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DH in Mongolia – Energy efficient and cleaner heating in Ulaanbaatar

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Ulaanbaatar District Heating Company,
Mongolia
Country feature:
Land area 1,553,556 sq km, 19th rank in the world
Population 3.0 million, 45% lives in Ulaanbaatar
Mongolia is ranked 15th in the world for coal resources.

Climate condition:
Mongolia is high elevated cold, and windy. It has an extreme continental climate.
The winter is cold with January averages dropping as low as −35 °C. A vast front of cold, heavy, shallow air comes in from Siberia.

Mongolia has 21 province, western provinces more cold during winter...

Type of heat resource province’s centre

- Combined heat and power station – 4
- Heat plant – 5
- Heat only boiler – 9
Ulaanbaatar, the **capital** and also the **largest** city in Mongolia. And the most **coldest capital** city in the world. Thus, heating is most important factor for living in comfort.

**Average monthly temperatures**
Ulaanbaatar district heating system OVERVIEW

- CHP – 2 est in 1961
- CHP – 3 est in 1968
- CHP – 4 est in 1983

Major investments starting from 1990s:
Investor: ADB, WB, Korea, JICA, others
Receiver: CHPs, UBDHC, Public CHCs

Buildings with
Individual heat exchangers

Ulaanbaatar district heating company
est in 1959

Private HC
With 40 group substations

Public CHC
With 130 group substation
Shareholders

- Current corporate form 1990 as state owned company
- Ministry of Energy (Share ratio: 41%)
- Ministry of Finance (Share ratio: 20%)
- State Property Committee (Share ratio: 39%)

Human resource & Organization

- Human resource - Total 336
- Organization - 12 Departments
  - 25 Teams

Current corporate form 1990 as state owned company
Company introduction

- CHP-2: 3.1%
- CHP-3: 35.4%
- CHP-4: 61.5%

8 boosting pump stations;
375.9 km of heating network;
Connected heat load 1625 Gcal/h;

New HOB under construction supply East area of UB
Company introduction

Sales & Outlook

Heat distribution, million Gcal/year

<table>
<thead>
<tr>
<th>Year</th>
<th>2009</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sales &amp; Net Income</td>
<td>20.3</td>
<td>26.1</td>
<td>28.7</td>
<td>30.5</td>
<td>35.9</td>
<td></td>
</tr>
</tbody>
</table>

[Unit: Million USD]
Regulatory framework and legislation

- Energy Law
  - Law on Concessions
  - Energy regulatory commission
    - Public CHC belongs to The housing and common public service administration
      - Private HC
      - Private HOB
Heat efficiency in Ulaanbaatar district heating sector

After project, DIRECT CONNECTED 20%

- Renovated heating equipment such as pump and steam pipes (12.3 million USD)
- Installed heating units in order to transfer to indirect mode. (13.6 million USD)
- Installed mixing loops in residential buildings (14.1 million USD)
Operational efficiencies increased by 20%

Saves 48 thousand Gcal/year through separation

Created heat resource capacity 150 Gcal/h in CHP3, 4

Saved 676 thousand USD from electricity expense

Economical results at the plants by implementing HEAT EFFICIENCY PROJECT
Contribution of Ger’s, CHP’s and HOB’s to UB air pollution

- The GER areas include traditional GER and individual houses.
- They use simple stoves for heating and cooking. There are 164,503 individual stoves fired coal and wood.

Impact of heat resource’s to air pollution

<table>
<thead>
<tr>
<th></th>
<th>CHP</th>
<th>Ger area’s</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td>PM10</td>
<td>3%</td>
<td>5%</td>
<td>48%</td>
</tr>
<tr>
<td>SO2</td>
<td>5%</td>
<td>7%</td>
<td>88%</td>
</tr>
<tr>
<td>NO2</td>
<td>8%</td>
<td>18%</td>
<td>7%</td>
</tr>
<tr>
<td>CO</td>
<td>0%</td>
<td>73%</td>
<td>23%</td>
</tr>
</tbody>
</table>
Heat efficiency in Ulaanbaatar district heating sector

Clean energy through “GER area re-planning” project with PPP, 2015~2020, in 22 subarea
Selected District Heating Sector
Challenges of Ulaanbaatar

Heat growth by Ulaanbaatar urban plan 2014~2030

Chingeltei district
Heat load : 77.3 Gcal/h
Buildings : 143

Bayangol district
Heat load: 100.4 Gcal/h
Buildings : 143

Sukhbaatar district
Heat load : 76.0 Gcal/h
Buildings: 139

Bayanzurkh district
Heat load : 186.8 Gcal/h
Buildings: 413

Khan-Uul district
Heat load : 580.2 Гкал/ц
Buildings : 1024

Songino khairhan district
Heat load: 197.4 Gcal/h
Buildings: 395

TOTAL
Heat load: 1218 Gcal/h
Buildings: 2605
Selected District Heating Sector
Challenges of Ulaanbaatar

District heating institutional state comparison with European countries

<table>
<thead>
<tr>
<th>Cities</th>
<th>Generation</th>
<th>Transportation</th>
<th>Distribution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ulaanbaatar</td>
<td>3 state-owned CHPs + HoB</td>
<td>UBDHC</td>
<td>21 CHCs + private suppliers</td>
</tr>
<tr>
<td>Warsaw</td>
<td>1 private production company</td>
<td>1 transmission and distribution private company</td>
<td></td>
</tr>
<tr>
<td>Vilnius</td>
<td>1 integrated private Company</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kiev</td>
<td>1 integrated private Company</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Almaty</td>
<td>State-owned CHPs</td>
<td></td>
<td>Municipal DH Company</td>
</tr>
</tbody>
</table>

Breakdown of heat supply /sales/ UBDHC

- 31% Heat supply provided to CHC /unmetered/
- 47% Heat supply provided to private suppliers /metered/
- 15% Other heat supply /metered/
- 7% Other heat supply /unmetered/
On going project by PPP agreement

Power generation

- Plant name and type: “Amgalan” HOB
- Client: China Energy Machinery Corporation
- Capacity, heat: 300 MW
- Statement: Under construction, complete in Oct. 2015
  /Open bidding/

- Plant: CHP#5
- Client: Consortium of Newcom LLC, International Power Plc”, Sojitz Corporation, Posco Energy
- Capacity: Electricity 450 mWh, heat 504 mWh
- Statement: Under PPA discussion
  /Concession: Build-own-operate-transfer/
GIS based UBDH integration system /2015-2017/

On going project

Web GIS  Mobile GIS  Desktop GIS

Data server

Information ready to use

GIS server

IT engineer

Engineers and Field employee
Our focus on future: Reduce heat loss

In 2014, transmission and distribution heat loss was 18.4%.

By 2030 we are focusing to reduce heat loss till 12%
Our focus on future:
Peak load boiler or waste to energy plant
in high elevated and farthest area from CHP

Unit capacity: 70~80 Gcal/h
Fuel: Gas or coal

CHP4 elev - 1266 meter
CHP3 elev - 1278 meter
CHP2 elev - 1276 meter
17th school elev - 1345 meter
Bayankhoshuu elev - 1401 meter
Dambadarjaa elev - 1356 meter
Dari-Ekh elev - 1358 meter
Zaisan elev - 1370 meter
Our focus on future:
Thermo Technical Rehabilitation project

Reduce the demand of some 500 pre-cast panel apartment buildings that were built between 1965 and 2000.

1970s black and white

2015, LED and 3D

1970s Cast iron

2016-2018
Panel radiator with thermostat valve and heat allocator
Conclusion

- Extend corporation with leading district heating companies to share experience and know-how and bring out new technology such as peak load boiler, waste to energy and heat accumulator.
- Well sequenced, comprehensive institutional reform and management. /PPP, Leasing, privatization/
- Support consumption covering tariffs motivate energy savings. Especially for residential inhabitants.
- Expand DHN or develop individual heating network to reduce air pollution from ger areas with PPP
- Develop Thermo Technical Rehabilitation project with PPP
THANK YOU
for paying attention