

Site Selection in Germany - Start of the Evaluation of the Site Selection Law – 15561

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ABSTRACT

Since 2011 Germany is pursuing a phase out strategy concerning the use of nuclear power for electricity production. This decision was strongly influenced by the Fukushima event. In 2013 the federal government announced that they also had achieved an agreement with the Federal States in Germany on a law to restart the site selection for a repository for spent fuel and high active heat producing waste from scratch. The consequence of this law is a delay of at least two decades to start operation of a final disposal site and additional costs of at least EUR 2.7 billion. The new law was passed in July 2013.

At first a 34-member commission had been installed in April 2014 to evaluate the Site Selection Law and to develop basic principles for site selection, including safety requirements and selection criteria for rock formations. The commission includes representatives from the parliament, academia, civil society organizations, industry, the environmental organizations and trade unions and should forward its recommendations after a delay in starting the evaluation process now in 2016. The first author of this paper is member of the evaluation commission.

The present law has to be reviewed within this time span. The site selection then might start after the next federal election in 2017 probably based on a new site selection law. This new site selection law will take into account or even follow the recommendations of the evaluation group. A new repository site should be according to the present law determined till 2031 and for this site the more detailed site investigation will take place followed by a detailed safety analysis, before the erection of the repository can start. Based on the present procedural steps it seems to be rather unlikely to determine a repository site till 2031. As shown in this publication, there will be a delay of at least 20 years compared to the schedule given in the site selection law until a repository site can be determined.

INTRODUCTION

The concept for disposal in Germany up to now was based on a resolution for the disposal of the waste of the nuclear power stations set up by the federal government and the heads of the governments of the Federal States of Germany on September 28th 1979 [1]. In the resolution the heads of the Governments appreciated that Lower Saxony was willing to accept the construction of a repository in Gorleben, once the investigation of the mine deliver the results necessary approve that the Gorleben salt dome is suitable for the disposal of especially heat generating waste. The plan was to install an integrated waste management facility including reprocessing and fuel element production. Due to the lack of acceptance reprocessing and fuel element production had been abandoned. Therefore the project was restricted to a conditioning facility for spent fuel, interim storage of heat generating waste from reprocessing as well as interim storage of low and intermediate level waste and final disposal. The suitability of the Gorleben salt

dome was not questioned by governments until 1998, when the federal government changed. The new government saw a necessity to refine the requirements for the applicability criteria to revise the conceptual design for the disposal of radioactive wastes and caused a moratorium on the exploration of the salt dome in Gorleben as a potential repository for heat generating radioactive waste. Thus, the exploration was suspended from 2000 till 2010.

A new government restarted the exploration of the Gorleben site October, 1st, 2010 but had stopped it again in 2013 according to the new site selection law.

After the Fukushima incident and the following repeal of the extension of operating times and the stipulated time limitation of power operations of all power stations, a discussion among the different parties in the German parliament about finding a consensus regarding the disposal of heat generating radioactive wastes took place. The result of the discussion was the “law about the search and the selection of a disposal-site for heat generating radioactive wastes and for the amendment of other acts” [2]. An assessment of the goals of this law and an evaluation whether the goals are accomplishable are part of the law itself and will be discussed in the following.

GOALS AND DETERMINATIONS FOR THE SITE SELECTION

The law for the prospecting of a repository includes regulations for the prospection and selection of sites for the disposal of heat generating radioactive wastes. The essential statements of the act are:

- Finding a solution for an appropriate disposal site in a national consensus
- Solving the task within one generation
- Disposal of the wastes produced in Germany according to the principle of national responsibility
- Selection of the site should be safety-oriented and based on scientific approaches
- All citizens should participate in a transparent procedure in every stage in order to achieve acceptance
- Essential decisions will be taken by the German Parliament and the Federal Assembly

The search is divided into nine procedural steps:

1. A first stage to evaluate the legal regulations and to determine general criteria
2. Investigation of potential siting regions
3. Exploration from above ground
4. Exploration under ground
5. Comparison of sites
6. Recommendation of one site
7. Determination of a site by federal law
8. Licensing procedure for the proof of safety at the defined site
9. Construction of the facility after legal verification of the approval decision, if applicable

Parties to the proceedings are:

- Federal and State Commission (34 members)
- Project developer (Federal Office for Radiation Protection (BfS))
- Regulating authority (Federal Office for Nuclear Disposal (BfE))
- Societal advisory committee

The law includes several approaches which all have to be considered positive. One is the planned consensus-oriented participation procedure, which represents an important socio-political goal after decades of controversy. Another important approach is to consider positive experiences acquired in other countries like Switzerland, Sweden and Finland. A fundamental element is the open and unbiased siting procedure without prior determination of one site.

EVALUATION OF THE LAW

a) Role of the Federal and States Commission

The first actions of the evaluation commission were to establish statutes and rules of procedure as well as to agree on a mission statement. The mission statement is still in discussion. The mayor elements are:

1. To establish a sustainable development where the interests of the different stakeholders are brought together.
2. The commission is developing his suggestions in a learning process.
3. The commission is willing to preserve the fundamental rights of self-determination for future generations.
4. The commission is willing to come to a broad agreement with respect to final disposal also for heat generating waste.
5. The basic principles are:
6. safety is of priority,
7. requirement of transparency should be kept during the whole process
8. installation of a process which is considered as being fair.
9. The commission is of the opinion that all radioactive waste produced in Germany should also be disposed of in Germany.

According to the siting law the Federal and States Commission is responsible for the following issues:

- a. Review of the siting law
- b. What can we learn from the approaches in other countries
- c. Suggestions to:
 - i. Review of alternatives to direct disposal
 - ii. Exclusion criteria (general safety requirements, geoscientific and water management, exclusion criteria or land use regulations)
 - iii. Minimal requirements
 - iv. Host-rock-specific exclusion and selection criteria for salt, clay, crystalline rocks
 - v. Host-rock-specific assessment criteria
 - vi. Methods for the safety analyses
 - vii. Retrievability, recoverability, re-entry
 - viii. Organization and procedure of the selection process
 - ix. Requirements for public participation

The commission will then publish a report with recommendations for the Federal Government, parliament and the Federal States. The report represents the basis for the evaluation of the law and for passing further laws (law stipulating exclusion criteria, minimal requirements and assessment criteria).

For this purpose, it must be mentioned:

- The mandate for the Federal and States Commission basically corresponds to the approaches developed by the AkEnd [3]. It is essential for the entire process that it is feasible to compare the safety of different host rocks and sites and corresponding criteria for comparing can be developed.
- The first procedural step of this law stipulates to evaluate the law itself.
- There might be alternatives to direct disposal like long-term interim storage, Partitioning and Transmutation or Partitioning and Conditioning.
- The questions to be clarified by the Federal and States Commission are of scientific nature.

The Federal and States Commission must develop profound criteria before the siting-process will start. Because of missing criteria for site comparison, it is not possible to determine the suitability of one site, yet. These criteria for comparison are crucial for the siting process, even more than minimal requirements or exclusion criteria. If there are no scientific criteria to compare sites of the same host rocks or overall, socioscientific criteria have to be used for siting, like it is the case in Switzerland.

Despite the fact that there are up to now no tools to compare different host rocks or sites, it is never the less possible to develop criteria to evaluate the suitability of sites or siting regions. Estimating the suitability of a particular site will be possible after surface exploration at the earliest.

The acceptance of the siting process and of the result is a vital element of the siting law. Public acceptance will play a relevant role when the Federal Office for Nuclear Disposal reaches a decision.

The law does not stipulate how this acceptance will have influence on the decision. Therefore, the Federal and States Committee must specify how and to what extent acceptance should affect the decision-finding.

The commission consists of 33 members:

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|------------------------------|---|---------------------------------|
| • Head of the commission | 1 | (2 people, rotating leadership) |
| • Parliamentarists | 8 | |
| • Members of the upper house | 8 | |
| • Scientists | 8 | |
| • Sociatal groups | 8 | |

All members of the commission have voting right despite for the final report where this right is restricted only to members of the scientific and the stakeholder group.

b) Organizational structure of the commission

The commission itself holds about one meeting per month. It has established 3 working groups as subgroups:

- Working group 1
Social dialogue, public participation and transparency
- Working group 2
Evaluation of the site selection law
- Working group 3

Site selection criteria

The main determinations made are:

- The working groups consist of members of the commission itself. But in addition it is possible to include also additional members at least for specific subjects but also for a limited time span.
- The meetings of the commission as well as the working group meetings are public.
- The subgroups should prepare recommendations for the commission.

c) Final report

According to the site selection law, the commission has to prepare a final report. This report contains proposals for all relevant aspects with respect to final disposal and suggestions for the organisation and the processes. This report is addressed to the German Parliament and the German Bundesrat (upper house of the German parliament).

If the commission comes to the result that the regulations of the law have to be modified, they have to justify that and have to submit an alternative proposal. The commission also has to evaluate already existing decisions and stipulations.

Of course also the schedule has to be evaluated by the commissions. There seems to be a broad consensus that it might not be achievable to determine a repository site till 2031 and to have a final disposal site in operation in 2051.

d) Public participation

The commission has to develop a concept to involve the public and to integrate the public opinion. An important item is to identify the public groups and a representative participation since best organized are the stakeholders from already existing final disposal regions.

e) Organizational deficits

Both the Federal Office for Radiation Protection BfS (being the applicant or project developer) and the Federal Office for Nuclear Disposal (BkE) are under the authority of the Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB).

Until now, it was the responsibility of the particular federal state authority to grant authorization concerning licensing of nuclear sites. The BMUB was authorized to issue directives (including those relevant for the search for disposal sites) to the appropriate authorities in the States.

Preliminary drafts recommended to separate these functions by transferring the responsibility for the applicant and operator of the repository to a private organization. This setup also represents the situation in Switzerland, Sweden, Finland and France.

The determination within the law which came into force in 2013 will possibly not comply with the Council Directive 2011/70/EURATOM of 19 July 2011 [4]. With regard to the regulatory authority the directive states in Article 6:

“Member States shall ensure that the competent regulatory authority is functionally separate from any other body or organisation concerned with (...) the management of spent fuel and radioactive

waste, in order to ensure effective independence from undue influence on its regulatory function.”
[4]

Separating the regulatory body and the project developer (like the directive demands) might not comply with this law.

f) Comparison of the suitability of possible disposal sites

Within the siting law, one of the biggest challenges is to compare regions or sites in terms of safety. This is underlined by the fact, that far reaching decisions are made at a time, when the knowledge about different sites or regions is at the very minimum. Only those regions are evaluated that are explored in terms of geology, hydro-geology, tectonics, etc. Missing knowledge about other potential siting regions will lead to an exclusion of the particular sites even before they are explored adequately.

Evaluation of one particular site is not possible without having concepts or advanced ideas of the quantity and type of the wastes, waste containers or disposal concepts. Final disposal concepts can be optimized. Thus, a relatively higher release of radioactive material in the post operational phase must not lead to the conclusion that the particular site is less suitable. Instead, it might be the entire disposal concept that was not suitable.

Switzerland drew the conclusion to use a threshold for the effective dose in the biosphere as criterion for the safety of a specific site. The radioactivity release must stay below the threshold in the long term safety proof to qualify the site for disposal. The concept provides all sites that have been investigated and being equally suitable in terms of safety if the release is under the threshold. Sweden and Finland developed similar concepts.

Insofar other safety criteria may and should therefore be used to finalize the decision about a specific site.

g) Time required for the siting process

The procedure until the final decision for one site is supposed to be finished by 2031, giving the participants about 16 years after the start of the evaluation procedure. This schedule does not represent an adequate time scale. The procedural steps are:

1. Principles for the decision,
2. Regions, sites for exploration above the surface,
3. Definition, programs, criteria for exploration above the surface,
4. Realization of the exploration from above surface, recommendations for sites to be explored underground,
5. Stipulation of sites to be explored underground,
6. Definition, programs, criteria for exploration underground,
7. Realization of the exploration underground,
8. Recommendation of one site,
9. Stipulation of one site for licensing.

After the particular site was stipulated, the actual exploration underground, the facility planning and design, developing the proof of safety and the licensing procedure will take place. After the plan approval decision and construction of the facility the operational phase may start, but law suits delaying operation must be considered.

	Tasks	Duration (target) [a]	Duration (realistic) [a]	Target [year]	Realistic [year]
1	Basics for decision review of alternatives	2	3	2015	2016
2	Recommendations regions/sites	2	6		
3	Program exploration above surface	1	3		
4	Site exploration from above surface	3	6,5		
5	Recommendation of sites	2	3	2023	2035
6	Program exploration underground	1	3		
7	Exploration underground	6	15,5		
8	Stipulation of one site	1	5		
	Σ	18	45	2031	2058
9	Exploration, licensing procedure, construction	19	25		
	Σ	37	70		
	Commissioning			2050	2083

Table 1: Duration of site selection

Following these regulations it can be shown that the siting procedure will easily take a minimum of 70 years until operation can start, even if short time frames are assumed for each procedural step.

Determining a site until 2031 like it is stipulated within the siting law seems to be unrealistic. Today's generation will not find a solution for final disposal. Therefore, the entire process should be accelerated.

h) Consequences

In any case, a restart of the siting procedure will cause the licensed operational phase of all interim stores to exceed. The idea to store wastes for a maximum of 40 years in an interim facility is no more achievable.

i) Possibilities for an acceleration of the site selection

Therefore it is important – if the final disposal task should be solved within one generation – to think about possibilities to accelerate the process without any reduction in safety.

The procedural steps to determine a repository site are:

1. A first stage to evaluate the legal regulations and to determine general criteria
2. Investigation of potential siting regions
3. Exploration from above ground
4. Exploration under ground
5. Comparison of sites
6. Recommendation of one site
7. Determination of a site by federal law
8. Licensing procedure for the proof of safety at the defined site based on a detailed underground exploration
9. Construction of the facility after legal verification of the approval decision, if applicable

This stepwise approach including the underground exploration is based on the German final disposal concept from earlier times. Exploration of the site from underground is the most time consuming step. Therefore it is worthwhile to evaluate, if this step is needed and if this step can contribute additional information, which could not be gained by a detailed above surface investigation using modern techniques. This evaluation is important, since for an underground exploration a mine has to be established and at least two shafts are needed before a site exploration can be carried out. The underground exploration is time consuming and takes already 20 years for this step.

The new investigation methods are e.g. 3-dimensional–seismic investigation or geophysical measurements in deflected boreholes using very few drill points in order to minimize a penetration of the surface layers by the above surface exploration. These techniques didn't exist when the Gorleben salt dome was planned to investigate. It is necessary to prove, which information is needed and cannot be achieved from above ground using the described techniques. If so, then an underground laboratory is needed like e.g. Bure in France. But this can be done in parallel for the different host rocks.

Countries like Sweden, Finland, France and Switzerland select their final disposal site without an onsite exploration from underground. They even grant the erection license without such an exploration from below ground. An underground verification is needed as a prerequisite for a license to dispose of radioactive waste.

Therefore it seems to be important to think of an improvement, if investigations from below ground are really essential for a site determination and if it is possible to abstain from installing a mine for the site selection.

There are several other advantages:

- Up to now only 2 sites can be compared in order to determine a selected site. Following this proposed procedure a selection can be made out of e.g. five sites explored from above ground.
- This would allow reducing the importance of the partly investigated Gorleben site which is politically controversial in Germany.
- The procedures would then be similar to those countries which have achieved a better acceptance for the disposal of heat generating and high radioactive waste.
- Up to now it is rather unclear what the difference is in the scope of underground investigations carried out for the site selection to those needed for the license.
- It is the only way to solve the task within one generation.

This proposal is new for the German site selection process and has to be discussed in a science based process and also with the different stakeholders in order to achieve acceptance.

CONCLUSIONS

The siting law should build the framework to perform the site selection for a repository in a national consensus with the federal government and the states, society and citizens. After years of socio-political controversy, a restart should overcome concerns by considering all regions in Germany to be a potential site without any prerequisites. Several goals are provided by the siting law. Two of them have a special relevance: the organizational structure and the selection process.

- The organizational structure does not comply to guidelines of the particular European directive
- The selection process is too long to find a solution within this generation

It should be pointed out that the “best” or the “safest” site will not to be found by a selection/siting procedure. Insofar, the siting law/act only describes a “best possible” site. The federal and states commission is responsible to elaborate existing deficiencies regarding organization and time scale and to develop an approach to come to a solution. It must be appreciated that one of the main determinations of the siting law is to perform an evaluation of the law itself.

It is expected that the commission will terminate and present their final report in 2016. But one has to be aware of the fact that some are seeing the necessity to extend the time frame.

REFERENCES

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