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Naturskyddsföreningen

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Recent developments of radioactive waste management in Sweden

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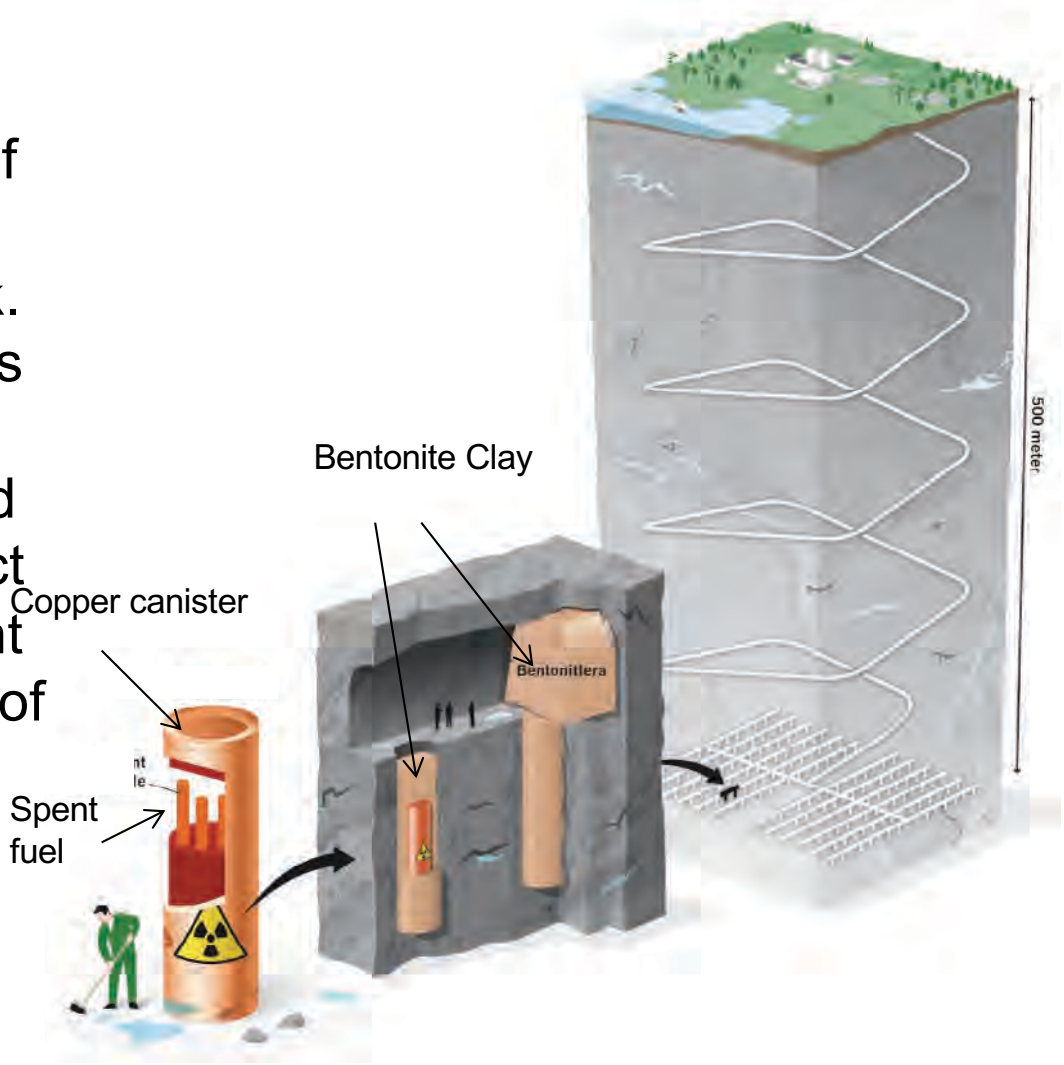
What will I talk about?

- Very short background about the Swedish nuclear industry's plans for a repository for spent nuclear fuel
- Very short background on the licensing process for the planned repository
- The decisions of the Swedish Environmental Court and the Swedish regulator SSM on January 23, 2018 with recommendations to the Government
- The Government review of copper corrosion issues
- A new unexpected development: New experimental packages from the LOT project retrieved with 20 years of copper corrosion
- What happens next?

The KBS method for disposal of spent fuel

- In the KBS method the waste canisters (5 m high) are to be deposited in holes in the floor of tunnels about 500 m underground in granite bedrock.
- The long-term safety case relies on two artificial engineered barriers – a copper canister and a bentonite clay buffer to protect the copper – to isolate the spent fuel for hundreds of thousands of years.
- In 2009 the nuclear industry's nuclear waste company SKB chose the Forsmark nuclear power plant as the site for the planned repository.



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The KBS(-3) method

1975-1983

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Development of KBS method 1983-2011

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License application and review (1)

- The nuclear waste company SKB submitted a license application for a spent fuel repository system using the KBS method at the Forsmark NPP on March 16, 2011.
- The application was reviewed by the regulator, the Swedish Radiation Safety Authority (SSM) according to the Nuclear Activities Act and the Environmental Court according to the Environmental Act. The final decision on a license permit is to finally be taken by the Government.
- Initial review for completeness of the application was completed in 2015. During 2016 and 2017 the application was reviewed on issues. Many issues were covered.
- During the review the issue of problems with the copper canister were raised by some actors including researchers at the Royal Institute of Technology (KTH) in Stockholm and MKG.

Licence application 2011

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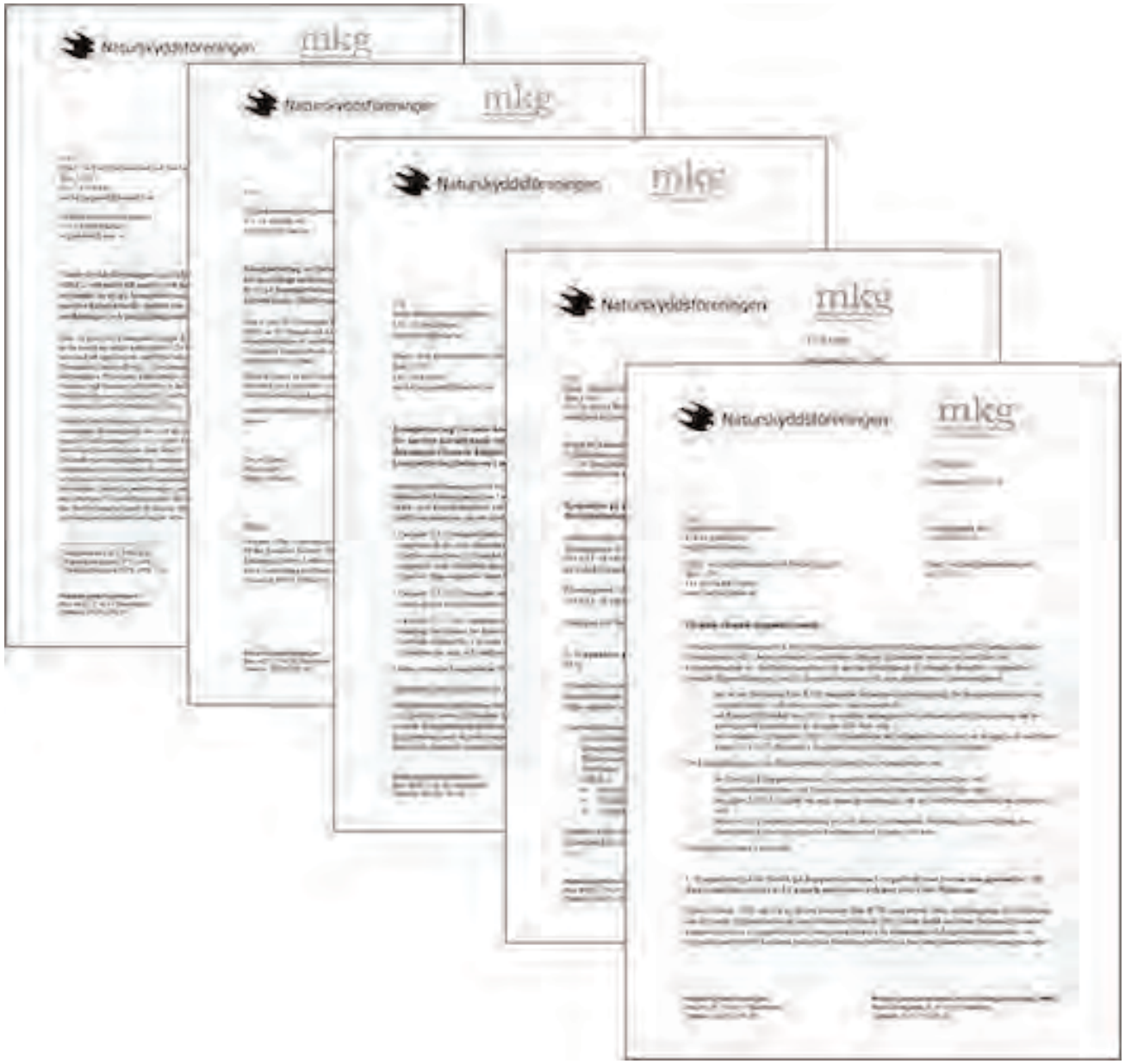

2012-2017

+ another
5-6 briefs

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License application and review (2)

- In the autumn of 2017 the main meeting of the Environmental Court was held. The regulator SSM told the court that some issues, i.e. the copper corrosion issue, could be dealt with after a government decision. The court questioned this in the meeting. According to both the Environmental Act and the Nuclear Activities Act the repository had to be shown safe before a government decision.
- At the court were also eminent scientists from the Royal Institute of Technology (KTH) in Stockholm that strongly questioned the SKB position on copper corrosion.
- During the court proceedings leaks to media showed that the regulator SSM had big internal problems (a corrosion expert was against a yes decision and scenarios showed regulatory limits would be exceeded).

Main meeting of the Environmental Court sept-okt 2017

MKG och Naturskyddsföreningen vid huvudförhandlingen. Från vänster: Magdalena Romanov, Christine Anvegård, Rebecca Nordenstam, Johan Swahn, Josia Hort.

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Natur

Dokumentet avslöjar: Så allvarliga är riskerna

Strålsäkerhetsmyndigheten påstår att de risker med slutförvaret som avslöjats är irrelevanta. Men ett nytt dokument visar att så inte är fallet. I det skriver myndighetsspecialisten med ansvar för granskningen av slutförvarets långsiktiga säkerhet om "kritiska osäkerheter och kunskapsluckor kring kapselns grundläggande funktion".

SVERIGES NATUR GRANSKAR SLUTFÖRVARET.

"Bör begära kompletterande underlag"

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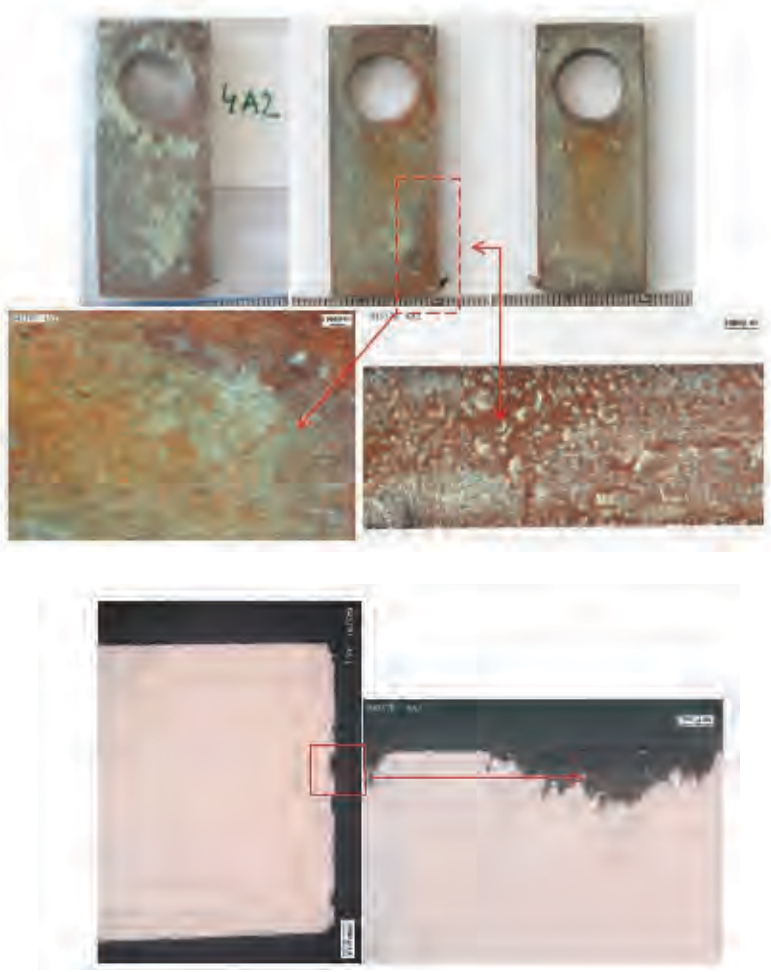
License application and review (3)

- On January 23, 2018 the Environmental Court made its recommendation to the government. The court recommended that the government say no to the application, primarily because the uncertainties regarding the long-term safety of the planned repository due to possible copper canister problems. These issues have to be resolved before a Government decision.
- On the same date the regulator SSM told the government that it could say yes, as some issues, i.e., possible problems with the long-term integrity of the copper cannister be dealt with later, after a government decision.
- The court decision took many Swedes by surprise and can be seen as an important victory for science and for those who have raised this issue.

The problems with copper



- The scientific hypothesis that anoxic (oxygen-free) water does not corrode copper in a repository, where there is no oxygen after closure, is very likely false.
- There is a ongoing scientific paradigm shift to the fact that water can directly corrode copper even when there is no oxygen.
- Copper in a KBS-repository may corrode at much faster rates than acceptable (<1 000 years until release of radioactivity).
- Results from the Swiss FEBEX experiment shows heavy copper corrosion

Source: FEBEX-DP Metal Corrosion and Iron-Bentonite Interaction Studies, P. Wersin & F. Kober (eds.), Arbeitsbericht NAB 16-16, Nagra, October 2017. Can be found on MKG's web site: http://www.mkg.se/omfattande-syrgasfri-korrosion-i-det-schweiziska-febex-forsoket

The Government review of copper corrosion issues

- Government review is ongoing and the nuclear waste company SKB made a submission of complementary information on copper corrosion on April 4th 2019.
- Comments of other parties were provided to the Government in the autumn of 2019.
- SSM:s conviction that the repository will be safe is “strengthened” by the new SKB information.
- The Swedish Council for Nuclear Waste says there may be problems with the copper that may show it does not work.
- MKG, the Swedish Society for Nature Conservation (and now the Swedish Friends of the Earth) make a strong statement saying copper should not be used as a canister material.
- The researchers at KTH persevere joined by the SSM corrosion expert

Naturskyddsföreningen

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YTTRANDE

Stockholm och Göteborg den 30 september 2019

Till
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Miljödepartementets dnr: M2018-00217/Me
och M2018/00221/Ke

Yttrande från Naturskyddsföreningen, Jordens Vänner och Miljöorganisationernas kärnavfallsgranskning (MKG) rörande remisser i regeringens prövning av ansökningar av ett slutförvarssystem för använt kärnbränsle enligt miljöbalken (M2018-00217/Me) och kärntekniklagen (M2018/00221/Ke)

Naturskyddsföreningen, Jordens Vänner och Miljöorganisationernas kärnavfallsgranskning (MKG) i fortsättningen benämnda *föreningarna*, vill lämna nedanstående synpunkter på remisserna från den 25 april 2019 i regeringens prövning av ansökningar av ett slutförvarssystem för använt kärnbränsle enligt miljöbalken (M2018-00217/Me) och kärntekniklagen (M2018/00221/Ke).

Remissen gäller kompletteringarna och yttrandena som kärnavfallsbolaget Svensk Kärnbränslehantering AB (SKB) i fortsättningen benämnd *sökanden*, överlämnade till regeringen den 4 april 2019 rörande ansökningarna om att få tillstånd till ett kärnbränsleförvar i Forsmark. Föreningarnas yttrande gäller både prövningen enligt miljöbalken och kärntekniklagen men fokuserar rättsligt på miljöbalksprövningen, eftersom föreningarna uppfattar att regeringen först ska ta ställning till frågan om tillåtlighet enligt balken.

Den 23 januari 2018 överlämnade Mark- och miljödomstolen vid Nacka tingsrätt sitt yttrande i mål M 1333-11 rörande ett system för slutförvaring av använt kärnbränsle med ett kärnavfallsförvar i Forsmark. Domstolen ställde som krav för att ansökan enligt miljöbalken ska kunna ges tillåtlighet att sökanden redovisar underlag som visar att kärnbränsleförvarsanläggningen på lång sikt uppfyller miljöbalkens krav, trots de osäkerheter som kvarstår om hur kapselns skyddsförmåga påverkas av fem olika degraderingsprocesser.

Samma datum, den 23 januari 2018, överlämnade Strålsäkerhetsmyndigheten (SSM) sitt yttrande enligt kärntekniklagen till regeringen. SSM tillstyrkte ansökan enligt kärntekniklagen.

1. Föreningarnas huvudsakliga inställning i tillåtlighetsfrågan

Efter att ha tagit del av sökandens komplettering och yttrande enligt miljöbalken gör föreningarna gällande att det redovisade underlaget *inte* visar att den planerade kärnbränsleförvarsanläggningen på

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A new unexpected development: New experimental packages from the LOT project retrieved with 20 years of copper corrosion (1)

- The LOT project has been ongoing at 400 m depth at the Äspö Hard Rock Laboratory since about the year 2000.
- In total there are seven experimental packages with copper and clay in a very good simulation of real repository conditions.
- Three 1-year packages were retrieved, but when SKB retrieved one 5-year package in 2006 an unexpected amount of copper corrosion had occurred. The report came out only in 2009 and had a very poor reporting of the copper corrosion, with a claim that entrapped oxygen in the system was the cause. This is very likely not the case.

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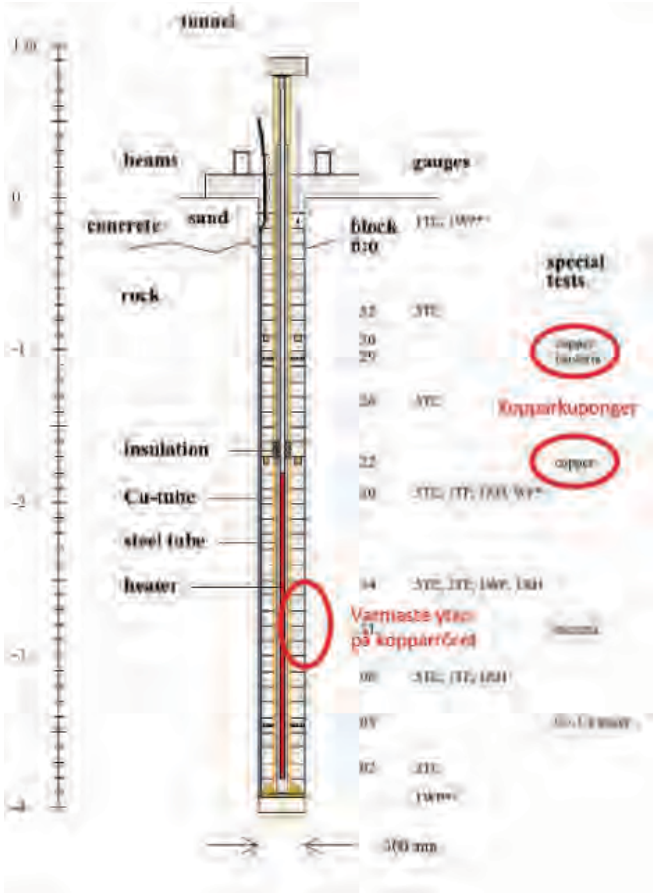
The LOT project at the Äspö hard rock laboratory



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A new unexpected development: New experimental packages from the LOT project retrieved with 20 years of copper corrosion (2)

- There was still one 5-year and two 10-year packages left.
- MKG has demanded that the next package be retrieved to see of the corrosion has continued. SKB has refused. The 18-year old FEBEX results made this even more important.
- In the autumn of 2019 SKB secretly retrieved two now 20-year old experimental packages. This was disclosed, likely as a mistake at a meeting organized by the regulator SSM in the beginning of October.
- MKG has worked to get SKB to disclose all relevant corrosion results as soon as possible and that SSM does a quality control of the results. It is now clear that this will happen.

A new unexpected development: New experimental packages from the LOT project retrieved with 20 years of copper corrosion (3)

- SKB has published one report with the details of the experiment and the retrieval. The corrosion results are said to be coming at the end of September.
- When SKB claimed that trapped oxygen was the cause of the unexpected corrosion in the 5-year package, they could do this only by not taking all corrosion into account.
- If corrosion has continued it has to be anoxic (not caused by oxygen) which puts the entire safety case in question.
- MKG has told the Government that it should wait for the SSM quality control that will be done by the end of the year before taking a decision on the repository.

What happens next? (1)

- Uncertainty on whether there will be another round or more of commenting to the Government regarding the new LOT-results.
- SKB (and unfortunately perhaps SSM) will downplay the results and claim that the repository is safe enough even if the copper canister does not work exactly as claimed. However, SSM may have difficulties to show that their rather strict regulatory dose limits are not exceeded.
- The community Östhammar will take a decision whether they want to veto or not. There will be no local advisory referendum.
- The Government may take a decision on the issue of permissibility according to the Environmental Act in 2021 (?).

What happens next? (2)

- After a possible yes from the Government according to the Environmental Act, the process towards a possible final construction license is long and may take 3-4 years.
- After a possible no, Sweden is very much back to square one.

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