OAK RIDGE National Laboratory

EMT Initiative: Applications and Pilots WG
ISO/RTO perspectives & challenges

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Southwest Power Pool

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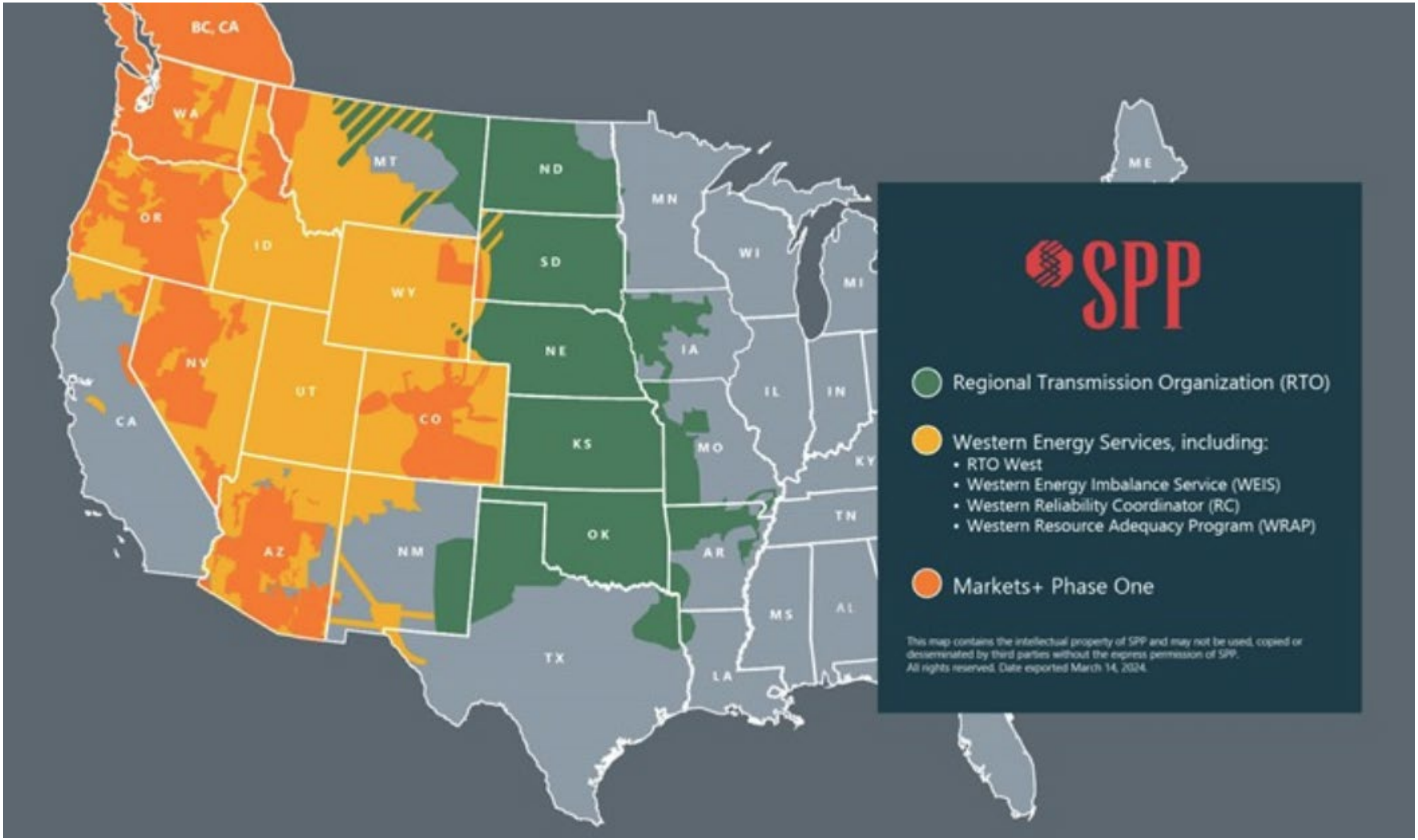
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SPP
Regional Transmission Organization (RTO)
Western Energy Services, including:
• RTO West
• Western Energy Imbalance Service (WEIS)
• Western Reliability Coordinator (RC)
• Western Resource Adequacy Program (WRAP)
Markets+ Phase One
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Key EMT Applications in SPP

- **Current Uses:**
  - Generator Interconnections (in weak grids)
  - HVDC Interconnection Planning and Design

- **Planned Uses:**
  - High Impact Large Load Interconnections (data centers, EV hubs)
  - Grid-Enhancing Technologies (GETs): Advanced Power Flow Controllers
  - MT-HVDC Transmission Planning and Design

EMT for Generator Interconnections (GI)

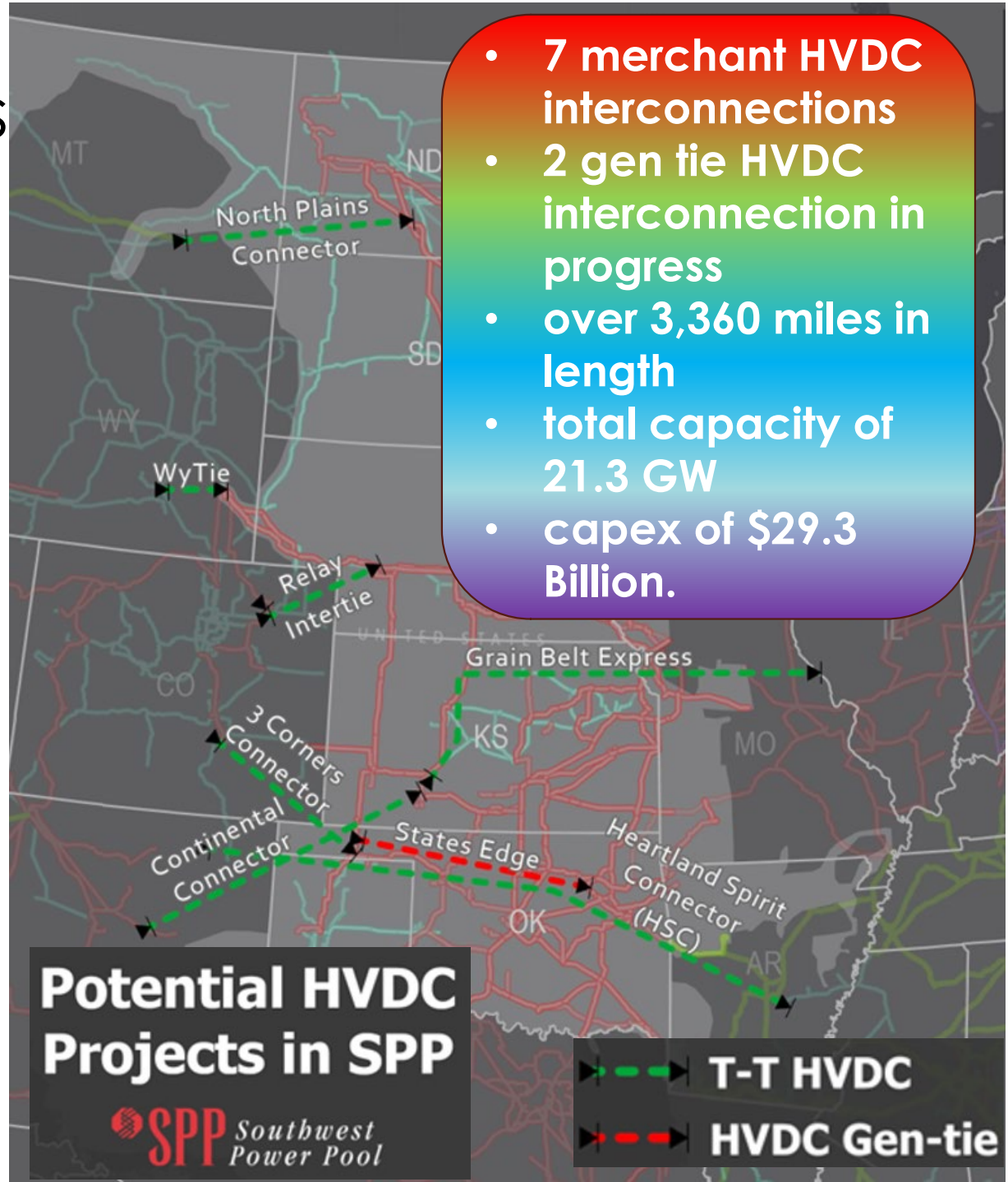
- **Use Case:**
  - Required when GSAT (SCR, WSCR, etc.) flags weak grid
- **Model Requirements:**
  - EMT model compliance with SPP EMT Model Requirements
  - Pass 12 technical tests (e.g., ride-through, P/Q control)
- **Key Studies:**
  - EMT dynamic performance study (Running TPL-001-5.1 contingencies)
- **Challenges:**
  - Model validation and developer coordination
  - Lack of detailed system-wide EMT models

SPP GI Queue, ISD 2030

GEN TYPE	Requests	GW Capacity
Battery / Storage	144	21 GW
Hybrid	59	12 GW
Solar	223	47.7 GW
Thermal	20	3.5 GW
Wind	115	27.4 GW
TOTAL	561	111.5 GW

EMT for HVDC Interconnections

- **Use Case:**
  - Required for all HVDC projects
- **Model Requirements:**
  - Like GI (previous slide)
- **Key Studies:**
  - EMT dynamic performance study
  - Emergency Power Control
  - Grid-Forming Assessment
  - Fault Ride-Through
  - SSO & Converter-Driven Stability
- **Challenges:**
  - Like GI (previous slide)



EMT for Large Load (>10 on 69kV, >50 MW above 69kV)

- **Use Case:**
  - Under development for loads like Data centers, EV hubs, and electrolyzers
- **Model Requirements:**
  - Like GI (previous slide)
- **Key Studies:**
  - EMT dynamic performance study
  - Harmonic impact and flicker
  - Fault Ride-Through
  - SSO & Converter-Driven Stability
- **Challenges:**
  - Like GI (previous slide)
  - High Fidelity EMT models
- **Planned Timeline:**
  - 2025–2026

SPP Requests:
- **Received: 26.36 GW**
- **In Service Date: 2027**
- **Added to Service Agreement: 7.05 GW**

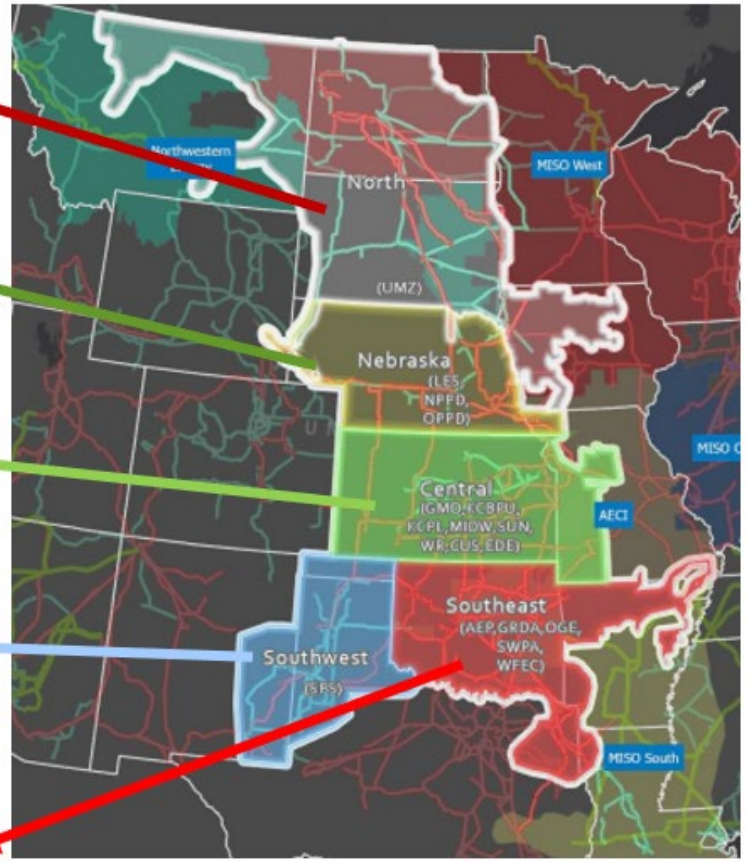
LL Requests. Received= 2581.02 MW
LL Requests Added to SA= 550.00 MW

LL Requests. Received=2145.21 MW
LL Requests Added to SA=759.00MW

LL Requests. Received=1577.49 MW
LL Requests Added to SA=1019.85MW

LL Requests. Received=6302.80 MW
LL Requests Added to SA=2300.00MW

LL Requests. Received=13758.08 MW
LL Requests Added to SA=2426.66 MW



Future Applications & Trends

- Grid-Enhancing Technologies (GETs): Advanced Power Flow Controllers
- High Impact Large Load (HILL)
- Multi-Terminal HVDC EMT Simulation
- Multi-Domain Simulation & Advanced Inverter Modeling
- EMT Simulations for SPP Operation

Thank you