Market Power and Electricity Market Reform in Northeast China

Zhang Xiaochun and John Parsons
Timeline

- 1985 -- end of the central govt monopoly in generation
  - provincial and local governments
  - state owned enterprises
  - private investors, including foreign investors
1997 – corporatization

- transmission and generation assets moved from the Ministry of Electric Power to a State Power Corporation of China
- parallel reforms at provincial and local levels
Timeline (cont.)

2002 -- break-up of SPC

- 2 main grid companies, with regional and provincial subsidiaries
- 5 main generation companies
- assorted engineering and other companies
- creation of a regulator, SERC or State Electricity Regulatory Commission, but continued involvement of NDRC in economic & industrial strategy
Regional Grid Cos

The State Grid Corp. of China (SGCC) operates the majority of the territory, including... Northwest, North, Northeast, Central & East.

The South China Grid Corp. operates the South Grid. This is a joint venture owned by the central government and provincial governments of Guangdong and Hainan.
Generation Cos

- 5 Gencos...majority owned by the central government
  - Datang
  - GuoDian
  - HuaDian
  - Huaneng
  - China Power Investment Corp.

- Assured that no company had more than 20% of the generating assets in any region.

- State Grid also has generation.

- Other 54% of generation continues...provincial, local, IPPs

- Ownership structure is inadequately reported.
Timeline (cont.)

■ **2004 -- Regional grids, uniform management & dispatch, increased geographic exchanges of power**

■ **2004 -- Development of market for wholesale power**
  - experiments had occurred in 2000-2001 in 5 provinces & 1 city; primarily simulation and generally of little consequence; many problems.
  - Northeast region started in January 2004; simulation first, trial operation for limited capacity; unsatisfactory results and no settlement; suspended pending decisions about how to move forward.
  - East region started in 2005 with simulation, a pair of auctions in 2006 with settlement.
  - South region started in 2006.
  - Others announced.
  - Single buyer system: generators sell to the grid, and the grid sells to consumers; parallel to long-term contracts.
  - Integration with reform of electricity tariff system is unclear.

■ **Next ???**
Our Analysis -- the Northeast Region

Liaoning, Jilin, Heilongjiang and the eastern portion of the Inner Mongolia Autonomous Region, encompassing the Hulunbeier League, Xingan League, Tongliao City and Chifeng City.
## Northeast Region -- Overview

<table>
<thead>
<tr>
<th>Territory</th>
<th>[a]</th>
<th>Population [c]</th>
<th>GDP [e]</th>
<th>[f]</th>
<th>[g]</th>
<th>Electricity Generation [h]</th>
<th>Electricity Consumption [j]</th>
</tr>
</thead>
<tbody>
<tr>
<td>NE</td>
<td>1,249</td>
<td>120</td>
<td>2,109</td>
<td>17,600</td>
<td>238</td>
<td>236</td>
<td>1,961</td>
</tr>
<tr>
<td>L</td>
<td>146</td>
<td>12%</td>
<td>926</td>
<td>44%</td>
<td>21,700</td>
<td>101</td>
<td>42%</td>
</tr>
<tr>
<td>J</td>
<td>187</td>
<td>15%</td>
<td>425</td>
<td>20%</td>
<td>15,600</td>
<td>46</td>
<td>19%</td>
</tr>
<tr>
<td>H</td>
<td>454</td>
<td>36%</td>
<td>622</td>
<td>29%</td>
<td>16,300</td>
<td>65</td>
<td>27%</td>
</tr>
<tr>
<td>IM</td>
<td>462</td>
<td>37%</td>
<td>136</td>
<td>6%</td>
<td>11,400</td>
<td>27</td>
<td>11%</td>
</tr>
</tbody>
</table>
Figure 2
Generation Capacity by Province

Installed capacity: 48 GW

Liaoning: 18 GW, 39% of the total
Jilin: 11 GW, 23%
Heilongjiang: 13 GW, 28%
E. Inner Mongol: 5 GW, 10%
Figure 3
Generation Capacity by Installation Size

Liaoning
- 100 MW > 17%
- 500-100 MW 32%
- > 1,000 MW 36%
- 1,000-500 MW 15%

Jilin
- 100 MW > 13%
- 500-100 MW 32%
- > 1,000 MW 40%

Heilongjiang
- 100 MW > 18%
- 500-100 MW 18%
- > 1,000 MW 28%
- 1,000-500 MW 26%

e. Inner Mongolia
- 100 MW > 7%
- 500-100 MW 16%
- > 1,000 MW 51%
Figure 4
Generation Capacity by Fuel Type

- **Liaoning**
  - Wind: 1%
  - Hydro: 8%
  - Thermal: 91%

- **Jilin**
  - Wind: 2%
  - Hydro: 35%
  - Thermal: 63%

- **Heilongjiang**
  - Wind: 1%
  - Hydro: 6%
  - Thermal: 93%

- **e. Inner Mongolia**
  - Wind: 6%
  - Hydro: 6%
  - Thermal: 88%
Figure 5
Generation Capacity by Outlet

Liaoning
- Self-Gen: 15%
- Sold: 85%

Jilin
- Self-Gen: 7%
- Sold: 93%

Heilongjiang
- Self-Gen: 20%
- Sold: 80%

e. Inner Mongolia
- Self-Gen: 9%
- Sold: 91%
Figure 6
Generation Capacity by Ownership
# Market Power in Trial Operation 2005

<table>
<thead>
<tr>
<th>Company</th>
<th>Capacity in MW</th>
<th>Market Share</th>
</tr>
</thead>
<tbody>
<tr>
<td>[1] Datang</td>
<td>1,406</td>
<td>7%</td>
</tr>
<tr>
<td>[2] Guodian</td>
<td>2,420</td>
<td>11%</td>
</tr>
<tr>
<td>[3] Huadian</td>
<td>5,420</td>
<td>25%</td>
</tr>
<tr>
<td>[4] Huneng</td>
<td>4,940</td>
<td>23%</td>
</tr>
<tr>
<td>[5] CPIC</td>
<td>2,200</td>
<td>10%</td>
</tr>
<tr>
<td>[6] Jizhou</td>
<td>1,200</td>
<td>6%</td>
</tr>
<tr>
<td>[7] Suizhong</td>
<td>1,600</td>
<td>7%</td>
</tr>
<tr>
<td>[8] Hunjiang</td>
<td>400</td>
<td>2%</td>
</tr>
<tr>
<td>[9] Yuanbaoshan</td>
<td>1,500</td>
<td>7%</td>
</tr>
<tr>
<td>[10] Nenggang</td>
<td>400</td>
<td>2%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>21,486</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

- Huadian and Huaneng 48%
- CR4 = 70%
- HHI = 1,582
Market Power in Trial Operation 2005

- Datang: 7%
- Guodian: 11%
- CPIC: 10%
- Huneng: 23%
- others: 24%

- Huadian and Huaneng: 48%
- CR4 = 70%
- HHI = 1,582
Market Power in Trial Operation 2006

<table>
<thead>
<tr>
<th>Company</th>
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<tbody>
<tr>
<td>[1] Datang</td>
<td>1,405</td>
<td>7%</td>
</tr>
<tr>
<td>[2] Guodian</td>
<td>2,430</td>
<td>12%</td>
</tr>
<tr>
<td>[3] Huadian</td>
<td>5,420</td>
<td>27%</td>
</tr>
<tr>
<td>[4] Huneng</td>
<td>4,700</td>
<td>23%</td>
</tr>
<tr>
<td>[5] CPIC</td>
<td>2,805</td>
<td>14%</td>
</tr>
<tr>
<td>[6] Suizhong</td>
<td>1,600</td>
<td>8%</td>
</tr>
<tr>
<td>[7] Nenggang</td>
<td>400</td>
<td>2%</td>
</tr>
<tr>
<td>[8] Yuanbaoshan</td>
<td>1,500</td>
<td>7%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>20,260</strong></td>
<td><strong>100%</strong></td>
</tr>
</tbody>
</table>

- Huadian and Huaneng 50%
- CR4 = 76%
- HHI = 1,759
Market Power in Trial Operation 2006

- In Liaoning, Huaneng has 35% of the competitive capacity.
- In Jilin, Guodian has 50% of the competitive capacity.
- In Heilongjiang, Huadian has 62% of the competitive capacity.
- When there are transmission constraints and power shortages, there might be significant concentrations of market power in these provinces.
# Prospects for an Expanded Regional Market

Excluding All Facilities Self-Generation

<table>
<thead>
<tr>
<th>Region</th>
<th>CR4</th>
<th>HHI</th>
<th>CR4</th>
<th>HHI</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>[a]</td>
<td>[b]</td>
<td>[c]</td>
<td>[d]</td>
</tr>
<tr>
<td><strong>Northeast Region</strong></td>
<td>50%</td>
<td>770</td>
<td>58%</td>
<td>1,035</td>
</tr>
<tr>
<td><strong>Liaoning</strong></td>
<td>44%</td>
<td>580</td>
<td>51%</td>
<td>803</td>
</tr>
<tr>
<td><strong>Jilin</strong></td>
<td>83%</td>
<td>1,925</td>
<td>89%</td>
<td>2,202</td>
</tr>
<tr>
<td><strong>Heilongjiang</strong></td>
<td>67%</td>
<td>1,837</td>
<td>84%</td>
<td>2,850</td>
</tr>
<tr>
<td><strong>E. Inner Mongolia</strong></td>
<td>87%</td>
<td>2,427</td>
<td>96%</td>
<td>2,952</td>
</tr>
<tr>
<td><strong>Trial Regional Market</strong></td>
<td>76%</td>
<td>1,759</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Thanks