Regulatory framework and preparation of geothermal power plants in Iceland – practical experience and obstacles

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Abstract

The regulatory framework in Iceland regarding environmental impact assessment and necessary permits must be taken into account at different stages of planning and preparing geothermal power plants. Before deciding on exploitation the next stage following recognition of a feasible geothermal area is the drilling of exploration wells to investigate and model the capacity of the geothermal resources. In some areas the developer must carry out an EIA on exploratory drilling before necessary permits are granted. An EIA is always required before permits are granted for construction of a new geothermal power plant. A study of comparable exploratory drilling projects in three geothermal areas in Iceland reveals great differences in how long it takes developers to obtain the necessary permits. In one case the developer's choice of drill site was not accepted after two EIA processes. Another project was accepted following an EIA but has not yet been granted necessary permits to start drilling. At the third location permits have been granted for the drilling of seven exploration wells without an EIA being required. A definitive national policy and plan on utilization in geothermal areas would support developers in planning future geothermal power plants and prevent costly investigations during the exploratory stages if they are unlikely to lead to exploitation.

***Keywords**: geothermal, exploration, utilisation, EIA, permits, policy.*

1 Introduction

In recent years there has been a growing interest in Iceland in the exploration and exploitation of high temperature geothermal energy as a clean and renewable energy source. The national policy is to increase use of domestic energy sources, in real terms and in proportion to imported fossil fuel and by the year 2000 the proportion of renewable energy had reached 70% of Iceland's total energy budget (Ministry for the Environment 2002).

The planning of a geothermal power plant can be subject to a wide range of legislation. In some cases this can lead to a complicated and long-term process of permit applications, environmental studies and development planning before consent for the project is granted.

In Iceland environmental impact assessment (EIA) has been carried out on the drilling of exploration wells, geothermal power plants, and extensions of such projects. Comparison of these projects generates valuable information for future planning. Official handling of permit applications, environmental assessment plans and EIA of comparable geothermal projects can vary greatly and obtaining consent for similar geothermal projects has been known to take anything from a few months to a couple of years. The results of this study will hopefully be an aid to future developers planning research and utilisation of high temperature geothermal resources in Iceland.

2 Legal framework

It is impossible to cover the whole legal framework in this paper. The aim is to give an idea of the Icelandic regulatory system regarding permits and environmental aspects and how this must be taken into account when planning and preparing geothermal projects.

2.1 Icelandic legislation

The following is a list of laws (Icelandic Parliament 2003) that primarily concern geothermal project development in Iceland:

- ***Act on Research and Use of Underground Resources No. 57/1998:*** According to this act the developer must apply for an exploration permit before starting further research and drilling of exploration wells. The developer must apply for an utilisation permit before starting construction of a power plant. Developers earn priority to utilisation permits by obtaining exploration permits in geothermal areas.
- ***Energy Act No. 65/2003:*** Developers planning to exploit geothermal resources for producing more than 1 MW electric power must apply for operation permits according to this act.
- ***Environmental Impact Assessment Act No. 106/2000:*** According to this act projects that may have significant effects on the environment are subject to EIA. Developers are responsible for the EIA and bear the cost. The Planning Agency delivers a ruling on the EIA and decides whether a project can be accepted or is opposed.
- ***Planning and Building Act No. 73/1997:*** According to this act to obtain development permits substantial development projects shall be in accordance with development plans and decisions on environmental impact assessment.
- ***Nature Conservation Act No. 44/1999:*** Certain types of landscape and habitats enjoy special protection according to this act. Amongst these are hot springs and other thermal sources, surface geothermal deposits, volcanic craters and lava fields – all of which are frequent features in high temperature geothermal areas.

2.2 Planning a geothermal project

Before starting any planning of research or development the geothermal area will already have been recognized by preliminary field assessment and research, including geological mapping and sampling. The regulatory framework for planning exploration by drilling and exploitation of geothermal resources is shown as a flowchart in Figure 1. The main stages of permit application before construction of a geothermal power plant can start are as follows:

The first stage is to apply for an exploration permit in order that drilling can begin. This stage is very important when investigating geothermal resources for future exploitation. The Planning Agency decides whether an EIA is required. A development permit for drilling can be issued when the Planning Agency has reached a decision and accepted the proposed project.

New geothermal power plants are always subject to an EIA in Iceland. If the developer decides on further development following a feasibility study the next stage is conducting an EIA. Development permits, utilisation permits and permits for operation of the power plant can be issued when the project has been accepted by the Planning Agency.

There has been a shortage of plans and official policy on what areas to utilise or whether they should be protected. A proposed Master Plan (Rammaáætlun 2003) for the utilization of hydro and geothermal energy resources is currently being prepared. A report on the first stage is expected to be made public late summer 2003.

3 Experience and obstacles

The time it takes to obtain consent from the authorities depends not only on official policy. Other determining factors are what plans already exist on development and nature conservation in the area as well as what environmental information is available. In some cases plans must be changed or new plans prepared. Potential geothermal areas are often located in landscapes that are protected by law. Preparation of comparable geothermal projects in similar areas can take different courses when the authorities make their decisions.

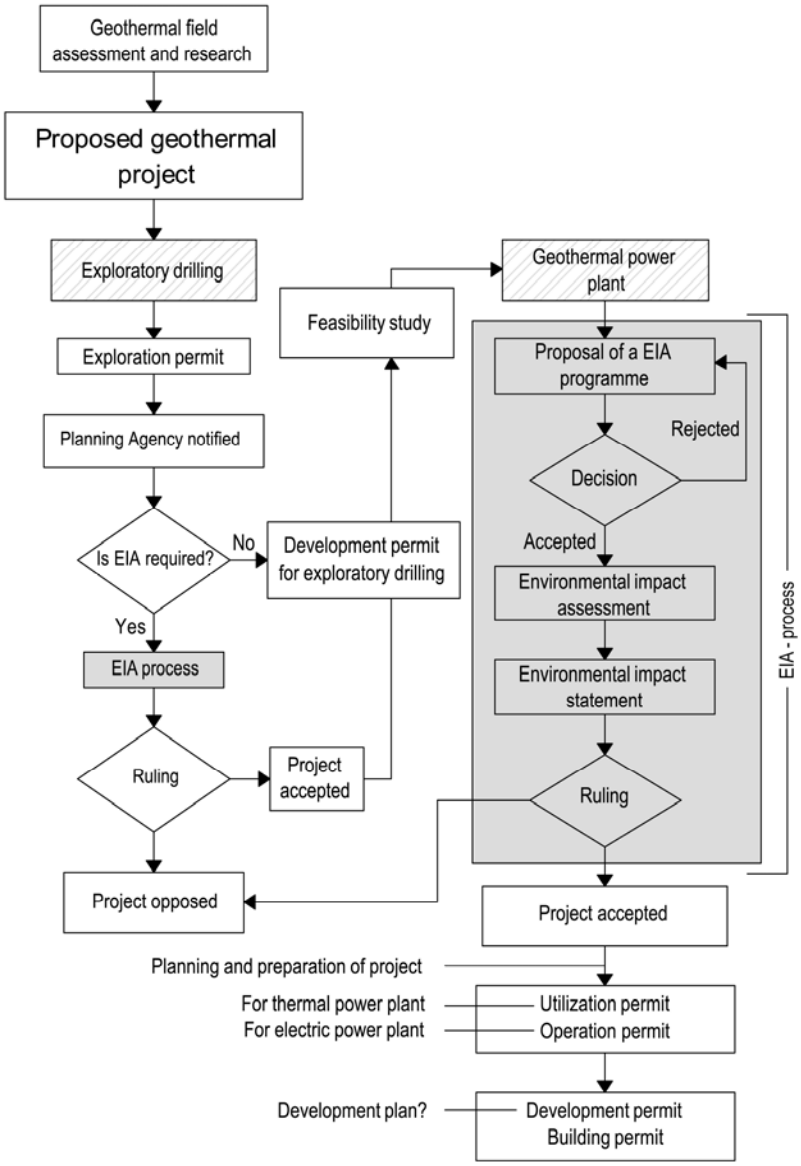

Figure 1: Flowchart on regulatory framework in Iceland.

3.1 Environmental impact assessment

The developer himself pays for most of the research on the geothermal resources in Iceland and he is also responsible for the EIA and collecting necessary environmental data. In many other countries most of the data the developer or his consultants need in order to carry out an EIA is easily obtained from official databases.

It is impossible to plan and prepare a geothermal power plant without the drilling of exploration wells, as this is necessary for further research and modelling on the capacity of the geothermal resources. Decisions on the feasibility of exploitation are based on the results. It can be difficult to assess the environmental impact of exploitation at the exploratory stage because of the authorities' demand for detailed information from the developer. At certain locations requirements for an EIA of the exploratory stage as well as exploitation leads to a repeated EIA process with extra expenses and delayed project development. In most cases the developer is not ready to present an EIA of both stages in the same environmental report (EIS), because the information gathered during the exploratory stage is required for assessing the effects of exploitation.

3.2 Geothermal projects

The object of our study was the official handling of proposed geothermal projects in eleven high temperature geothermal areas in Iceland (Figure 2) (projects prior to enforcement of the Icelandic EIA act in 1993 not included). Examples consisted of exploration permit application (Ministry of Industry and Commerce 2003), notification of projects for decision on EIA requirements, EIA programmes and EIA reports (Planning Agency 2003). Comparison of these cases reveals the main issues in the authorities' opinions on environmental effects of geothermal projects. The following issues are considered to affect their decisions on whether projects should require an EIA:

- Geographical location
- Geology and landscape
- Whether the area is exploited
- Relation to protected areas
- Recreational attraction
- Existing development plan

Projects of exploratory drilling in three geothermal areas are discussed in detail in the following sections: Krafla in NE-Iceland (VGK and Orkustofnun 2002) and Grændalur (VGK, Orkustofnun and Hönnun, 2001) and Hellisheidi, both in SW-Iceland (VGK 2002, 2003). The first project has been accepted after an EIA was carried out, but not all necessary permits have been granted. The second project was partly opposed following an EIA and will most likely not proceed. As far as the third project is concerned all necessary permits for drilling several exploration wells have been granted without an EIA being required.

3.2.1 Krafla

Landsvirkjun plans the drilling of exploration wells in the western part of the Krafla geothermal area in NE-Iceland (VGK 2002). The company received an exploration permit for seven years in 2002. According to the Nature Conservation Act No. 44/1999 and the Act on Conservation of lake Myvatn and the River Laxa No. 36/1974 the project is located in an area of natural interest. Part of the project involves the construction of a road to access the drill site. The Krafla geothermal power plant, recent volcanism and geothermal surface formations in the area attract tourists during the summer.

The Planning Agency (2003) decided that the Krafla project required an EIA. The Minister for the Environment (2001) confirmed the decision. An EIA was carried out and the project was accepted in 2002. Landowners appealed to the Minister for the Environment (2003) who confirmed the ruling. Exploratory drilling has not yet started two and a half years after permit application and must wait for a change to be accepted in the municipal plan.

3.2.2 Grændalur

Sunnlensk Orka proposed a project of exploratory drilling and an access road in the valley Grændalur SW-Iceland (Planning Agency 2003; VGK, Orkustofnun and Hönnun 2001). EIA was required according to an older EIA act No. 63/1993. Part of the project is in the Hengill-area listed as an area of natural interest. Geothermal springs and wetlands, both protected habitats, are common in the non-exploited valley and the area is popular for recreation. A municipal plan is in preparation.

Figure 2: Geothermal projects notified to authorities according to the EIA Act.

After a preliminary EIA the Planning Agency accepted drilling in one location but referred parts of the project to further EIA. A second EIA was carried out according to a new EIA Act No. 106/2000. The Planning Agency ruled against part of the project, due to significant impact on geothermal springs, wetlands, vegetation, geology, landscape and the recreational value of the area. The developer appealed to the Minister for the Environment (2001) who disallowed the ruling and accepted one location for drilling. Opposition to the developer's first choice of drill site and road construction was confirmed. The exploration permit issued for three years in June 1999 has expired and the project has been postponed.

3.2.3 Hellisheidi

Hellisheidi is south of the Hengill volcano in SW-Iceland. The Hengill area north of the proposed development site is an area of natural interest. Volcanic craters and lava fields, which are specially protected geological features, are common in the area surroundings. The area is popular for recreational activity. There are skiing facilities, roads, power lines and gravel pits in the proposed project area and a municipal plan is in preparation.

In May 2001 Orkuveita Reykjavikur obtained an exploration permit valid fifteen years and drilling of exploration wells started that summer, one year after the company applied for a permit. The exploration project is an important stage in planning exploitation of the geothermal resources and development of a geothermal power plant on Hellisheidi. Four stages of the project have been notified to the Planning Agency (2003) and none have required EIA. Development permits have been issued for seven exploration wells five are completed and two exploration wells will be drilled in 2003. The Planning Agency has accepted an EIA programme and a report is in preparation.

4 Conclusion

Because of the legal framework in Iceland planning of a geothermal power plant can be a complicated process. As discussed in the previous chapter three comparable projects of drilling exploration wells in high temperature geothermal areas have received different official treatment and only one has proceeded. A lack of official policy and plans on where to permit utilisation has made it difficult for developers to plan future exploitation of this renewable energy source.

The Planning Agency has raised the question on whether the impact of exploitation could possibly be assessed before accepting a project of drilling exploration wells (Hólmfrídur Sigurdardóttir 2002). Developers have thought this difficult because of the authorities' demand of detailed environmental information. It is possible that Icelandic authorities have set the standards too high in light of the lack of environmental information. EIA at the exploratory stage should not be the responsibility of the developer.

In our view it is important to simplify the legal framework in Iceland. This will enable authorities to make quick decisions on where to permit exploration and exploitation of geothermal resources at an early stage of project planning. We also ask whether authorities should not themselves carry out a preliminary EIA before granting exploration permits – especially in disputed areas. This would prevent developers from performing costly investigation during the exploratory and EIA stages if they are unlikely to lead to exploitation. A definitive government policy and plan on utilization in geothermal areas would support developers in planning future geothermal power plants.

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