CHALLENGES AHEAD AND WAY FORWARD:
Fostering Renewable Energy Deployment in Mongolia

ENKHTUVSHIN Ganbaatar
Ph.D candidate
GETPPP,
Green school, Korea University

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Seoul, Rep of Korea
Table of Contents

• Introduction
  • Mongolian Energy Sector

• Mongolian Regulatory and Investment Framework on Renewable Energy Development
  • Investment Environment
  • Energy Regulation

• Limitations to Renewable Energy Deployment
  • Local factors
  • Regional factors

• Way Forward
Introduction

Map 1. Energy Atlas of Mongolia

Total GDP (current U$D): 11,16 billion
Population: 3,120,606
GNI per capita (current U$D): 3550
Surface area: 1,566,000 km² (19th)
Power installed capacity: 1186.5 MW
Energy mix: 92% CHP, 6% Wind & Solar PV’s, 2% Hydro
Energy access to grid: 98%
Government: Unitary-Parliamentary republic

Source: worldbank.org /2016/
Overview of Investment Plan:
First phase 2015-2023
1. BOT 450MW CHP-S in CES;
2. IPP Tavan Tolgoi 450 MW TPP SES;
3. BOT Baganuur 700 MW TPP CES;
4. Initiate Export oriented Big scale TPP and HVDC project;
5. BT Egiin HPP CES;
6. BT TPP WES;
7. BT Khovd River HPP WES;
8. BOT Dornod 100MW TPP EES;
9. BT Telnem 100 MW TPP WES;
10. Construct over 300 MW Solar PV and Wind farm;
11. Construct transmission lines such Baganuur-Choir, Ulaanbaatar-Mandal Govi, Baganuur-Ulaanbaatar, Baganuur-Undurkhaan-ChoiBalsan, Choir-Sainshand, Mandal Govi-Aralkheer, Ulaanbaatar-Uliastai-Durgunii roughs;
Second phase 2024-2030
1. Start power export based on Large scale export oriented TPP and HVDC transmission lines;
2. Construct 300 MW Selenge River HPP;
# Table of Contents

- **Introduction**
  - Mongolian energy sector

- **Mongolian regulatory and Investment Framework on Renewable energy Development**
  - Investment environment
  - Energy regulation

- **Limitations to Renewable energy Deployment**
  - Local factors
  - Regional factors

- **Way Forward**
Mongolian regulatory and Investment Framework on Renewable energy Development: Investment environment

• Signatorie of Paris accord;
  • NDC
  • RE share 30% until 2030,
  • Improve EE

• Signatorie of International Energy Charter:
  • Energy trilemma
  • The need for diversification of energy sources and routes
  • Role of enhanced energy trade for sustainable energy development
  • Etc …
Mongolian regulatory and Investment Framework on Renewable energy Development: Investment environment

- **Concession Law 2010**
  
  Establish the framework for granting concessions to private investors to use existing infrastructure facilities owned by the state, and to construct new infrastructure facilities for the purpose of providing services to the general public.

- **Investment Law 2013**
  
  Protect the legal rights and interests of investors in the territory of Mongolia, to establish a common legislative guarantee for investment, to stabilize the tax environment.

**Coal Fired TPP’s for Export purpose:**
- 9600 MW Shivee Ovoo Thermal Power Plant /Government/;
- 4 other TPP’s combined capacity of 8360 MW /Private/;

**Renewable energy:**
- Egiin HPP /Government/;
- Erdeneburen HPP /Government and Private/;
- Sain Shand wind farm /private/;
- Tsetsii wind farm /private/;
Mongolian regulatory and Investment Framework on Renewable energy Development: **Energy regulation**

- Renewable Energy Act /2007, 2015/: Stipulated Feed-In-Tariff (Encouraging tariff)
  - Solar PV: 0.15-0.18 cent;
  - Wind farm: 0.08-0.095 cent;
  - HPP up to 5 MW: 0.045-0.06 cent;
- Energy Efficiency Act /2015/
- National Energy Policy Document /2015/: 2\textsuperscript{nd} Term 2024-2030. Export secondary energy and sustainable energy development;
- Government Action Plan /2016-2020/: By maintaining local electricity supply-demand sustainably, initiates power export projects to PRC;
Table of Contents

• Introduction
  • Mongolian energy sector

• Mongolian regulatory and Investment Framework on Renewable energy Development
  • Investment environment
  • Energy regulation

• Limitations to Renewable energy Deployment
  • Local factors
  • Regional factors

• Way Forward
Limitations to Renewable energy Deployment

Local factors

1) Higher Loss of Transmission & Distribution Network:
   • Long transmission & distribution lines to lower demand – lowest population density in the world
   • Overload in distribution network in the cities
   • Aging of distribution network

2) Lack of Investment:
   • Low capacity of State Budget
   • High political risk
   • Low tariff of Domestic Power System
   • Payback period of investment is comparatively long and huge investment is needed in short period

3) Lack of Transparency and Governance

4) Climate Risk due to harsh weather

5) Renewables development capacity limits due to insufficient load demand and base load supply
Continue: Tariff Comparison in some Countries

Figure 1. Tariff Ratio /US cents/

<table>
<thead>
<tr>
<th>Country</th>
<th>Industrial</th>
<th>Households</th>
</tr>
</thead>
<tbody>
<tr>
<td>Singapore</td>
<td>19.2</td>
<td>21.6</td>
</tr>
<tr>
<td>Japan</td>
<td>16.2</td>
<td>22.5</td>
</tr>
<tr>
<td>South Korea</td>
<td>7.4</td>
<td>8.5</td>
</tr>
<tr>
<td>Philippines</td>
<td>14.5</td>
<td>18.4</td>
</tr>
<tr>
<td>Thailand</td>
<td>7.4</td>
<td>10.4</td>
</tr>
<tr>
<td>Denmark</td>
<td>9.9</td>
<td>32.3</td>
</tr>
<tr>
<td>UK</td>
<td>14.4</td>
<td>20.4</td>
</tr>
<tr>
<td>Switzerland</td>
<td>12.2</td>
<td>20.6</td>
</tr>
<tr>
<td>USA</td>
<td>12.6</td>
<td>14.9</td>
</tr>
<tr>
<td>Canada</td>
<td>10.7</td>
<td>11.4</td>
</tr>
<tr>
<td>Slovenia</td>
<td>7.6</td>
<td>11.6</td>
</tr>
<tr>
<td>Hungary</td>
<td>8.5</td>
<td>13.9</td>
</tr>
<tr>
<td>Poland</td>
<td>8.5</td>
<td>13.2</td>
</tr>
<tr>
<td>Romania</td>
<td>8</td>
<td>7.5</td>
</tr>
<tr>
<td>China (Northern)</td>
<td>10.7</td>
<td>14</td>
</tr>
<tr>
<td>Russia</td>
<td>14</td>
<td>4.9</td>
</tr>
<tr>
<td>Mongolia</td>
<td>5.3</td>
<td>8.5</td>
</tr>
</tbody>
</table>
Continue:

• Due to depressed energy tariff, the sector is suffering from with high FIT off take /FIT is 2-3 times higher than residential sector/;

• Renewable development capacity limits due to lower load demand and supply side characteristics of base load;

• System impact studies of Renewable energy generation should be taken place;

• Mongolian Energy system is independent energy system. However, annual import of electricity is around 20% or 120.0 – 150.0 million US.D.

Sheet 3. Every time additional capacity starts operation, supporting tariff is added to customers bill:

<table>
<thead>
<tr>
<th>Ex)Recent RE developments</th>
<th>50 MW Wind farm</th>
<th>50 MW Wind farm</th>
<th>10 MW Solar PV</th>
<th>10 MW Solar PV</th>
<th>Total RE supporting tariff</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.0020 US cents/kWh</td>
<td>0.0020 US cents/kWh</td>
<td>0.000424 US cents/kWh</td>
<td>0.000424 US cents/kWh</td>
<td>0.005 US cents</td>
</tr>
</tbody>
</table>

Source: ERC of Mongolila
Limitations to Renewable energy Deployment

Regional factors

- Strong Geopolitical risk factors;
- Strong Inter-Governmental organization is needed;
- Government’s commitment to support private initiative;
- Payback period of investment is comparatively long and huge investment is needed in short period;
- Lack of strong incentives from private business and industrial lobby groups, specially demand side;
- Feasible Business model (Softbank/Private/ - KEPCO/Public/ - SGCC/Public/ - Ministry of Energy/Public/ + Rosseti /Public/)
- Lack of recognition of cross border electricity trade;
Northeast Asia Super Grid (Appr. 2000 km HVDC)

Map 3. Grid Interconnection of NEA

Source: Pre feasibility study ECS /2014/
Table of Contents

• Introduction
  • Mongolian energy sector

• Mongolian regulatory and Investment Framework on Renewable energy Development
  • Investment environment
  • Energy regulation

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  • Local factors
  • Regional factors

• Way Forward
Way Forward

• BP Energy outlook 2017: *The world economy continues to electrify: nearly two-thirds of the increase in global energy consumption over the Outlook is used for power generation. This rising share partly reflects a shift in consumer preferences towards electricity as a fuel that is clean and convenient at the point of use.*

• IEA Energy Outlook 2017: *In 2016, there were 750,000 electric cars sold worldwide, taking the Global stock around 2 million. Already data, communication centres consuming 2% of total power generation.*

• Crypto currencies and emerging technologies tend to increase energy consumption gradually;

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**Figure 2. Global average cost of selected technologies**

<table>
<thead>
<tr>
<th>Year</th>
<th>Solar PV Cost</th>
<th>EV Battery Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>500 dollars</td>
<td>200 dollars</td>
</tr>
<tr>
<td>2020</td>
<td>400 dollars</td>
<td>150 dollars</td>
</tr>
</tbody>
</table>

**Source: IEA Energy Outlook**

**Figure 3. Share of power sector in primary energy consumption**

**Electricity consumption per capita**

**Source: BP Energy Outlook**
Way Forward

• Promising increase in energy demand in future;
• Countries with strong economic background;
• Develop fully operational and interconnected energy union;
• Promote the integration of renewable energies;
• Reduce GHG emissions;
• Grid investments is generally a very cost efficient way to improve the electricity system;
• Multiple benefits from interconnectors;
• Curtailment is greatly reduced by market integration;
• Effective use of Natural resources;
• 2GW transmission concept prepared;
• ADB proposed NAPSI project (Mongolian Power Trade Strategy: Northeast Asian Power System Interconnection);
THANK YOU FOR YOUR ATTENTION

Contact e-mail: tuvshee_g@hotmail.com