MANAGEMENT OF GEOTHERMAL RESOURCES IN TIANJIN

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INTRODUCTION

1996: Mineral Resources Law

- Mineral resources shall be owned by the State.
- Anyone who wishes to explore or to mine mineral resources shall apply for and obtain upon approval, and shall carry out the registration procedures.
- The department in charge of geology and mineral resources under the State Council shall be responsible for supervising and administering the exploration and mining of mineral resources throughout the country.
- The State shall adopt the system that exploration and mining rights are to be obtained with compensation.
- Anyone who mines mineral resources must pay resources tax and mineral resource compensation of relevant provision of the State.
LAWS AND SYSTEM IN TIANJIN

- **1995:** Provision of Geothermal Resources Management in Tianjin
- **2001:** Regulation of Mineral Resources in Tianjin
- **2006:** Plan of Geothermal Development and Utilization In Tianjin (2006-2010)
Registering to Explore Geothermal Resources

- TBLRREM under Tianjin Municipality
- Application for exploration rights
  - Feasibility research
  - Evaluation of Reimbursement fee for exploration right
- Related expenses
  - Fee for the use of exploration rights (exploration fee)
  - Reimbursement fee for exploration right
- Determination of the mineral resources areas for exploration with Block Registration System
- Period of validity for an exploration license:
  - ≤3 years
- Obligations of exploration licensees
Registering to Mine Geothermal Resources

- TBLRREM under Tianjin Municipality
- Application for mining rights
- Related expenses
  - Mining fee
  - Reimbursement fee for mining right
  - Geothermal resource compensation
- Period of validity for a mining license:
  - the magnitude of the mining project
  - < 30 years
- Obligations of mining concessioners
System of the Supervision and Examination of Geothermal Production

- The administrative department (TBLRREM) in charge of geology and mineral resources supervises and examines the geothermal production.
  - the limits of its mining area
  - mining design or plan of mining
  - Production evaluation of single well’s reserves
  - production technique and safety and environmental protection measures
  - Monitoring of the water level, temperature, flow rate and quality of geothermal well
Plan of Geothermal Development and Utilization In Tianjin (2006-2010)

- Three planning sub-areas:
  - restricted productive zoning
  - allowable productive zoning
  - geological survey zoning
Layout of Ng group in Tertiary
新近系馆陶组规划图
6/18/2008

Layout of Jxw in Proterozoic
蓟县系雾迷山组规划图
Main Objects of Planning

- Controlling the increasement of geothermal production rate
  - 2010 production rate $\leq 3300 \times 10^4 \text{m}^3/\text{a}$

- Reinjection
  - All of the geothermal water used for space heating will be reinjected in new projects.
  - Adding some new reinjection wells for old geothermal space heating system.
  - 2010 reinjection rate $\geq 600 \times 10^4 \text{m}^3/\text{a}$
Main Objects of Planning

- Temperature of waste water $\leq 25^\circ C$
- Rebuilding or reequipping the old geothermal station, to improve the geothermal efficiency.
- Geothermal automatic monitoring system.
- New encouraging policy and tax incentive to encourage reinjection and resources protection.
Incentive Policies of Geothermal Reinjection & Comprehensive Use

- Permit process for mining geothermal resources
- Tax shelter
  - 70% mineral resource compensation of the reinjection rate is exempt for the doublet system
- Governmental subsidy
  - protection projects of mineral resources
  - Commonweal scientific funds by Geothermal resource compensation
Example Analysis

Geothermal Space Heating System in Haihe New World residential area

- Mineral Resources Protection Projects in 2007
- Building area: 235,000m²

<table>
<thead>
<tr>
<th>Geothermal Well</th>
<th>Drilling time</th>
<th>Depth (m)</th>
<th>Temperature (°C)</th>
<th>Flowrate (m³/h)</th>
<th>TDS (mg/L)</th>
<th>Remarks</th>
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<td>82</td>
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<td>2006.3</td>
<td>1388.6</td>
<td>48.5</td>
<td>43.92</td>
<td>&gt;4000</td>
<td>Domestic hot water</td>
<td>Production</td>
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</table>
- **Undertaken by**: Heat-Supplying Company of Hedong Bureau of Real Estate Management
- **Designed by**: Geothermal Institute of Tianjin Ganquan Group Ltd. and Tianjin University
- 2007, the financial support of US$340,000 (2.4MRMB) from the Ministry of Finance
- Initial investment: US $1600,000 (11MRMB)
- Annual overall operational cost: US$420,000
  - US$2.3 per unit area of space heating
- Compared with the space heating by coal-fire boiler
  - initial investments of geothermal station is US$280,000 higher
  - running cost can be saved about US$130,000 every year
- Saving energy and decrease emission:
  - 6100 tons of standard coal
  - 42.7 tons coal dust
  - 183 tons sulphur dioxide
  - 55 tons nitrogen dioxide
  - 4700 m³ carbon dioxide
Discussion

- Drilling reinjection well for the early single production wells
  - Large scale production —— rapidly drawdown of water level
- Reconstruction of the old geothermal station
  - Wellhead facilities
  - Pipeline
- Lack of funds and space
- Plan and incentive policies have been put forward since 2006, which has strong feasibility under the guidance and support from the government.
CONCLUSIONS

- The policies and regulations are effective measures to promote exploration, development, utilization and protection of geothermal resources in Tianjin. Some related policies will be implemented in the future.

- Since 2006, the geothermal mining-rights shall be paid for by the mining concessioner with a geothermal mining fee. The detailed specifications for managing the use of the funds mentioned above will be formulated in the near future by the department in charge of geothermal resources jointly with the department in charge of finance under the City Municipality.
CONCLUSIONS

- Geothermal monitoring and reinjection should be an essential part of sustainable geothermal utilization.
- Jointly with the department in charge of finance and space heating, some policies will be established for encouraging the combination and optimization of early geothermal utilization systems. Therefore, the development of geothermal resources will be continued.
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