Chapter 4

Recommendations to Policy Makers

1. The Most Important Policy Relevant Findings

The most important barriers common for power generation and direct use/GSHP in many member countries are:

a) lack of knowledge on geothermal energy use,

b) lack of legislation/business mechanism,

c) lack of technical information and/or experience, and

d) lack of economic incentives and high exploration/installation cost.

- For a) and c), education of both experts and ordinary people is needed.
- For b), creation of decent legislation system is necessary.
- For d), cost problems in the short term should be solved by economic incentives given by the government with proper legislation system. That, in the long term, should be solved by technology development which also needs R&D support from the government.
- Since many important barriers are inter-related, systematic support by the government is essential.

Direct benefits automatically obtained from geothermal power/heat plant installation are:

- Electricity or heat production,
- National energy security (domestic energy),
- Saving fossil fuels,
- Saving energy cost (sales price of electricity or heat),
- Saving land (amongst renewable energy),
- CO_2 mitigation,
- Saving cost for CO_2 mitigation,
- Benefits for local economy: new employment, businesses with exploration and development staffs, and
- Development of the local region (in cases of rural areas).

In many cases, indirect benefits have much larger significance to the local economy than direct benefits. Indirect benefits obtained by additional economic activity using excess heat of geothermal power plant are:

- New businesses such as greenhouse agriculture, fish farming, sport facilities by cascade heat use or mineral extraction from geothermal fluid.

For GSHP, direct benefits automatically obtained by installation are:

- Saving electricity,
- National energy security (domestic energy),
- Saving fossil fuels,
- Saving energy cost,
- Reduction of urban heat island phenomenon, and
- CO_2 mitigation by replacement from heater by fossil fuels (direct) and by saving electricity (indirect).

Indirect benefits obtained by additional economic activity using GSHP are:

- New businesses such as greenhouse agriculture, fish farming, sport facilities (swimming pools), etc.

2. Recommendations

The followings innovations are recommended to remove barriers to geothermal power generation:

Policy aspect:

- Set target on geothermal development. It should be described in national policy with roadmap and bound to national energy policy.
- Give economic incentives to geothermal business. Note that although FiT or RPS is effective, in many cases FiT or RPS is not sufficient for the private sector because of high exploration risks and high initial cost of geothermal energy development. Government support in each stage, such as R&D, subsidies for exploration and drilling, low-interest loans, and/or tax reductions are recommended.
- Create systems for capacity building and open data access. International collaboration in information exchange, case studies, and technology transfer should be encouraged.
- Conduct the following, if not yet done:
  - ✓ National demonstration projects to show best practice to investors,
  - ✓ Cooperation with other countries on research projects, capacity building, and technical and economic cooperation,
  - ✓ Inter-ministry cooperation in the government, and
  - ✓ Tax exemption for importing materials and equipment for geothermal development.

Social aspect:

- Create a good business mechanism. A mechanism contributing to local economy and welfare, and national policy on environment and energy security would be recommended for business sustainability.
- Strengthen capacity building. Education programmes at university level or higher to strengthen expertise and a social system for sustainable human resources (to keep experts in technology fields) are necessary.
- Enhance geothermal publicity through social media for public acceptance.
- Zoning by the government is needed in case of controversy with other land uses and environmental matters.

Legal aspect:

- Set laws or regulations for geothermal resource management. Rights of developers and necessary legislation process should be described in laws or Acts (legal framework). Also, geothermal development towards other land uses from environmental aspects should be given priority.
- Set up one-stop shops for simple permit and authorisation process. Especially if comprehensive geothermal law does not exist, existence of official one-stop shops for faster permission process is essential to encourage the private sector.

Fiscal aspect:

- Set risk fund (insurance scheme) or low-interest loans for geothermal exploration.
- Give drilling support (subsidies and/or risk fund).
- Give economic incentives (FiT/RPS) especially for technically difficult resources, such as low-temperature, deep, small-scale, acid-fluid, etc., with effective duration and price.
- Give tax incentives such as environmental incentives for renewable energy.

Technical aspect:

- Conduct investigations on geothermal resource reserves as national project.
- Provide open data access to previous geological exploration achievements. If there are conflicts with existing regulations, give access at least for research purpose. Sharing data from other sites may largely reduce exploration risks.
- Give strong support for R&D especially for deep EGS reservoir creation.
- Conduct national demonstration projects to show best practice for technology development to investors and to find real problems at the site.
- Promote international cooperation especially on:
  - ✓ Development of new technologies for exploration surveys

- ✓ Collaborative research on scaling, erosion, and corrosion
- ✓ Sharing best practices on reservoir management
- ✓ Capacity building: training of experts abroad

For ground source heat pump (GHSP), the followings innovations are recommended:

Policy aspect:

- Give geothermal-specific policy to drive expansion of residential applications.

Legal aspect:

- Give legal incentives for green energy (not penalty but reward) to GSHP.
- Set accurate monitoring schemes of load factors and system COPs for both technical and social awareness of GSHP benefits.
- Set government supervision of reservoir management (especially on injection) for sustainable use of reservoirs for direct use by the community.

Technical aspect:

- Conduct research to 1) compile suitability maps in a regional scale and 2) optimise GSHP system based on the local hydrogeological and thermal condition, targeting a) accurate GSHP system design (reduction of installation/running cost), b) sustainable use of GSHP, and c) raising awareness of GSHP.
- For direct use, conduct R&D of technical part of injection especially into sandstone range.

Fiscal aspect:

- Support R&D for hydrogeological field surveys, case studies, and long-term monitoring.
- Subsidise new installations of GSHP system in private residential buildings.

Appendix 1 (Form of the inquiry surveys for geothermal power generation)

Inquiry on Barriers to Geothermal Power Generation in Your Country

1. Please provide following information by check a box or fill on the underlines.

Your name: ☐Mr., ☐Ms., ☐Dr., ☐Prof. _____ (Optional)

Affiliation: University (☐teacher, ☐student), ☐Research institute, Government officer (☐federal, ☐local)
Company (☐manufacturer, ☐developer, ☐consultant/technical service, ☐banker/insurance)
Others (specify:)

Background: Period of involvement in geothermal power-related businesses or researches (_____ years/_____ months)

2. Please evaluate the contribution of barriers in your country and fill the value in numbers (%).

Evaluation by your personal opinion is requested.
The total must be 100 (%).

		(Example)	Your answer
Policy	National Energy Policy		
	Lack of Economic Incentives (subsidies, FiT, tax reduction, etc.)		
	Lack of R&D Funding		
	Refusal of Foreign Technology or Expert for Domestic Business/Info. Protection		
	Others (please specify:)		
Social	Lack of Expert	25	
	Lack of Awareness		
	Lack of Knowledge, Wrong Information		
	Lack of Business Model	15	
	Other Land Uses		
	Public Acceptance (PA)		
	Others (please specify:)		
Legal	Environmntal Matters (national parks, forestry, etc.)		
	Legislation or Business Mechanism	10	
	Lack of Incentives (from environmental or energy security aspects)		
	Others (please specify:)	5	
Fiscal	High Exploration Cost	10	
	Low Selling Price		
	No Loan from Banks nor Support from Government		
	Others (please specify:)		
Technical	Lack of Information or Experience (general)		
	Exploration Technology		
	Data Integration or Interpretation	30	
	Drilling		
	Scaling, Errosion	5	
	Reservoir Engineering and Management		
	Others (please specify:)		
TOTAL (%)		100	100

Thank you!

Appendix 2 (Form of the inquiry surveys for direct use and GSHP)

Inquiry on Barriers to Geothermal Energy Use in Your Country

(Direct Use / Ground Source Heat Pump)

1. Please provide following information by check a box or fill on the underlines.

Your name: ☐Mr., ☐Ms., ☐Dr., ☐Prof. _____ (Optional)

Affiliation: University (☐teacher, ☐student), ☐Research institute, Government officer (☐federal, ☐local)
Company (☐manufacturer, ☐developer, ☐consultant/technical service, ☐banker/insurance)
Others (specify: _____)

This sheet is your answer for: ☐Ground Source Heat Pump (GSHP), or ☐Other Direct Use of geothermal heat.
Background: Period of involvement in geothermal/GSHP related business or research (_____ years/_____ months)

2. Please evaluate the contribution of barriers in your country and fill the value in numbers (%).

Evaluation by your personal opinion is requested.
The total must be 100 (%).

		(Example)	Your answer
Policy	National Energy Policy		
	Lack of Economic Incentives (subsidies, tax reduction, etc.)	15	
	Lack of R&D Funding	5	
	Others (please specify:)		
Social	Lack of Expert	5	
	Lack of Awareness		
	Lack of Knowledge, Wrong Information	10	
	Lack of Business Model		
	Others (please specify:)	15	
Legal	Environmntal Matters (protection of groundwater, etc.)	10	
	Legislation or Business Mechanism		
	Lack of Incentives (from environmental aspects or energy security)	10	
	Others (please specify:)		
Fiscal	High Installation Cost		
	No Loan from Banks nor Support from Government		
	Others (please specify:)		
Technical	Lack of Information or Experience (general)	25	
	Lack of hydrogeological Information		
	Lack of Installation Technology		
	Lack of Heatpump Makers		
	Others (please specify:)	5	
TOTAL (%)		100	100

Thank you!