Nebraska's Public Power System

Nebraska Wind Working Group

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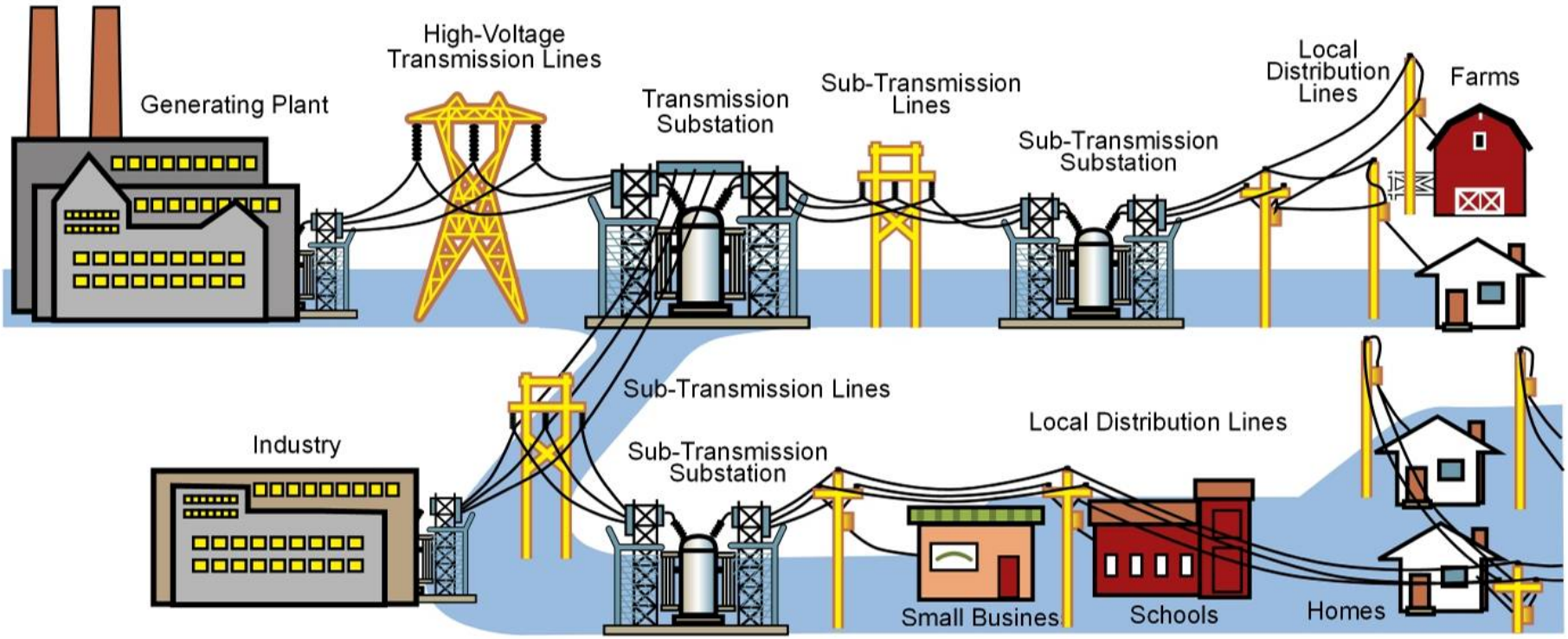
Nebraska Public Power District

"Always there when you need us"

How Electricity is Delivered from Power Plant to You

From the power plant, large cables (transmission lines) suspended on steel poles or towers carry the current to substations. Here the voltage (pressure) is lowered and fed into a distribution system. Smaller transformers provide the proper voltages for industries, stores, homes and farms.



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Primary Functions of Transmission

- Delivery of energy from the generators to the load (customers) centers
- Interconnections with neighboring utility systems provide support when their generation is off-line and provide for transfer of energy across the region

What is that Line on My Property?

- Distribution 12.47 kV
- Sub-Transmission 34.5 or 69 kV
- Transmission 115, 230 or 345 kV

12.5kV

34.5 kV

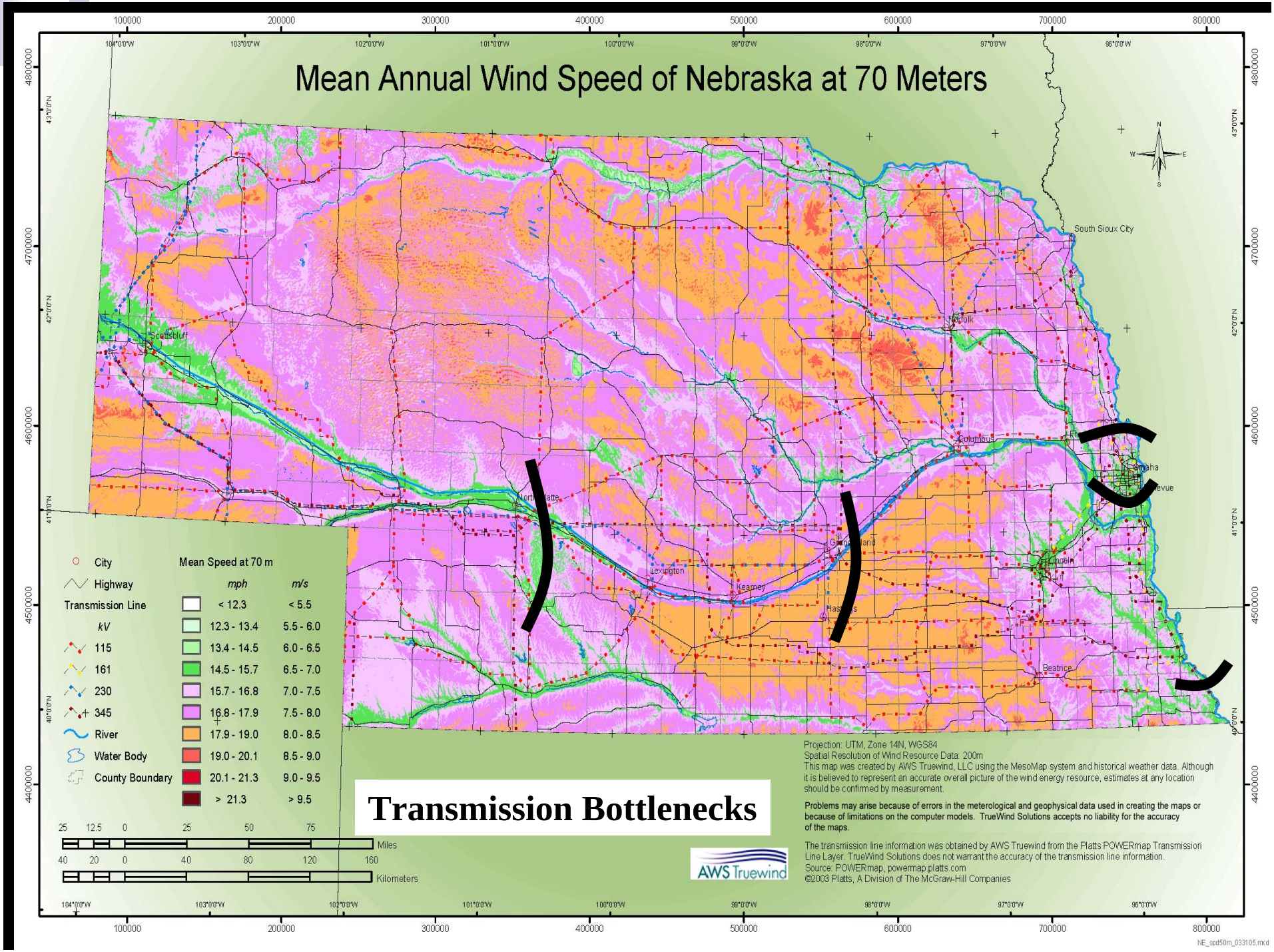
115 kV

What is the Transmission Interconnection Process at NPPD?

- Queue Process
- NPPD Example
- Web Page: http://www.nppd.com/About_Us/Transmission/default.asp

Cost to Build Transmission Lines

- High voltage (115 kV and 230 kV) transmission line can cost between $250,000 and $1,000,000 per mile to build
- The NPPD Electric Transmission Reliability Project (345 kV) cost is between $1,500,000 - $2,000,000 per mile

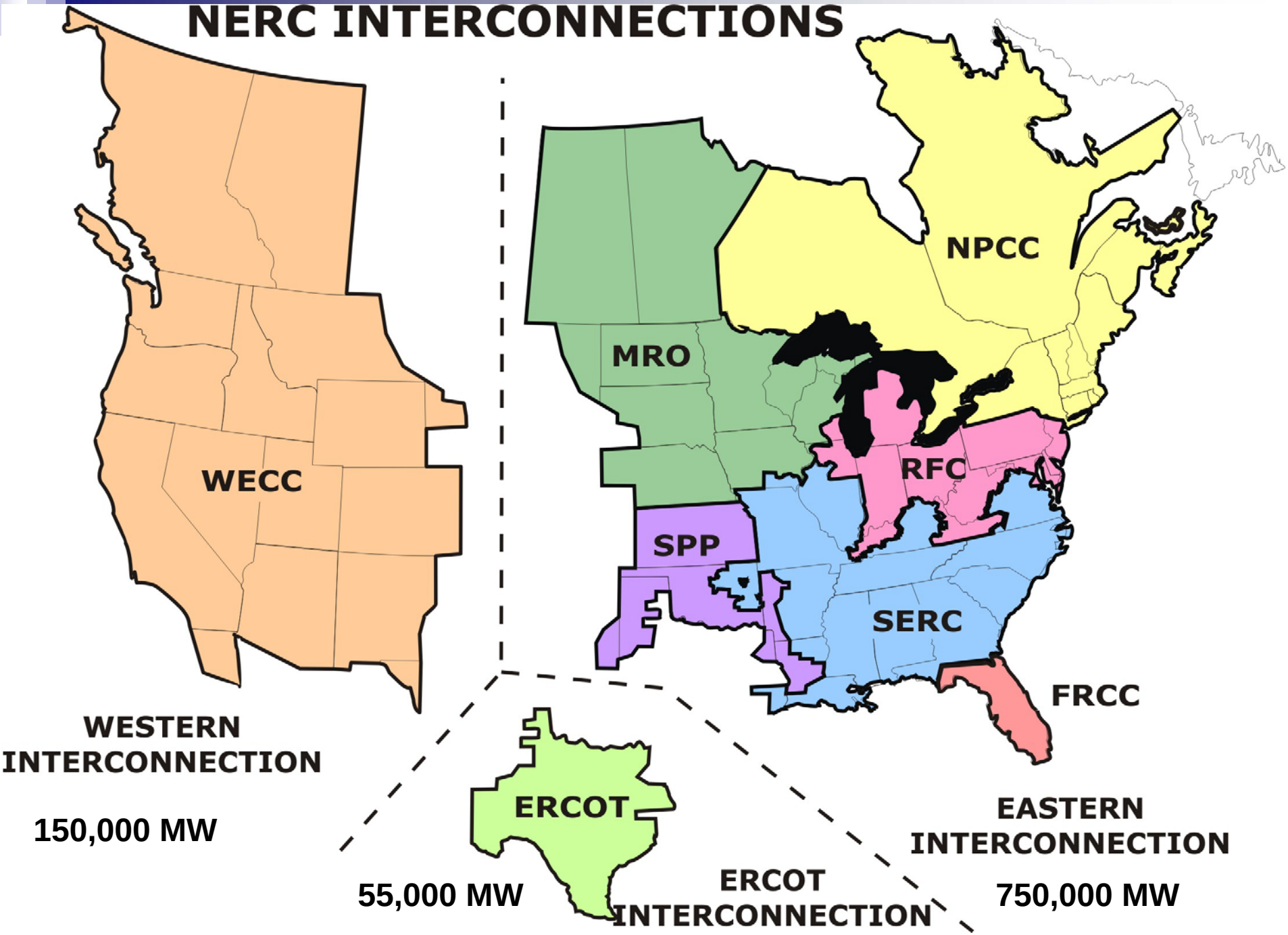


Transmission Bottlenecks

Reliability Overview

- Balance generation and demand (load)
  - Nearly instantaneous, cannot store electric energy
- Monitor power flows and maintain within system limits
  - Power flows across the interconnected network of transmission lines – path of least resistance
- Operate for unplanned contingencies
  - Outages of generators and lines
- Plan, design and maintain a reliable system
  - Built-in redundancy
- Prepare for emergencies
  - Power System Restoration

NERC INTERCONNECTIONS



North American Electric Reliability Corporation (NERC) Hierarchy of Control

- **3 Interconnections** – Eastern, Western and Electric Reliability Council of Texas (ERCOT)
  - All generators in each Interconnection are synchronized – Eastern Interconnection can be thought of as world's largest machine
  - Only a limited number of Direct Current ties between the Interconnections allow power transfer across the interconnections

Federal Energy Regulatory Commission Rulemakings

- **Generator Interconnections**
  - **FERC Order 2003 – Generators 20 MW or greater**
  - **FERC Order 2006 – Generators Less than 20 MW**

  - Requires the use of Standard Generator Interconnection Procedures and Agreements
  - Generators must pay for the cost of transmission network upgrades required to interconnect
  - This helps keep native load customers from paying for the cost of transmission upgrades needed solely for merchant generators

Summary – why transmission is so important

- Development of adequate regional transmission is the key to reliably serving existing and new load
- Large Scale wind development in the plains states will require significant regional transmission expansion
- Need a funding mechanism that spreads the cost of new transmission across the region

Questions?

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