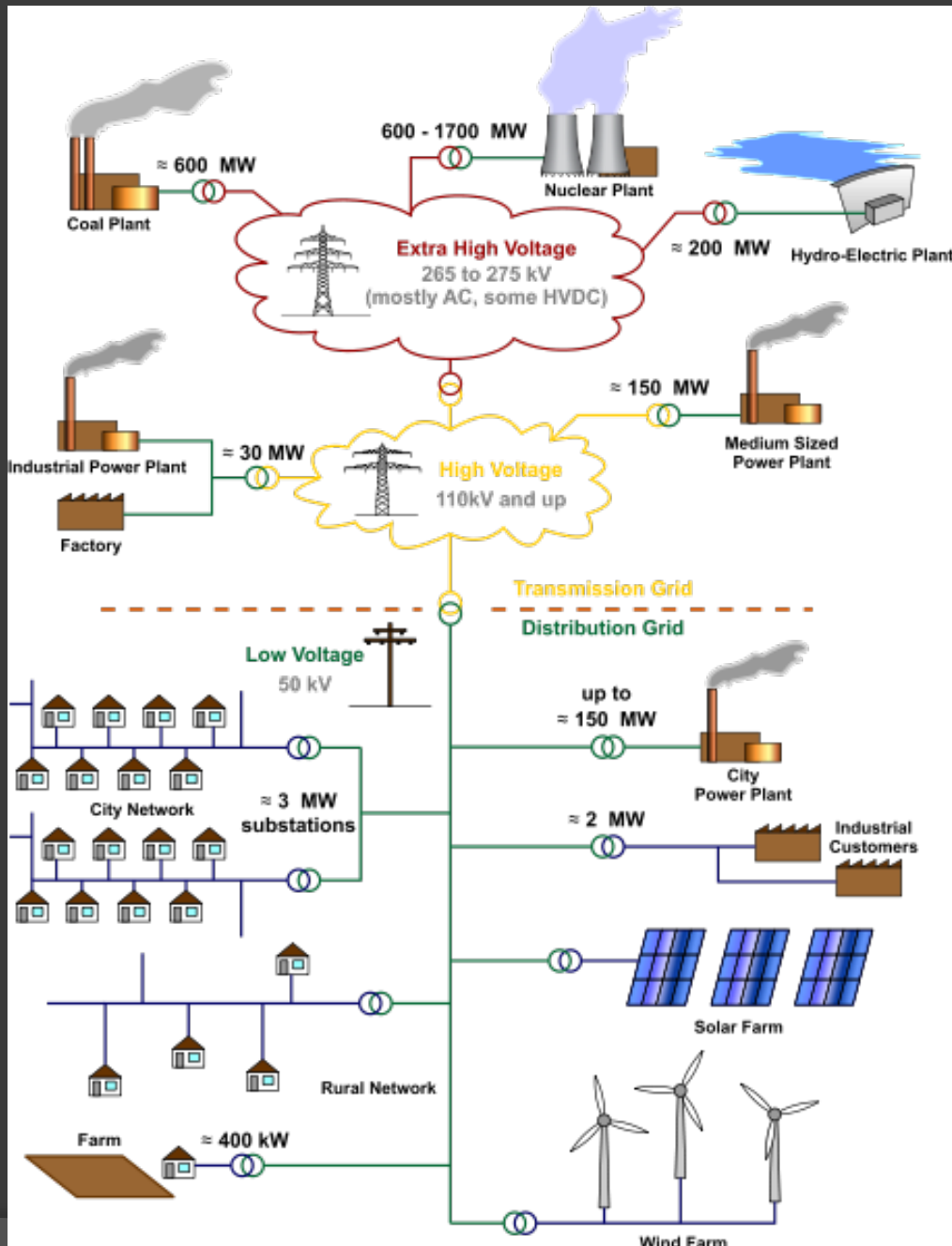
Economies of Scale



345,000 Volts



120 Volts



Transmission

Distribution



Powering the Upper Midwest...

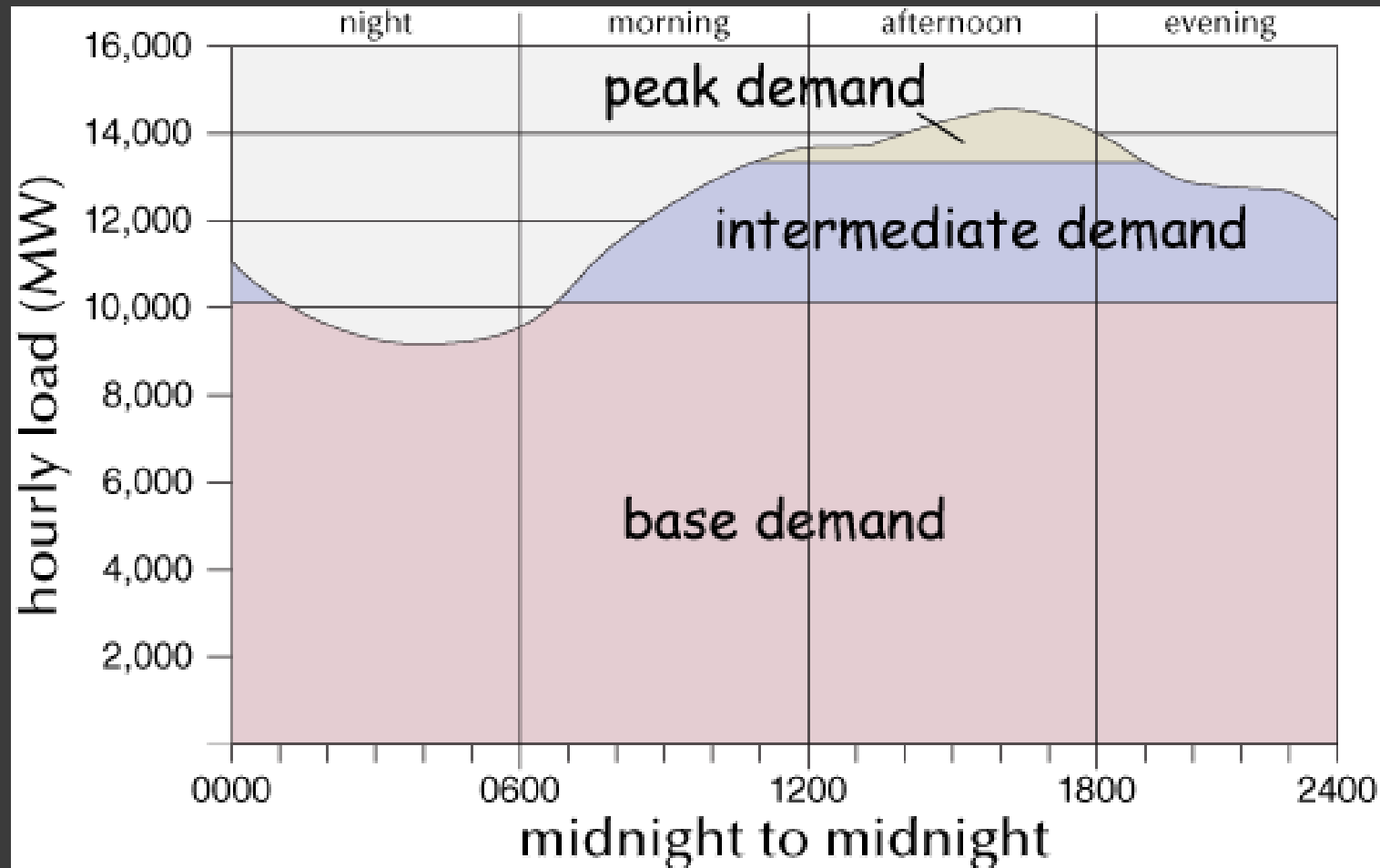
Missouri River Dams



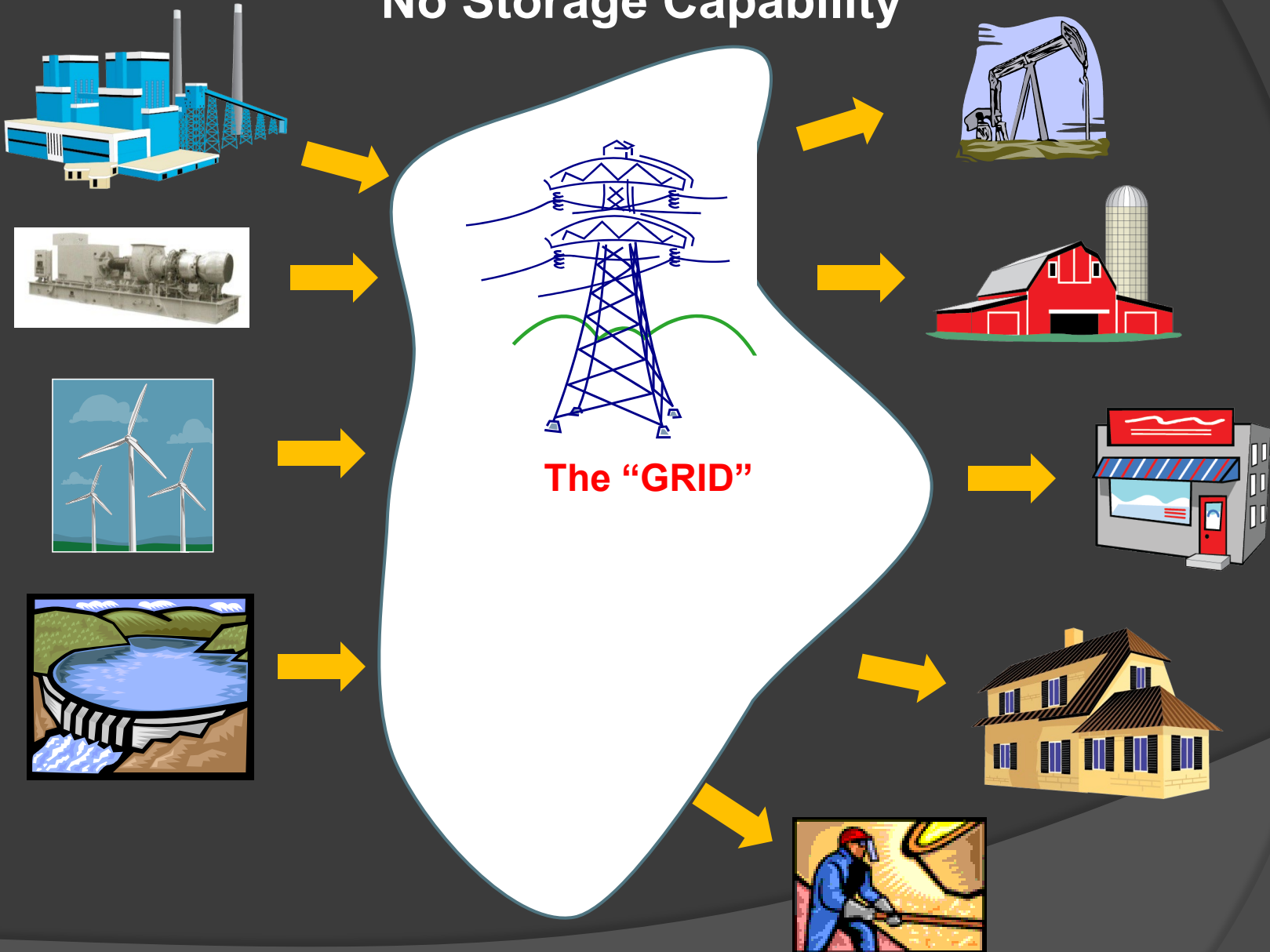
Lignite Power Plants



Typical Daily Electricity Demand By Hour



Generation = Demand No Storage Capability



Regulation:

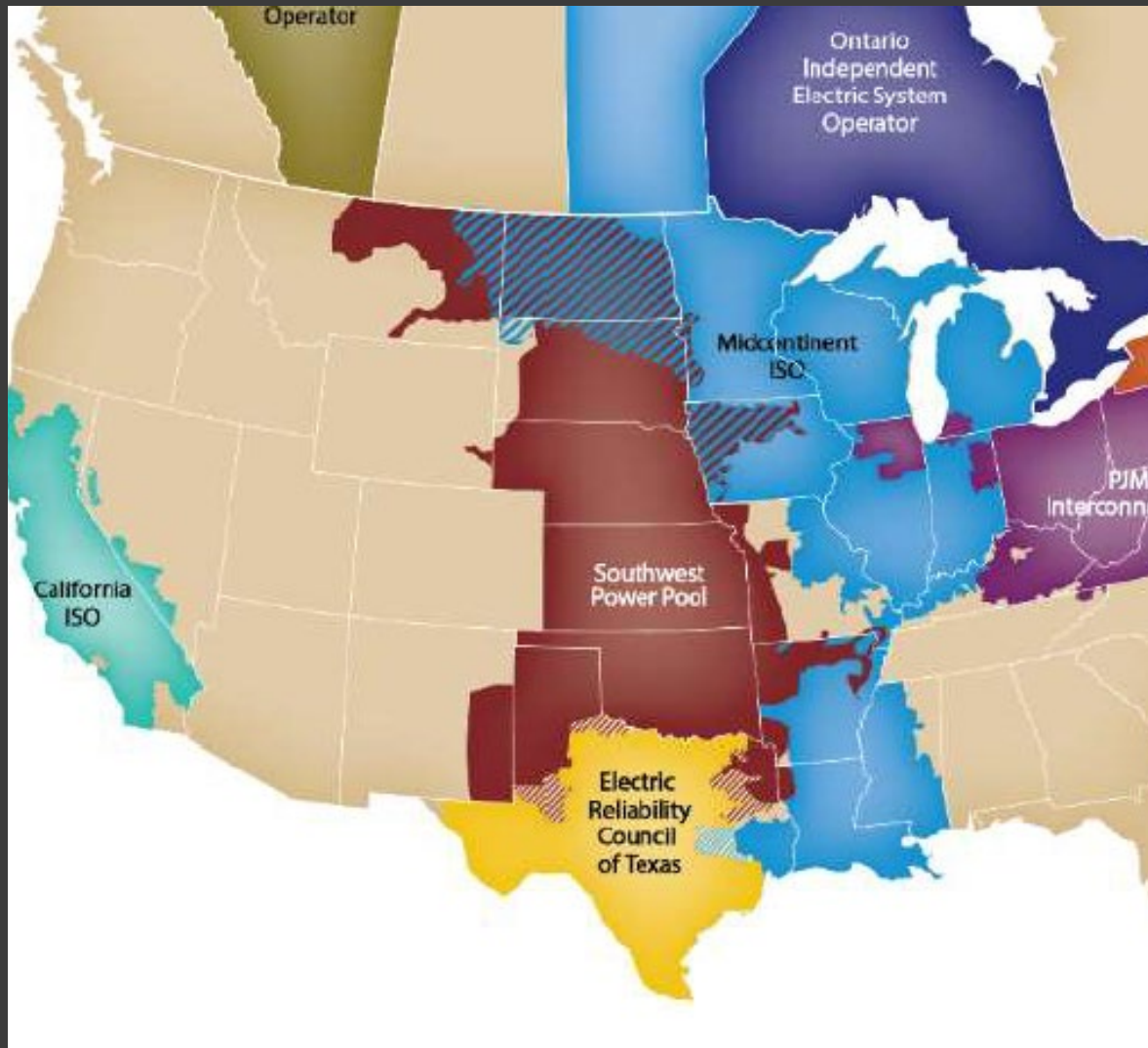


FERC: Regulates Interstate Electricity Transmission
State Public Service Commissions: Regulate Internal State Transmission



NERC: Sets Mandatory Reliability Standards

Energy Markets





WHO IS SPP?

501(c)(6) nonprofit corporation

One of 9 regional grid operators

104 member companies in 14 states

"Air traffic control" for high-voltage grid

Balances supply and demand across region

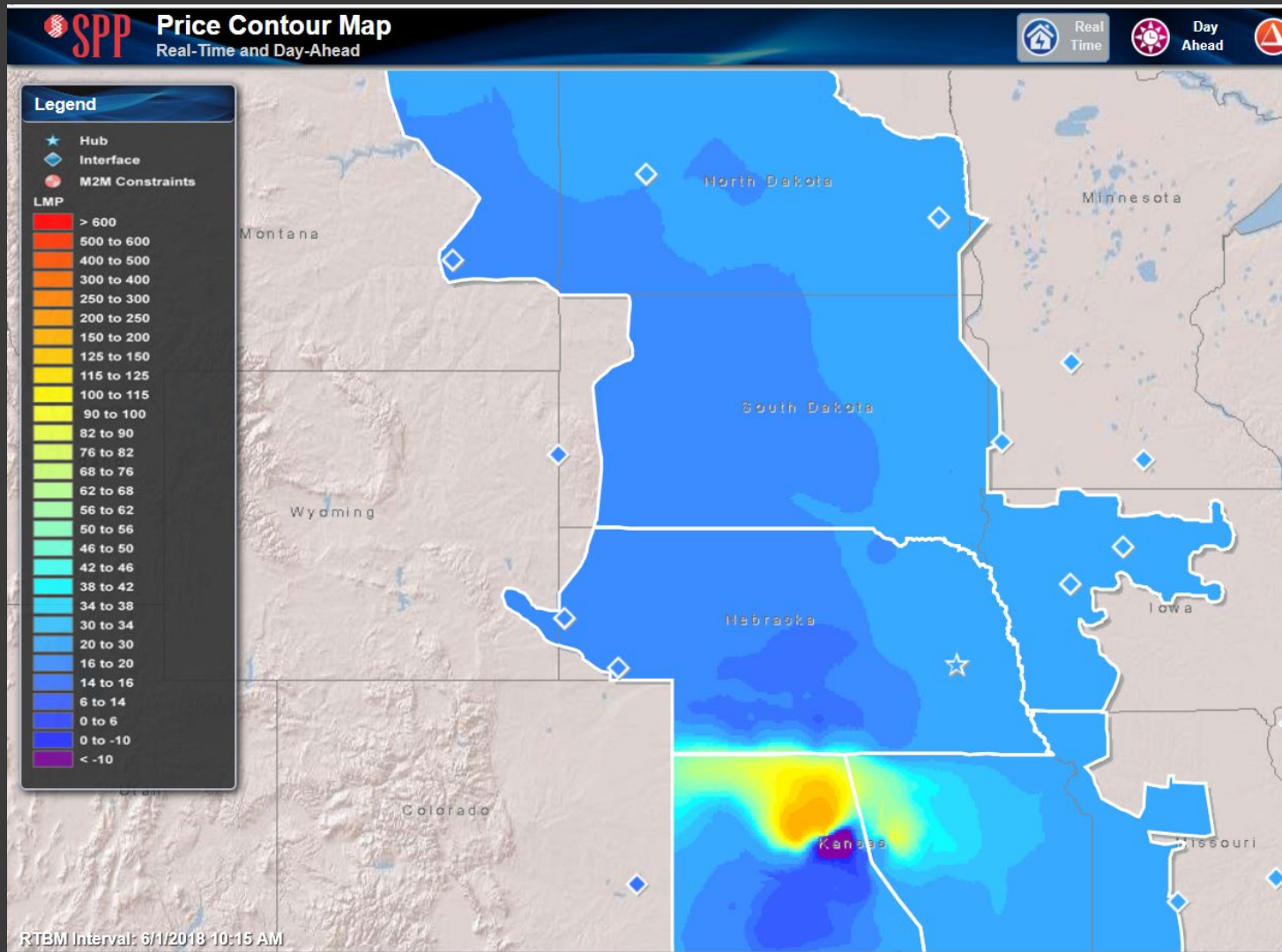
Maintains reliable grid operations

Operates wholesale energy market

Plans future transmission needs



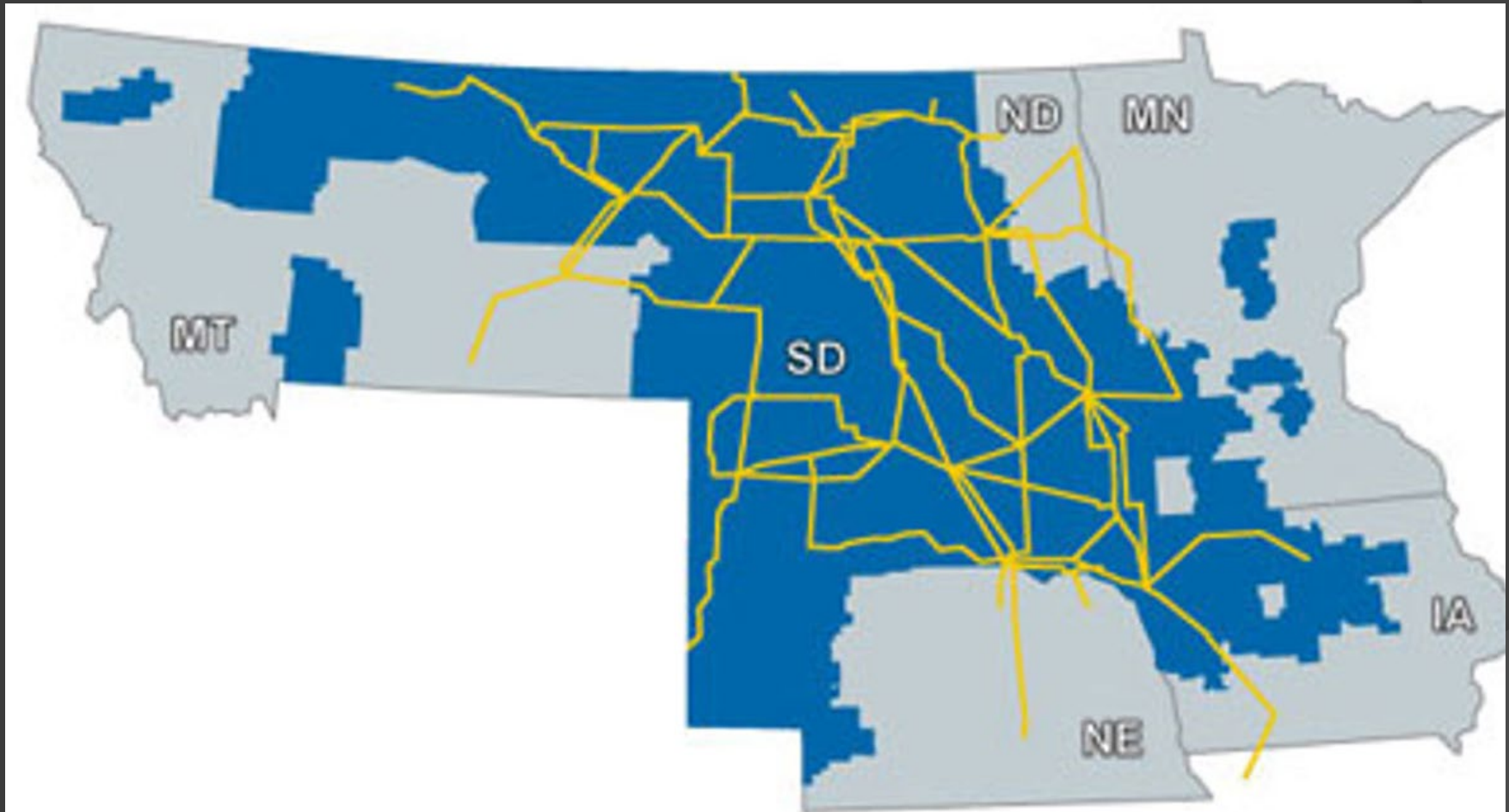
Locational Marginal Prices - SPP.org



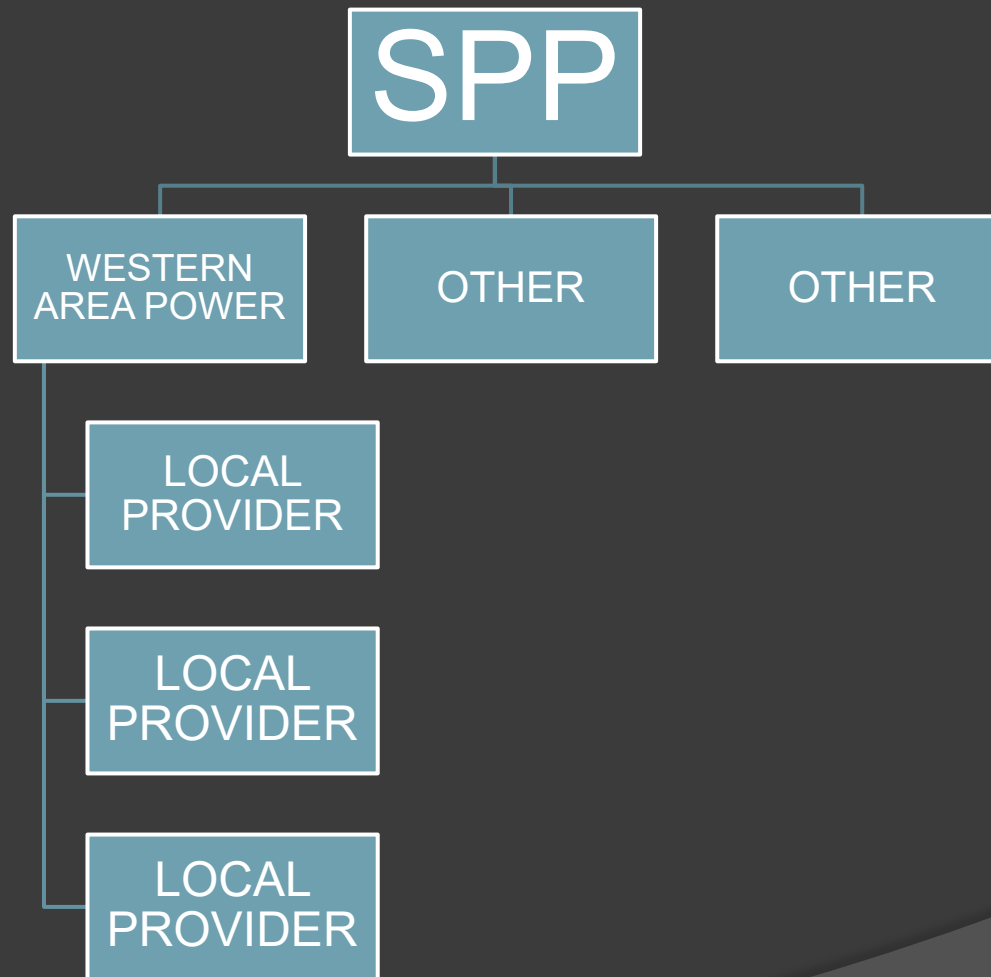


Western Area
Power Administration

Transmission Operator



Transmission Hierarchy



Expanding The Grid

- \$200,000 per mile for 60,000 Volt lines
- \$1,000,000 per mile for 115,000 Volt lines
- \$2,000,000 per mile for 230,000 Volt lines
- \$3,000,000 per mile for 345,000 Volt lines
- Transmission is ~7% of Average Electric Bill



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