



# Guidelines for Geothermal Projects

## Organisation and Competences

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## 1. Guidelines for organisation and competences in connection with geothermal projects

These guidelines deal with organising when engaging in exploration for and recovery of geothermal energy and the competences (here defined as the sum of knowledge and experience) being the foundation of good organising.

These guidelines are one of six guidelines concerned with geothermal projects in 2015 prepared for the Danish Energy Agency (DEA), and they should be studied parallel to the other five.

### Strategic approach to geothermal projects

Verification process for geothermal projects

Regulatory requirements

Organisation and competences

Content of standard contracts

Budgeting for and cost control of geothermal wells

The thoughts presented here on organising in principle are independent of the chosen type of contract. The type of contract is solely a question of to where - contractually seen - the individual elements of the organisation belong. By multi-contracts and individual trade contracts a major part of the project organisation will be contractually attached to the project owner, while in case of a total contract the majority of the project organisation will be subcontractors / suppliers to the main contractor. However, this means no change to the total project organisation. Whether he/she is employed by the project owner or by a main contractor a geologist is, for instance, continuously required at the drilling site during the drilling activities.

## 2. Project and operations organisation

Organisation is of paramount importance to the success of any project and to the optimal and safe operation of any process plant – and, thus, to the establishing and operation of any geothermal plant.

It is important to understand that establishing and operation of a geothermal plant naturally will take place as a succession of current and partly overlapping phases as a minimum consisting of:

1. Project development and maturing
2. Seismic pre-surveys
3. Drilling and testing
4. Surface installations
5. Operation

During each of these phases there will be a need for various competences, and, consequently, the organisation to a certain degree will have to be changed from one phase to the next one. Proposals for organisational diagrams and the related job descriptions are found in *Drejebog om geotermi* (Script on geothermics) and *Udredning om mulighederne for risikoafdækning i geotermiprojekter* (Memorandum on the possibilities for risk coverage of geothermal projects).

However, at the same time it is important to ensure part of the organisation to be maintained from phase to phase to keep a *red thread* running through establishing and operation of the geothermal plant.

Typically, the upper layers of the organisation – the project owner / concession holder and a possible advisory board – will be unchanged throughout the project. Furthermore, it is sensible to have an over-all project manager who can follow the development of the geothermal project all the way from initial idea to start-up and handing over to the operating organisation. It will be an advantage, too, to include the future operations manager in the organisation as early as during the arrival of the installations. Running a geothermal plant requires an overall understanding of the activities of the individual phases as well as an understanding of the special requirements for systematic control and follow-up materializing during all major construction projects.

### 3. Professional competences

If an organisation is to function as expected it is important that all positions are taken up by personnel possessing the necessary professional competences – and that such competences are duly documented.

It is going too far to describe in detail all the necessary competences for setting-up and operating a geothermal plant. Instead, reference is made to *Drejebog om geotermi* (Script on Geothermics) where more detailed descriptions on all the professional competences required are described.

Documentation of the competences required should be presented as:

- References (for external advisors, contractors and suppliers)
- CV (for key personnel, internal as well as external)

References and CVs should be checked via contacts to previous clients / partners.

### 4. Competence to take decisions

During the construction and operation of a geothermal plant a large amount of small and major decisions are to be taken – and probably a large number of persons should be involved as they in one way or another may or should contribute to the right decisions being taken.

For that reason, at an early stage it is important to state who in the organisation is authorized to take which decisions – and who is just supposed to give his/her opinion. A so-called Responsibility Matrix is a useful tool to provide a clear picture of competences and responsibilities in a project. The Matrix states four levels of authority:

- Executing: is responsible for handling / executing a certain task.
- Responsible: has the overall responsibility (to e.g. the owners and / or the authorities) for the above-mentioned task.
- Consulted: is to be consulted in connection with planning or execution of the task.
- Informed: is to be kept informed during and possibly after, too, the task has been completed.

An example of a filled-in matrix (a RACI Chart) is to be found as Appendix 5 to *Drejebog om geotermi* (Script on geothermics).

When drafting a Responsibility Matrix, it is important to state the allocated competence for decision, too. Here, it is important to ensure in advance that each decision is taken at the lowest possible and reasonable level of the organisation. This will ensure the project organisation at any time to be able to act efficiently and in a responsible way. Often, allocation of competence to decide may be a compromise between the need for including the (economically) responsible persons and the need for being able to take quick decisions to ensure progress and minimize cost. A solution might be to give a drilling manager and a

construction manager power of attorney to take decisions committing the company up to a certain amount of money.

## 5. The decision tree

During the construction of a geothermal plant it will be necessary to take some most important decisions – in some cases even under a considerable time pressure. This for instance may go for the drilling activities when measuring in the well, its temperature and tests of the yield of the reservoir may be decided if the project is to be continued as planned, if it is to be adjusted to the new conditions discovered, or – in the worst case – if it should be aborted. Often such decisions are to be taken while equipment and drilling crew are on standby, thus increasing the strain to take a decision as fast as possible to minimize standby costs.

Consequently, an efficient execution of a project requires all central decision processes to be well prepared. A useful tool for this is to draw up a *decision tree* mapping all possible contingencies and thereby forcing the involved persons to consider which parameters may decide the subsequent progress. An example of a decision tree is found on page 140 in *Drejebog om geotermi* (Script on geothermics).

The decision tree being visual and thereby easy to understand, should be supplemented by an appendix stating in more detail:

- The concrete criteria for a decision pointing one way or another.
- Risks to the project resulting from each decision.
- Who provides the input for the decision.
- When the decision is expected to be taken.
- Who – based on the provided facts and perhaps a proposal – takes the final decision.
- Who is to communicate the decision taken to whom.

## 6. Where to find more information?

- Udredning om mulighederne for risikoafdækning i geotermiprojekter  
(Memorandum on the possibilities for risk coverage of geothermal projects) (DEA, 2014)
- Drejebog om geotermi  
(Script on geothermics) (DEA, 2014)
- Vejledning om strategisk tilgang  
(Guideline on strategic approach to Geothermal Projects) (DEA, 2015)
- Vejledning om myndighedsbehandling  
(Guideline on Regulatory requirements) (DEA 2015)
- Vejledning om organisering og kompetencer i forbindelse med geotermi  
(Guideline on Organisation structure and competences related to geothermics) (DEA, 2015)
- Vejledning om modelkontrakter  
(Guideline on Content of standard contracts) (DEA, 2015)
- Vejledning om budget & økonomistyring for geotermiboringer  
(Guideline on Budgeting and cost control for geothermal wells) (DEA 2015)

## **7. Use of the guidance**

As everybody knows no two geothermal projects are alike, and the reader's attention is drawn to the fact that this guidance cannot and does not aim at replacing any concrete advice in the relevant area.

Thus, the guidance under all circumstances should be augmented by special advice on the project in question within planning, regulatory procedures, geology and geophysics, reservoir, drilling management and logistics, legal and insurance-related advice as well as any other type of assistance and advice.