Geothermal Resources and Utilization in Tibet and the Himalayas

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Geothermal Resources in Tibet

• Over 600 Natural Geothermal Manifestations
  – Boiling springs, 45
  – 80°C~Boiling, 7
  – 60°C~80°C, 83
  – 40°C~60°C, 109

• The number of geothermal manifestations has been the second range, as well as the boiling springs occupy a half of total in China, and the high temperature geothermal resources ranks the first in whole Nation.
Geothermal Resources in Tibet

Distribution map of active structures and high temperature geothermal fields in Tibet
Geothermal Resources in Tibet

Distribution map of high temperature geothermal fields along the Qinghai-Tibet railway.
Geothermal Resources in Tibet

Tagejia geyser
Geothermal Resources in Tibet

Tagejia geyser
Geothermal Resources in Tibet

Karwu boiling spring in Sagia county—93°C
# Geothermal Resources in Tibet

<table>
<thead>
<tr>
<th>Division</th>
<th>Manifestation locations</th>
<th>Spring temp. in ave. °C</th>
<th>Reservoir temp. °C</th>
<th>Exploitable resource MW</th>
<th>Reservoir area km²</th>
<th>Resources $10^{18}$ J</th>
</tr>
</thead>
<tbody>
<tr>
<td>S. Tibet</td>
<td>234</td>
<td>58.19</td>
<td>142.76</td>
<td>80,962.9</td>
<td>255.60</td>
<td>1,558.33</td>
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<tr>
<td>Central Tibet</td>
<td>151</td>
<td>46.42</td>
<td>120.19</td>
<td>115,643.0</td>
<td>130.11</td>
<td>729.58</td>
</tr>
<tr>
<td>E. Tibet</td>
<td>190</td>
<td>39.73</td>
<td>105.63</td>
<td>76,669.7</td>
<td>82.00</td>
<td>469.70</td>
</tr>
<tr>
<td>W. Tibet</td>
<td>49</td>
<td>51.40</td>
<td>134.02</td>
<td>17,639.7</td>
<td>47.49</td>
<td>231.86</td>
</tr>
<tr>
<td>N. Tibet</td>
<td>40</td>
<td>9.60</td>
<td>76.58</td>
<td>7,915.1</td>
<td>5.00</td>
<td>106.98</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>664</strong></td>
<td></td>
<td></td>
<td><strong>298,830.4</strong></td>
<td><strong>520.20</strong></td>
<td><strong>3,096.45</strong></td>
</tr>
</tbody>
</table>

Resources $3,096.45 \times 10^{18}$J
Exploitable Resources $298,830.4$MW
Geothermal Resources Utilizations in Tibet

- High temperature geothermal power generation
  - Total capacity 28.18MW, which 25.18MW in Yangbajian, 2MW in Langjiu, 1MW (binary unit) in Nagqu
  - The first generation unit of Yangbajian power plant was built in 1977, and has been running over 30 years continuously
  - The annual generation of Yangbajian power plant is about 100 GWh in recent years, and the total generation has reached 2,120 GWh for the end of 2007
  - The capacity was no increase since 1990
Geothermal Resources Utilizations in Tibet

No.2 branch of Yangbajian geothermal power plant
Generation of Yangbajian power plant from 1977 to 2005
Geothermal Resources Utilizations in Tibet

![Pie graph of Central Tibet power grid—2005](image)
Geothermal Resources Utilizations in Tibet

• **Direct use of medium-low temperature geothermal**
  – Geothermal greenhouse
  – Hot spring bathing
  – Medical care
  – Tourism
  – Space heating
  – Industrial Washing: sheep’s wool and tinkalite
Geothermal Resources Utilizations in Tibet

• Geothermal greenhouse

Yangbajian geothermal greenhouse
Geothermal Resources Utilizations in Tibet

- Geothermal Greenhouse

Nagqu Geothermal Greenhouse
Geothermal Resources Utilizations in Tibet

• Hot Spring Bathing and Medical Care
  – Simplified conditions in many places
  – Almost no establishment
  – Outdoor pool or simplified house

Tagejia
Geothermal Resources Utilizations in Tibet

- Hot spring bathing

Karga in Xietongmen county
Geothermal Resources Utilizations in Tibet

• Tour projects

Ningzhong geothermal field, Dangxiong county
Geothermal Resources Utilizations in Tibet

- Tour projects

Karga in Xietongmen county
Geothermal Resources Utilizations in Tibet

- Space Heating
Conclusions and Expectations

• Conclusions
  – There is abundant geothermal resource in Tibet.
  – The level of exploitation and utilization of geothermal resource is low in Tibet.
  – It’s potential for utilization of geothermal resource for heat with respect of resource and market.
Conclusions and Expectations

• Expectations
  – To build demonstrated base for high-temperature geothermal resource exploitation and utilization, and bring along Yunnan, Fujian, Taiwan, etc.
  – Utilization of high-temperature geothermal resource should be enhanced for power generation in Yangbajing and Yangyi.
  – Thermal waste water from the Yangbajing geothermal power plant could be transported to Lhasa for heating to realize high-temperature geothermal resource business.
Conclusions and Expectation

• Expectations
  – To develop direct-use of medium-low temperature geothermal sources and strengthen infrastructure construction, and realize economic benefit.
  – To develop technique of investigation, exploitation and utilization, and form integrated system for exploiting and utilizing geothermal resource.
Welcome to Tibet