

**The Swedish NGO Office for
Nuclear Waste Review, MKG,
presents its view on**

alternative methods och sites

**for the final disposal of
Swedish high-level nuclear
waste**

A method that is better for the environment?

Public health and the environment must be the prime concern when planning for a final repository for high-level nuclear waste. The goal must be that no radioactivity will leak from the repository and reach the biosphere for at least 100,000 years. It is unacceptable to risk that future generations might be exposed to radioactive materials because we did not choose to use the method for final disposal of spent fuel from nuclear reactors that is best for the environment in the long term.

The nuclear power industry, acting through a jointly owned nuclear waste management company, SKB AB, has been working for some thirty years on the KBS method, an option for final disposal that they now are eager to put into practice. The method involves placing the waste in mined tunnels 500 meters underground in bedrock that contains upwardly mobile groundwater. The waste is to be isolated by man-made barriers of copper and clay. Despite three decades of work, the long-term safety of the systems has yet to be demonstrated.

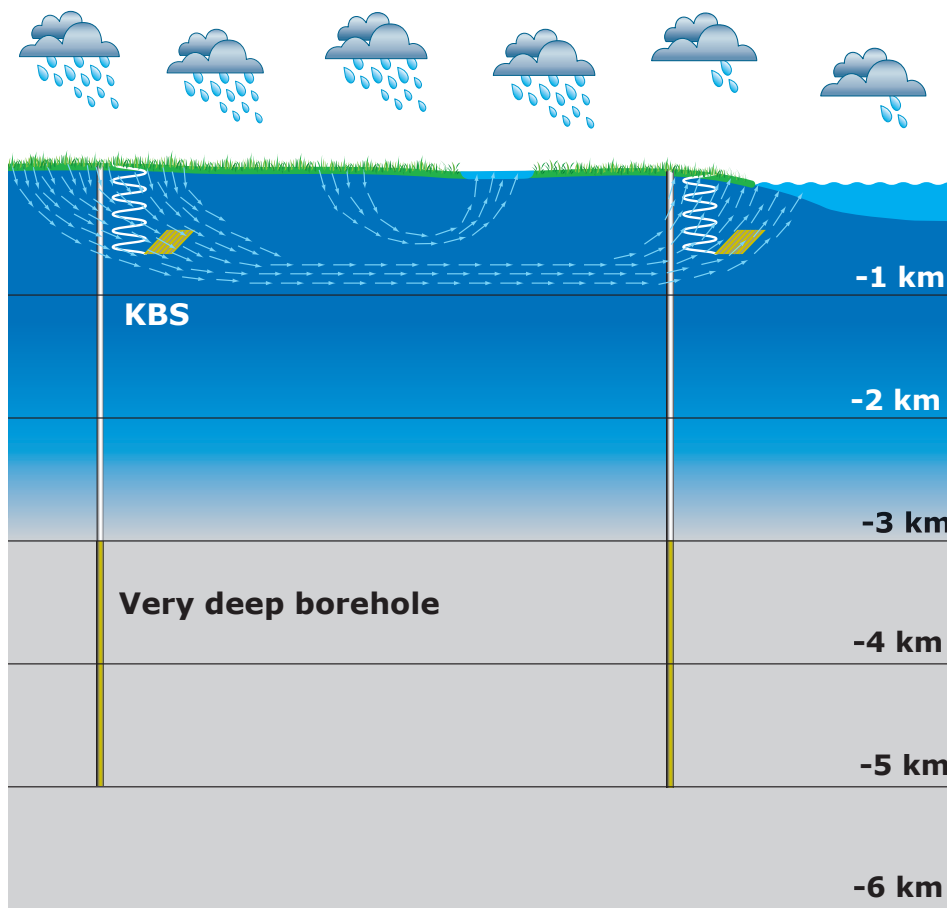
An alternative to the KBS method is disposal of high-level nuclear waste in very deep boreholes, whereby the waste will be deposited at a depth of 3 to 5 kilometres (see figure). Groundwater

at these depths may have been immobile for millions of years. Modelling has shown that the groundwater would remain stable even after a repository has been constructed. Totally isolated from the biosphere, the repository may therefore be expected to afford much more robust protection to human life and the environment than the method the industry arrived at thirty years ago.

Another advantage of very deep boreholes is that once sealed, it would be more difficult to retrieve the spent nuclear fuel in the repository. Spent fuel rods contain plutonium, which can be used as raw material for the manufacture nuclear weapons. The KBS method thus has a serious drawback in that it requires safeguards over 100,000 years to prevent intrusion into the repository in search of plutonium.

It is vital that the Swedish environmental courts and the Government have a solid scientific basis for the choice of disposal method when decisions are to be taken on industry's application for permission to start constructing a final repository. For this to be possible, the industry must put much more effort into the study of the very deep borehole alternative. Full-scale development of the alternative is hardly necessary, only research

Schematic drawing demonstrating both the method and siting issues



Method

The KBS method, favoured by the Swedish nuclear industry, involves disposal of high-level nuclear waste in the form of spent nuclear fuel in mined tunnels in bedrock at a depth of 500 m. Rock at this depth contains upwardly mobile groundwater that is in contact with the surface of the earth.

An alternative method, very deep boreholes, involves disposal of the high-level nuclear waste in boreholes at a depth of 3-5 kilometres in bedrock that has no contact with the biosphere, i.e., with human beings and the environment.

Sites

Given the coastal siting of a KBS repository, any leakage would reach the surface relatively quickly. If a KBS repository were instead sited inland in a recharge area for groundwater, radioactive substances from the repository may not reach the surface for tens of thousands of years.

Whether sited on the coast or inland, using very deep boreholes may be a better choice from the point of view of the environment. If the KBS method is chosen, an inland site appears to be preferable.

to answer some outstanding questions. It is entirely feasible to wait ten more years before submitting an application for a KBS repository; ten years is a very slight delay in a project that is to last 100,000 years.

The nuclear power industry claims that there are too many "ifs" in the very deep borehole alternative, so that it is not possible to say that it is a better method than the KBS method. The Swedish NGO Office for Nuclear Waste Review, MKG, is of the opinion that the industry has a duty to research the remaining outstanding questions. The industry's unwillingness to consider

alternatives may cause other, from the point of view of the long-term environmental security, potentially better options to be ignored or rejected. This is unacceptable.

MKG does not support a specific method for final disposal of high-level waste, but wants the government to make it clear to the nuclear industry that their proposed method cannot be approved until they have produced a better basis for environmental comparisons with alternative methods.

A site that is better for the environment?

At present, the nuclear industry is planning to site the final repository for high-level nuclear waste at one of two sites immediately adjacent to nuclear power stations (Forsmark and Oskarshamn) on Sweden's Baltic Sea coast.

The very deep borehole method may turn out to be an environmentally sounder option for disposal of spent nuclear fuel than the industry's proposed KBS method. However, if the KBS method is chosen, care in the choice of the site may substantially delay leakage of radioactivity to the environment. Generally speaking, the movement of groundwater up to a kilometre beneath the surface may be described like this: in

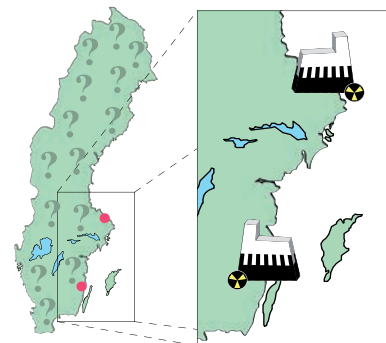
the inland water sinks down through the soil and subsurface rock and rises again toward the coast (see figure). If a KBS repository is properly sited and an optimal depth is chosen, leakage from the repository will follow the stream of groundwater and surface again, perhaps at the coast, up to 50,000 years later. If, however, a KBS repository is sited on the coast, leakage may be transported to the biosphere in roughly 50-100 years' time. From the point of view of long-term environmental security, an inland site in rock having downwardly mobile groundwater could be a better choice for a final repository of the KBS type.

(Continued on the next page.)

THE NUCLEAR INDUSTRY'S PLANS FOR A REPOSITORY — neither the best method nor the best site?



A good method? An law passed some thirty years ago forced the Swedish nuclear power industry to start developing a method for disposal of high-level nuclear waste (or else stop producing it). The industry quickly put together a draft option for a method, KBS, which with minor modifications they have adhered to ever since. Today, much more is known about bedrock and groundwater mobility than was known back then. The view of the Swedish NGO Office for Nuclear Waste Review, MKG, is that the choice of method should foremost be based on an evaluation of the long-term environmental security of different alternatives. The method that is best for the environment in the long term should be chosen – an alternative that fulfils the Swedish environmental law. The picture shows old reports from the KBS project from the late 1970s and early 1980s.



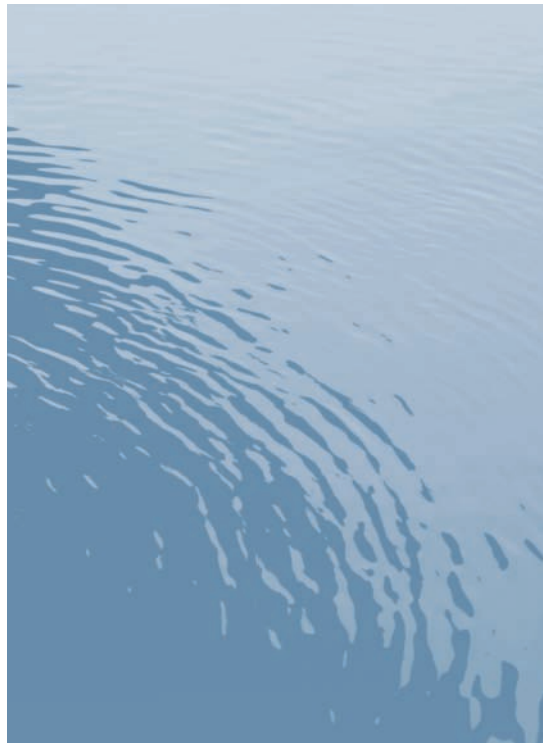
A good site? The Swedish nuclear industry has been looking for a site for a repository for high-level nuclear waste for thirty years. The result has been the choice of two alternative sites, each adjacent to a nuclear power plant (Forsmark and Oskarshamn) on the Baltic Sea coast. Did geology or local opinion decide the choice? The industry claims that it simply a coincidence that the chosen sites are just beside the nuclear power plants. The Swedish NGO Office for Nuclear Waste Review, MKG, wants the siting of a repository to have the best hydrogeological conditions the country has to offer, not just "good enough".

Groundwater at the depth currently envisaged in the KBS method is more saline at the Baltic coast than groundwater at similar depths in the inland. In as much as salinity can adversely affect the clay that forms a buffer around the canisters containing high-level nuclear waste, this too speaks for siting a KBS repository inland.

The nuclear industry maintains that some coastal bedrock, too, exhibits downward groundwater drainage patterns. Be that as it may, the two

proposed sites do not lie in such zones. The downward drainage patterns that would delay leakage the longest time are far from the sea.

MKG does not support a specific site for a final repository for high-level waste, but wants the government to make it clear to the nuclear industry that their proposed site cannot be approved until they have produced a better basis for environmental comparisons with other sites.



Swedish NGO Office for Nuclear Waste Review, MKG, was established in the autumn of 2004. Its work is financed out of the Nuclear Waste Fund. The aim of MKG is to achieve the implementation of the environmentally best long-term option, for both the public health and for the environment, for the management of the radioactive waste from nuclear activities in Sweden.

MKG has four member organizations: Youth and Nature Sweden, Oss (a local opinion group for safe final storage of radioactive waste in Östhammar community), the Swedish Society for Nature Conservation, SNF, the local chapter of SNF in Uppsala county administrative province and the local chapter of SNF in Kalmar county administrative province.

mkg
Miljöorganisationernas
kärnavfallsgranskning

Swedish NGO Office for Nuclear Waste Review
Box 7005 • SE-402 31 Göteborg, Sweden
Visiting address: Norra Allégatan 5
Phone: +46 (0) 31 711 00 92 • Fax: +46 (0) 31-711 00 93
E-mail: info@mkg.se
www.mkg.se
Director: Johan Swahn, mobile: 070-467 37 31