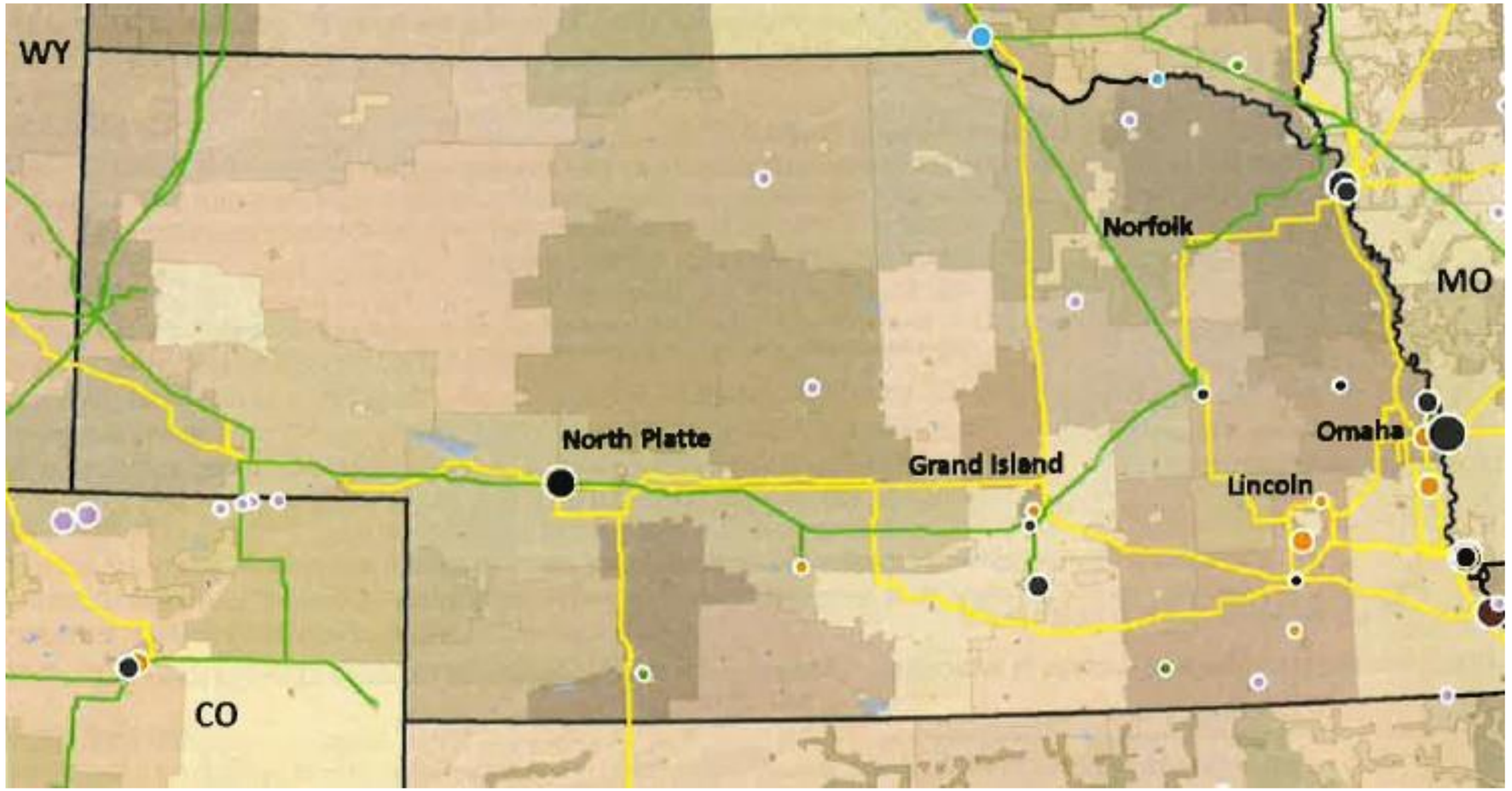
# Energy Assurance at NPPD

Nebraska Local Energy Assurance Workshop
June, 2019

Scott Walz T&D Construction & Maintenance Manager

Nebraska Public Power District
*Always there when you need us*

# Nebraska Transmission System




**Electric Power Plants: 104 (1% total U.S.)**
- Coal-fired: 10 (1% total U.S.)
- Petroleum-fired: 37 (2% total U.S.)
- Natural Gas-fired: 34 (1% total U.S.)
- Nuclear: 2 (2% total U.S.)
- Hydro-electric: 11 (<1% total U.S.)
- Other Renewable: 10 (<1% total U.S.)

**Transmission Lines:**
- High-Voltage (>230 kV): 2,330 Miles
- Low-Voltage (<230 kV): 7,487 Miles

**Power Plants**

**Nameplate Capacity** (MW)
- 50 - 250
- 251 - 750
- 751 - 1,500
- 1,501 - 3,000
- 3,501 - 6,500+

**Primary Fuel Type**
- Coal
- Natural Gas
- Oil
- Uranium
- Water
- Renewable

**Transmission Lines**
- 220kV - 315kV
- 345kV - 450kV
- 500kV - 525kV
- 735kV - 765kV

**Utility Company***

*Shaded by Company

Data Sources:
ANL 2013; ESRI 2012;
EIA 2014; Platts 2014.

# Lost the Power Grid

Something caused the lights to go out

- Voltage Instability
- Natural Events such as storms, earthquakes, etc.
- Human Error (Switching errors, unknown consequences)
- Terrorism or Sabotage

# Determine the Status

# What Next?

PSR guide

- Focus on Black Start Units
- Utilize low voltage transmission system
- Use “controlled open” strategy
  - Fewer steps
  - Minimize use of stored energy
- Equipment availability has not changed

## Priorities…

# Priorities

- Cooper Nuclear Station
- Rebuild interconnection
  - Supply power to key generation sites
  - Plan how to pick up larger loads
  - Need to stabilize voltage and frequency
  - Supply power to key substations
- Pick up loads on Sub-T as the system allows
- Avoid Wind Farms (dynamic challenges)

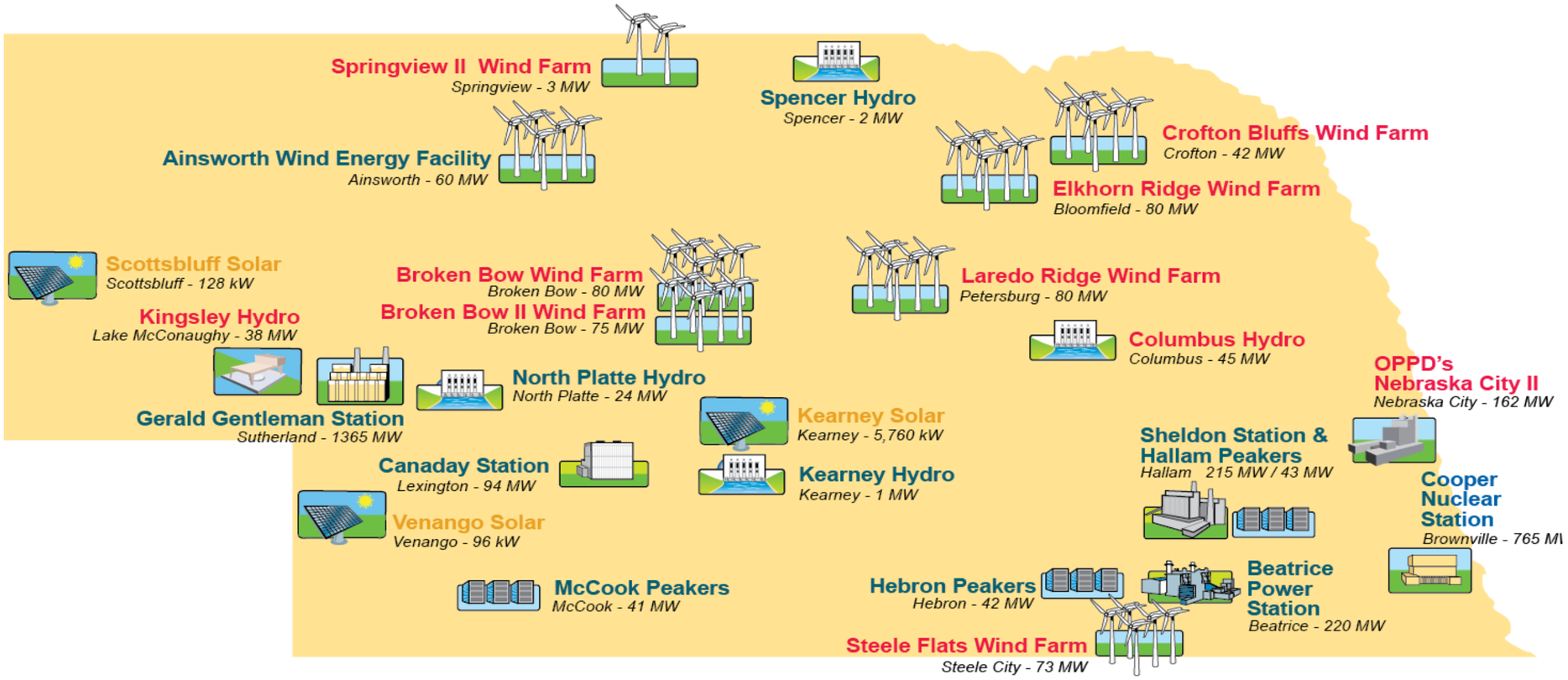
# Restoration Overview

- Parallel restoration in each island
  - NPPD Eastern
  - NPPD Western
  - LES
  - OPPD
  - Municipals with generation
- Build loops, not radials where possible
- Get prepared for larger units and associated load pickup

# What To Expect

- This will be a long process that will likely span multiple days
- There will be instances where some loads at a substation are in service long before other loads at the same substation.
- DO NOT ADD LOAD WITHOUT DIRECTION FROM THE DONIPHAN CONTROL CENTER
- Updates initially would occur through normal channels – would move to periodic updates as per the NPPD Emergency Restoration Plan

# NPPD's Generation Profile




Nebraska Public Power District
Always there when you need us

# Mobile Transformers

- Mobile XFM #1 - 22 MVA – 115/69/34.5 KV
- Mobile XFM #2 – 12.5 MVA – 115/69/34.5 KV
- Mobile XFM #3 - 22 MVA – 115/69/34.5 KV
- Mobile XFM #4 - 22 MVA – 115/69/34.5 KV
- Mobile XFM #5 - 56 MVA – 115/69/34.5 KV
- Mobile XFM #6 - 56 MVA – 115/69/34.5 KV

# Mobile Transformer 5 & 6

# Mobile Circuit Switcher

- Mobile Circuit Switcher 1

Mobile Circuit Switcher 5


Nebraska Public Power District
*Always there when you need us*

# Mobile Substations

- **Mobile Substation #1 - 10 MVA - No LTC**
  - High side voltage 67 X 33.5 Kv
  - Low side voltage 2.4/4.16Y/2.4 X 7.2/12.5Y/7.2 X 8.3/14.4Y/8.3 Kv
  - The capacity is reduced to 8.7 MVA at 4.16 Kv and to 5 MVA at 2.4 Kv
- **Mobile Substation #2 - 10 MVA - With LTC**
  - High side voltage 67 X 33.5 Kv
  - Low side voltage 2.4/4.16Y/2.4 X 7.2/12.5Y/7.2 X 8.3/14.4Y/8.3 Kv
  - The capacity is reduced to 8.7 MVA at 4.16 Kv and to 5 MVA at 2.4 Kv
- **Mobile Substation #3 - 15 MVA - With LTC**
  - High side voltage 67 X 33.5 Kv
  - Low side voltage 2.4/4.16Y X 7.2/12.5Y/7.2 Kv
  - The capacity is reduced to 10 MVA at 4.16 Kv

# Mobile Substation 2 - Installed

# Mobile Generators

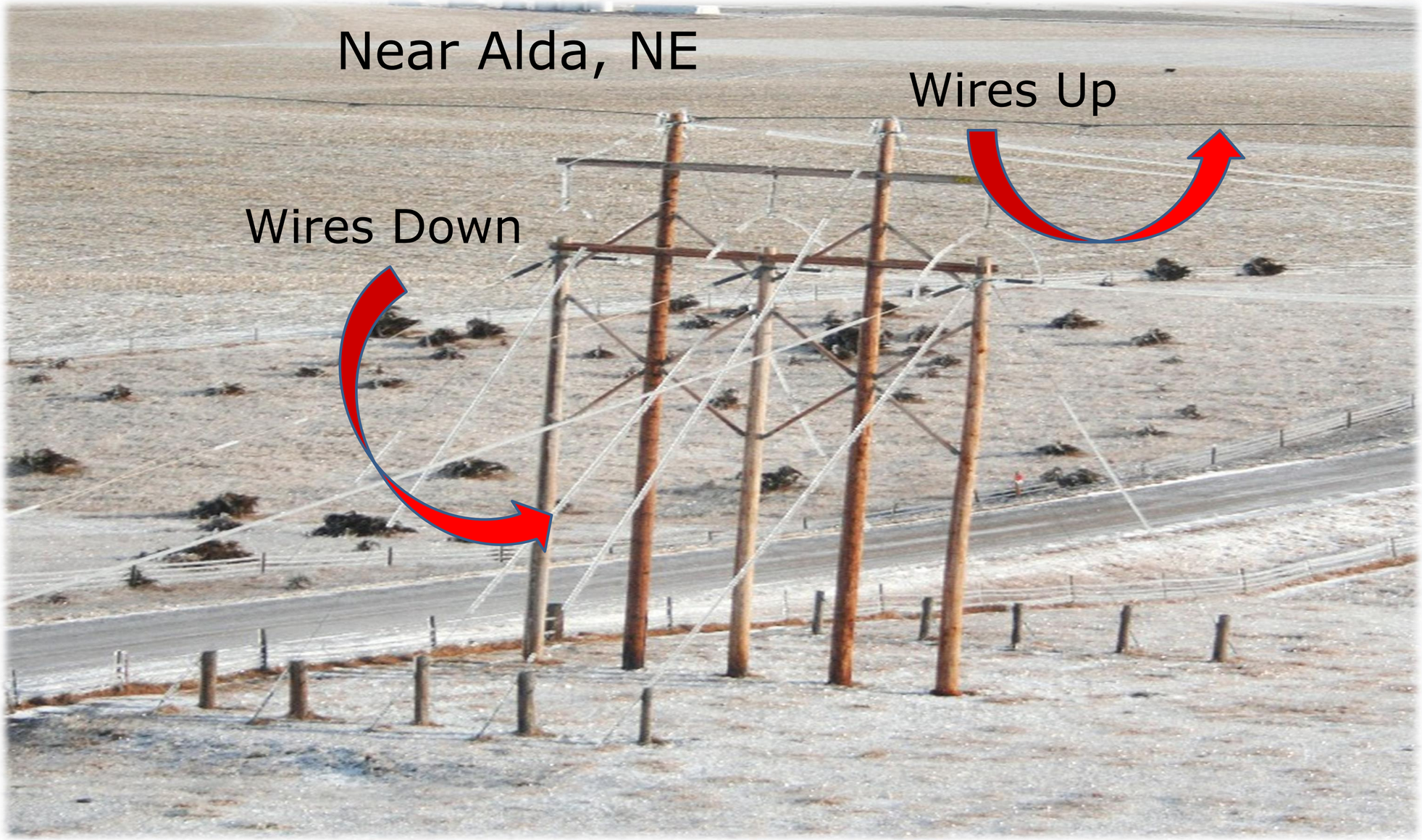
- **500 KW Mobile Diesel Generator** -
  - Generates 500 KW at 120/240Y volts or 277/480Y 120/240 Y 4 wire
- **1,000 KW Mobile Generator** -
  - At 4.16 wye volts or 2.4 delta
- **1,600 KW Mobile Generator** -
  - At 4.16 wye volts or 2.4 delta
- **Transformer Trailer 1,000 kVA** -
  - Primary voltage 7.2 Kv delta or 12.47 Kv wye
  - Secondary voltage 2.4 Kv delta or 4.16 Kv wye
  - Setup to go with the 1,000 kVA generator
- **Transformer Trailer 1,600 kVA** -
  - Primary voltage 7.2 Kv delta or 12.47 Kv wye
  - Secondary voltage 2.4 Kv delta or 4.16 Kv wye
  - Setup to go with the 1,600 kVA generator

# Mobile Generator 1,600 kW

# Locations Generators Have Been Used

- City of Holdrege January 2017 - Ice Storm
  - ✓ Generation ran for an entire month while transmission lines were restored
  - ✓ Population of Holdrege 5000+ residents
- Village of Santee March 2019 – Flood
  - ✓ All feeds into village were out

# Hazard Mitigation Structures




Nebraska Public Power District
*Always there when you need us*

# Questions?

Stay connected with us.

Nebraska Public Power District

*Always there when you need us*