North American Power Symposium

September 20, 2016

Dr. ANTHONY MONTOYA
Executive Vice President and Chief Operating Officer

Denver, CO
A Little About Western...
A Federal Power Marketing Administration

-- Formed under the Department of Energy Organization Act of 1977
Past: Reclamation Origins

Reclamation Act of 1906

• Authorizes development of power at reclamation sites when necessary for irrigation of project lands.

• Authorizes lease of any surplus power or power privilege.

• Gives preference in leases of surplus power to municipal purposes.
A Little About Western…

Service Area:
Construct, operate, and maintain substantial electrical facilities in 15 western states
A Little About Western…

17,000 miles of high and extra high voltage transmission lines.
A Little About Western…

Market power from 57 power plants, consisting of 10,400 MW of generating capacity from 181 generators.
Geomagnetic Disturbances (GMD)

• Solar flares can create coronal mass ejections (CMEs)
• CMEs can interact with the earth’s magnetic field
• Geomagnetically induced currents (GICs) can be developed in long transmission circuits
Geomagnetic Disturbances (GMD)

- Quasi-DC nature of GICs can cause half-cycle saturation in power transformers
- May lead to transformer overheating, harmonics, and voltage instability
Geomagnetic Disturbances (GMD)

- Monitoring GIC
  - EPRI Sunburst Program

- Mitigating effects of GIC
  - Operating procedures
  - Neutral current blocking device in neutral of transformer
  - Series capacitors to block DC in transmission circuits
VARIABLE SHUNT REACTORS

Need for reactive power compensation

– Stability on long line transmissions

– Voltage control during light load conditions
Variable Shunt Reactor
50-100 MVAr, 242 kV
DOE Interconnection Seams Study

• Funded by the Department of Energy’s Grid Modernization Initiative
  • $1.2 million project
  • Launched in April of 2016 and is scheduled to conclude in September of 2017

• The study seeks to understand what economic and reliability opportunities could be realized through better coordination and increased capacity along the transmission seams between the Eastern and Western Interconnections.

• Scenarios will include combinations of upgrades to AC-DC-AC Converter Stations and HVDC line additions. The 18-month project will involve co-optimized generation and transmission expansion at the seams, sub-hourly production cost model simulations, and power flow analyses.

• Study team:
  • National Renewable Energy Laboratory, Pacific Northwest National Laboratory, Oak Ridge National Laboratory, and Argonne National Laboratory
  • Iowa State University
  • Southwest Power Pool, Midcontinent Independent System Operator
  • Western Area Power Administration
Geographic and Temporal Diversity of Generation Resources
## AC-DC-AC Converter Stations in the U.S.

<table>
<thead>
<tr>
<th>Station</th>
<th>Owner</th>
<th>Operator</th>
<th>Capacity</th>
<th>Year Built</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rapid City, SD</td>
<td>Black Hills Electric</td>
<td>Black Hills Electric</td>
<td>200 MW</td>
<td>2003</td>
</tr>
<tr>
<td>Miles City, MT</td>
<td>Western Area Power Administration</td>
<td>Western Area Power Administration</td>
<td>200 MW</td>
<td>1985</td>
</tr>
<tr>
<td>Stegall, NE</td>
<td>TriState G&amp;T/Basin Electric</td>
<td>Western Area Power Administration</td>
<td>100 MW</td>
<td>1977</td>
</tr>
<tr>
<td>Sidney, NE</td>
<td>Western Area Power Administration</td>
<td>Western Area Power Administration</td>
<td>200 MW</td>
<td>1988</td>
</tr>
<tr>
<td>Lamar, CO</td>
<td>Xcel Energy</td>
<td>Xcel Energy</td>
<td>210 MW</td>
<td>2005</td>
</tr>
<tr>
<td>Clovis, NM</td>
<td>Public Service Company of New Mexico</td>
<td>Public Service Company of New Mexico</td>
<td>200 MW</td>
<td>1984</td>
</tr>
<tr>
<td>Artesia, NM</td>
<td>Public Service Company of New Mexico</td>
<td>Not currently operating</td>
<td>200 MW</td>
<td>1983</td>
</tr>
</tbody>
</table>
Strategic Transformer Reserve (STR)

• Technical study of severe events that exceed reasonable utility contingency planning.

• The studies assumption is that after such an event there will be a shortage of LPTs preventing restoration of the grid to a minimum tolerable level of performance in a timely manner.

• The study will provide guidance on whether a LPT reserve is required and the size of the reserve (numbers and sizes) as well as potential regional distribution correlated with threat/risk mitigation.
STR Logistics

- Coordination with utilities, operators, reliability organizations, manufacturers, and other federal agencies.
- Identify Critical Substations (simulations)
- Identify System needs/requirements (simulations and system modeling)
- Address all (major) possible events and outcomes
- Identify LPT needs (temporary)
- Determine options for number & type of additional provisional replacement LPTs
- Identify Siting for STR staging (favorable to transport, security, maintenance req.)
Contact

Dr. Anthony Montoya
Tmontoya@WAPA.GOV
720-962-7071

www.wapa.gov