Introduction to Transmission

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Agenda

- The SD System
- Transmission
  - What is it?
  - Need for improvement
  - Deficiencies
- Regulatory Processes
- MISO
Electricity

- Can’t be stored
- It is delivered the instant it is needed
- Transmission carries electricity from the generating plant to distribution points
Transmission

- Transmission – Used for bulk power transfers
  - 230 kV and higher is generally transmission
  - Between 230 kV & 115 kV maybe transmission
- Sub-transmission/distribution
  - Below 115 kV is generally not transmission
South Dakota Utilities Participate In A Regional System
Transmission’s Role

- To reliably deliver electricity to distribution systems
- To connect utilities together to enhance reliability
- To accommodate economic exchanges of electricity (wholesale market)
### Generation in South Dakota (>10 MW)

<table>
<thead>
<tr>
<th>Name</th>
<th>Capacity (MW)</th>
<th>Category</th>
<th>Operator</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oahe</td>
<td>714</td>
<td>Hydro</td>
<td>WAPA</td>
</tr>
<tr>
<td>Big Bend</td>
<td>536</td>
<td>Hydro</td>
<td>WAPA</td>
</tr>
<tr>
<td>Big Stone</td>
<td>472.6</td>
<td>ST Coal</td>
<td>OTP</td>
</tr>
<tr>
<td>Fort Randall</td>
<td>356</td>
<td>Hydro</td>
<td>WAPA</td>
</tr>
<tr>
<td>Angus Anson</td>
<td>229</td>
<td>CT Gas</td>
<td>Xcel</td>
</tr>
<tr>
<td>Gavins Point</td>
<td>113</td>
<td>Hydro</td>
<td>WAPA</td>
</tr>
<tr>
<td>Watertown</td>
<td>65</td>
<td>CT Oil</td>
<td>MRES</td>
</tr>
<tr>
<td>Spirit Mound</td>
<td>104</td>
<td>CT Oil</td>
<td>BEPC</td>
</tr>
<tr>
<td>Huron</td>
<td>49</td>
<td>CT Gas</td>
<td>NWPS</td>
</tr>
<tr>
<td>Highmore</td>
<td>40</td>
<td>Wind</td>
<td>FPL</td>
</tr>
<tr>
<td>Lange PP</td>
<td>40</td>
<td>CT Gas</td>
<td>BHP</td>
</tr>
<tr>
<td>Aberdeen</td>
<td>29.4</td>
<td>CT Oil</td>
<td>NWPS</td>
</tr>
<tr>
<td>Lake Preston</td>
<td>29.4</td>
<td>CT Oil</td>
<td>OTP</td>
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<tr>
<td>Ben French</td>
<td>25</td>
<td>ST Coal</td>
<td>BHP</td>
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<tr>
<td>Huron</td>
<td>14.8</td>
<td>CT Gas</td>
<td>NWPS</td>
</tr>
<tr>
<td>Yankton</td>
<td>11.42</td>
<td>CT Gas</td>
<td>NWPS</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2829</strong></td>
<td></td>
<td></td>
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### SD Load and Generation Energy Sales

#### Generation by Fuel (GWhr)

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
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<tbody>
<tr>
<td>Coal</td>
<td>2,642</td>
<td>3,314</td>
<td>3,272</td>
<td>2.4</td>
<td>50.3</td>
<td>26.6</td>
<td>42.4</td>
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<tr>
<td>Petroleum</td>
<td>12</td>
<td>7</td>
<td>5</td>
<td>−9.6</td>
<td>0.2</td>
<td>0.1</td>
<td>0.1</td>
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<tr>
<td>Natural Gas</td>
<td>11</td>
<td>117</td>
<td>86</td>
<td>26.2</td>
<td>0.2</td>
<td>0.9</td>
<td>1.1</td>
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<tr>
<td>Hydroelectric</td>
<td>2,591</td>
<td>9,012</td>
<td>4,354</td>
<td>5.9</td>
<td>49.3</td>
<td>72.4</td>
<td>56.4</td>
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<tr>
<td>Other Renewables</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>na</td>
<td>0</td>
<td>0</td>
<td>0.1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>5,256</td>
<td>12,450</td>
<td>7,722</td>
<td>4.4</td>
<td>100</td>
<td>100</td>
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</table>

#### Retail Sales by Customer Sector (GWhr)

<table>
<thead>
<tr>
<th></th>
<th></th>
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<th></th>
<th></th>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Residential</td>
<td>3,109</td>
<td>3,376</td>
<td>3,733</td>
<td>2</td>
<td>45</td>
<td>43.4</td>
<td>41.8</td>
</tr>
<tr>
<td>Commercial</td>
<td>1,621</td>
<td>2,207</td>
<td>3,062</td>
<td>7.3</td>
<td>23.5</td>
<td>28.4</td>
<td>34.3</td>
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<tr>
<td>Industrial</td>
<td>1,847</td>
<td>1,841</td>
<td>1,604</td>
<td>−1.6</td>
<td>26.8</td>
<td>23.7</td>
<td>17.9</td>
</tr>
<tr>
<td>Other</td>
<td>327</td>
<td>349</td>
<td>538</td>
<td>5.7</td>
<td>4.7</td>
<td>4.5</td>
<td>6</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>6,905</td>
<td>7,773</td>
<td>8,937</td>
<td>2.9</td>
<td>100</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

*From EIA State Electricity Profiles 2002*
Wholesale Market

- Transmission allows utilities to make bulk power transfers and take advantage of energy cost differences
- In 1992, FERC opened up transmission system to all generators, thus deregulating the wholesale energy market
- Safeguards reliability. It established “rules of the road” for transmission operation.
- MAPP assures any new additions to the transmission system will maintain or enhance reliability, not harm it.
Independent System Operator

- Coordinates regional planning
- Ensures equal access to transmission system
- Maintains or improves transmission reliability
- Operate energy market starting 3/1/05
Today’s Challenges

- Aging system
- Growing electric usage
- Changing role of system
- Generation additions
- FERC Requirements to build for Transmission Service requests
- Transmission Constraints/ Lack of ATC
Aging Transmission System

- Portions 35 to 50 years old while others are between 50 and 80 years old.
- Limited expansion over last two decades
  - Portions of system at or near capacity
  - Problems dealing with load growth
  - Problems dealing with new generation
Electric Demand Has Grown

- Electricity usage in Midwest has steadily grown
  - 1993-2002 2.9% annually*
- Some of the fastest growing (electrically) parts of the U.S. are in the Upper Midwest

* Source: EIA State electricity profiles
Changing Roles

- Results in regional issues
  - Additions or deficiencies in South Dakota may affect service in neighboring states
  - Requires planning coordination
  - MISO starting an energy market 3/1/05

“It’s a delicate balance!”
New generating facilities

Generation in Combined Queues

Features Legend
- Other
- Wind
- Gas
- Coal

Miles

0 70 140
MISO Queue

- Currently
  - 21,000 MW of unstudied requests
  - Consists of 121 separate projects
- Since the open of the queue in Oct. 1998
  - 32,000 MW in 170 requests have been studied
  - 57,000 MW in 76 requests have been withdrawn
MISO has issued a statement indicating that there are too many requests in the queue for the system to handle. Upgrades will need to be made and studies will take longer than usual.
Transmission Service from New Generation to Load

- Two Part Process
  - Generation Interconnection
    - Evaluates the impact of the interconnection on the system
  - TSR
    - Evaluates the impact of the delivery on the system
- Does not cover state routing process
MISO Transmission Service Request

TSR Process Overview

Tariff Specified Times

Delivery Service = 195 Days
MAPP Process

- Request service
- Validate Request – 7 days
- MAPP Request Evaluation Process – 7 days
  - Determines impact on constrained paths and available ATC
- Execute System Impact Study Agreement – 15-30 days
- Perform System Impact Study – 60 days
  - Determines reliability issues
- Execute Facilities Study Agreement – 15-30 days
- Perform Facilities Study – 120 days
  - Determines upgrades needed to fix reliability issues
WAPA Interconnection and TSR Process

**STEP 1.** Contact Western and submit application

**STEP 2.** System impact study and agreement

**STEP 3.** Facilities study and agreement

**STEP 4.** Environmental review process

**STEP 5.** Land acquisition process

**STEP 6.** Design and construction

**STEP 7.** Interconnection agreement, review and testing, and energize

**STEP 8.** Project close-out

**LEGEND**
- Standard process flow
- Information, funding, or other input into process flow
- Milestone
- Supporting action process
- Separate but parallel process (transmission service, environmental review and land acquisition)

**NOTE:** This diagram shows the full standard process for interconnection in a general chronological order. In actuality, the steps may overlap, be consolidated or otherwise be expedited, when appropriate.

The interconnection process does not guarantee transmission service, which is a separate but parallel process detailed within Western’s Open Access Transmission Service Tariff. It is not a substitute for formally requesting transmission service through the Tariff.
Comparison of Processes

- **MISO**
  - TSR ~ 200 days
  - GI ~ 600 days

- **MAPP**
  - TSR ~ 180 days
  - GI ~ 300 days

- **WAPA** (generally performed in coordination w/ MAPP process)
  - TSR ~ 180 days
  - GI ~ 300 days
New Generation in SD

- **Angus Anson III**
  - 205 MW Gas unit
  - Expected to be online in 2005

- **Big Stone II**
  - Up to 600 MW of Coal
  - Expected to be online in 2011

- **Coal Coalition**
  - Up to 600 MW of Coal
  - Expected to be online in 2013
  - Sites include: Leland Olds ND, Gascoyne ND, Selby SD, Yankton SD, and Modale IA

- **Wind**
  - Numerous projects proposed in the eastern and central parts of the state
  - WAPA is currently studying what upgrades would be needed to support various amounts of wind
MAPP Constraints
## MAPP TLRs

### MAPP Flowgates

During the period From 1/1/2001 through 6/30/2002

<table>
<thead>
<tr>
<th>Flowgate Name and ID Number</th>
<th>Two Account For 83% of MAPP TLR Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooper S 6009</td>
<td></td>
</tr>
<tr>
<td>Baulaire-Arpin 345 KV 3006</td>
<td></td>
</tr>
<tr>
<td>MHEX_N 6003</td>
<td></td>
</tr>
<tr>
<td>WHE_VKS 6007</td>
<td></td>
</tr>
<tr>
<td>PRI-BYN 6012</td>
<td></td>
</tr>
<tr>
<td>MHEX_S 6002</td>
<td></td>
</tr>
</tbody>
</table>

TLR Level:
- 5B
- 5A
- 4
- 3B
- 3A
- 1
- 0
Transmission Projects

- **Split Rock to Lakefield 345 kV line**
  - Associated with the Buffalo Ridge Wind

- **White-Yankee-Buffalo Ridge 115 kV**
  - Associated with the Buffalo Ridge Wind

- **Watertown to Brookings to Sioux Falls 115 kV reconductor**
  - Will be built to 230 kV standards for future upgrades

- **Rapid City DC tie**
  - 200 MW tie between the East and Western interconnects
  - Online in October of 2003
Observations

- Any major generation project will have to get transmission service out of SD
- Any major generation projects in SD will require transmission into MISO footprint
- SD generation will have to follow process in MAPP and MISO
- MISO market will create barriers to SD generation