International energy cooperation of Inner Mongolia power company
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International energy cooperation
Part 1  Inner Mongolia grid

1.1 Structure of the grid

1.2 Structure of the power source

1.3 Clean energy (wind and solar)
Part 1 Inner Mongolia grid

1.1 Structure of the grid
Inner Mongolia power company (IMPC) is a special large-sized state-owned enterprise, operating the central and western grid of China's Inner Mongolia Autonomous Region (usually call west Inner Mongolia grid). The power supply area covers 720,000 square kilometers. Inner Mongolia power company at No. 252 of Fortune China 500.

In 2017, IMPC completed 167.887 billion kilowatt hours of electricity sold, up 14.63 percent year-on-year.
1.1 Structure of the grid—scale (By the end of 2017)

- 500kV Substations: 26  Capacity: 51000MVA
- 220kV Substations: 139  Capacity: 52929MVA
- 500kV Power lines: 6280km
- 220kV Power lines: 20043km
1.1 Structure of the grid—500kV grid structure (By the end of 2017)
By 2020, Inner Mongolia grid will form “4 lengthwise and 5 transverse “500kV main grid.
Part 1  Inner Mongolia grid

1.2  Structure of the power source
1.2 Structure of the power source—installed capacity (66,000MW)

- Biomass 140 MW
- Hydro 1860 MW
- Wind&Solar 2,230 MW
- Thermal 41700 MW
1.2 Structure of the power source—Proportion

<table>
<thead>
<tr>
<th></th>
<th>Capacity (MW)</th>
<th>(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>66000</td>
<td></td>
</tr>
<tr>
<td>Thermal</td>
<td>41700</td>
<td>63.3</td>
</tr>
<tr>
<td>Hydro</td>
<td>1860</td>
<td>2.8</td>
</tr>
<tr>
<td>Wind</td>
<td>16500</td>
<td>25.0</td>
</tr>
<tr>
<td>Solar</td>
<td>5800</td>
<td>8.7</td>
</tr>
<tr>
<td>Biomass</td>
<td>140</td>
<td>0.2</td>
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</table>
Part 2 International energy cooperation

2.1 current situation

2.2 The research of grids interconnection
2.1 current situation

2.2 The research of grids interconnection
2.1 current situation

Power transmission project to Mongolia (by the end of 2017)

<table>
<thead>
<tr>
<th>Area</th>
<th>Xilin Gol</th>
<th>Bayan Nur</th>
<th>Alxa</th>
<th>Baotou</th>
</tr>
</thead>
<tbody>
<tr>
<td>Border port</td>
<td>Zhuengada buqi</td>
<td>Erenhot</td>
<td>Ganqimaodao (GuoHe)</td>
<td>Ceke</td>
</tr>
<tr>
<td>Power line</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Voltage class (kV)</td>
<td>35</td>
<td>10</td>
<td>220</td>
<td>10</td>
</tr>
</tbody>
</table>

Map showing the areas Xilin Gol, Bayan Nur, Alxa, Baotou, Zhuengada buqi, Erenhot, GuoHe, Mandula, and Ceke port.
The project has already supply power to OT mine more than 6 billion kilowatt hours since November 2012. IMPC and relevant Mongolian enterprises have organized several exchanged visits in recent years and the two sides established the strategic cooperative partnership, marking a new stage of development for the corporation. With the deepening of the cooperation, in May and June 2017, IMPC, Mongolia national grid and OT company signed the 4 + 2 years Electricity Purchase Contracts.
Part 2  International energy cooperation

2.1 current situation

2.2 The research of grids interconnection
2.2.1 Introduction

Research idea

Planning year

- Analyze natural resources of the 3 areas
- Estimate cooperation direction
- Provide the near-term and mid-term grids interconnection plans, envision the long-term plan

- Analyze current grid and grid planning of the 3 areas
- Estimate the time of power systems interconnection

- Analyze different ways of grids interconnection
- Select suitable grids interconnection way
2.2.1 Introduction

- **Research idea**
- **Planning year**

**Near-term (2020)**
- Supply power for southern Mongolia from Inner Mongolia grid

**Mid-term (2030)**
- Come up with the grid interconnection plans between China and Mongolia, basing on the connection of Mongolia central grid and southern grid.

**Long-term (2050)**
- Envision the long-term power systems interconnection plan among China, Russia, and Mongolia.
2.2.2 Analysis of necessity

- **Near-term**

- **Mid-term & Long-term**

### (1) Supply power for South Mongolia mining enterprises

The southern region of Mongolia is planning to develop several mines and the saynshand development zone. Mongolia power supply capacity is insufficient; its southern grid is weak and remote from Mongolia central grid, unable to meet the needs of the region’s power load. Supply power from Inner Mongolia grid could satisfy the needs of new load in the near future.

### (2) Supply power for port regions

The China-Mongolia borderline in Inner Mongolia is 3103 km. In west Inner Mongolia, there are existing 7 ports open to Mongolia. The continuing growth of bilateral trade scale will lead considerable growth of power.
2.2.2 Analysis of necessity

**Near-term**

- **(1) Promote the Belt and Road Initiative**
  Enhance the grids interconnection will promote the Belt and Road Initiative.

**Mid-term & Long-term**

- **(2) Realize complementary advantages**
  Through the interconnection of the power grids, it will realize resource complementation and in line with common expectation of China, Russia and Mongolia.

- **(3) Improve the reliability of Mongolia grid**
  By strengthening the power grids connection between China and Mongolia, it will improve the reliability of Mongolia grid.
2.2.3 Interconnection plans — Inner Mongolia grid and Mongolia grid

**Near-term**

- Plan 1: Several 220kV power delivery channels

**Mid-term**

**Long-term**

- Plan 2: Single 500kV power delivery channel
2.2.3 Interconnection plans — Inner Mongolia grid and Mongolia grid

Grid plan

- **Near-term**
- **Mid-term**
- **Long-term**

**200kV power lines**

- TT Mine
- Saynshand 1
- Saynshand 2
- East Gobi plant
- OT Mine
- TT Plant
- Mark Mine
- Hanji Port
- Mandula Port
- GuoHe
- YuLong
- Mandula
- GuoHe
- 200kV power lines
- Mid-term
- Long-term
2.2.3 Interconnection plans — Inner Mongolia grid and Mongolia grid

**Near-term**

- OT Mine
- TT Plant
- TT Mine
- TT Plant
- Mark Mine
- Wyynshand 1
- Wyynshand 2
- East Gobi plant
- 500kV power lines

**Mid-term**

- GuoHe
- WuZhongQi
- Hanji Port
- Mandula Port

**Long-term**

- Yulong
- East Gobi plant
- Hanji Port
- Mandula Port
- 500kV power lines
Through detailed demonstration, the two types of grids interconnection meet the demand for power system stability analysis.
2.2.3 Interconnection plans — Inner Mongolia grid and Mongolia grid

Grid plan

- Near-term
- Mid-term
- Long-term

Investment estimation

- **Plan 1**: Gross investment: 3 billion ¥

- **Plan 2**: Gross investment: 3.3 billion ¥
2.2.3 Interconnection plans — Inner Mongolia grid and Mongolia grid

Grid plan | Plan1 | Plan2
---|---|---

Three types of power system interconnection

- AC synchronous interconnection: form a larger synchronous grid.
- DC asynchronous interconnection: form an asynchronous grid, including grids with different frequency.
- Synchronized AC/DC hybrid system: form a smart synchronous grid which takes advantages of the high flexibility of DC power system.
2.2.3 Interconnection plans — Inner Mongolia grid and Mongolia grid

**Grid plan**

- **Plan1**
- **Plan2**

**AC synchronous interconnection**

- **Mid-term**
- **Near-term**
- **Long-term**

**Case 1**
- Inner Mongolia grid
- Mongolia south grid
- Mongolia main grid
- 360km

**Case 2**
- Inner Mongolia grid
- Mongolia south grid
- Mongolia main grid
- 360km
- 240km
- 400km
2.2.3 Interconnection plans — Inner Mongolia grid and Mongolia grid

**Grid plan**

- **Plan 1**
- **Plan 2**

**AC synchronous interconnection**

- **Near-term**
- **Mid-term**
- **Long-term**

**Mongolia main grid**

**Mongolia south grid**

**Inner Mongolia grid**

**Case 3**

420km
2.2.3 Interconnection plans — Inner Mongolia grid and Mongolia grid

- **Grid plan**
- **Plan 1**
- **Plan 2**

**AC/DC hybrid system**

- **Near-term**
- **Mid-term**
- **Long-term**

**Case 1**

- **Mongolia main grid**
- **Mongolia south grid**
- **Inner Mongolia grid**
- **BTB converter station**
2.2.3 Interconnection plans — Inner Mongolia grid and Mongolia grid

Grid plan

Plan 1

Plan 2

AC/DC hybrid system

2.2.3 Interconnection plans — Inner Mongolia grid and Mongolia grid

Grid plan

Plan 1

Plan 2

AC/DC hybrid system

2.2.3 Interconnection plans — Inner Mongolia grid and Mongolia grid

Grid plan

Plan 1

Plan 2

AC/DC hybrid system

2.2.3 Interconnection plans — Inner Mongolia grid and Mongolia grid

Grid plan

Plan 1

Plan 2

AC/DC hybrid system

2.2.3 Interconnection plans — Inner Mongolia grid and Mongolia grid

Grid plan

Plan 1

Plan 2

AC/DC hybrid system
2.2.4 Interconnection plans —long-term

The future orientation of Inner Mongolia grid: power distribution center among China, Russia, Mongolia, Power delivery hub of China, Russia, Mongolia
Policy: Each country has its own policy and law, how to coordinate with each other is a big challenge.

Security: How to keep security and stability after the interconnection and the problems of operation and dispatching need to be further studied.

Economy: Grids interconnection is a huge project, how to ensure investment economy and achieve mutual benefits need our joint effort.
Thank you!

- Strong Grid
- Excellent Service
- Splendid Culture
- Lean Management
- Scientific Management