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Association for Multinational
Radioactive Waste Solutions

Siting of Geological Repositories: Key Issues

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Foreword

This is an introduction to the following talk and discussion on the challenges of siting a multinational repository (MNR).

The main “messages” are:

- Siting ANY repository is a challenging task
- The biggest challenges are not technical but SOCIETAL
- National repositories (NR) have tried different approaches
- More NR past siting failures than successes
- BUT there are more recent success stories
- **Successes and the failures both give guidance for MNR siting**

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The Key Siting Questions

- Is the site **technically suitable**?
  - Safety must be clearly demonstratable - esp. long-term
  - Practical implementation must be feasible (engineering, geotechnical aspects, costs)

- Is the site **societally acceptable**?
  - Host Community
  - Surrounding Regions
  - Host Country
  - …….. and, for an MNR, globally

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The Safety Question

- Robust validated safety assessment (SA) tools are available
- Many data required – physical, chemical, geological, etc.
- Sufficient data can be gathered (but not ALL)
  (Lab experiments; Field experiments; URLs; Analogue studies)

- The SA tools can demonstrate when sites are **clearly safe enough**
- They cannot distinguish between very safe sites
- An optimised choice of site depends on many factors
  - Safety; engineering feasibility; environmental impacts, costs, societal acceptance

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Nagra Publication of Site Recommendation 2022

Project of the century

- Nagra proposes “Nördlich Lägern” as the site for a repository.
- Nördlich Lägern is the safest site for a deep geological repository: here, the rock deep below the surface best confines the radioactive waste for a very long time.
- Nagra’s investigations demonstrate this. The siting proposal is an important milestone in the project of the century of deep geological disposal.

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  - …. and for MNR, Globally

THE GREATEST CHALLENGES ARE SOCIETAL!

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“Taxonomy” of Siting Approaches

- Decide-Announce-Defend (DAD or often DADA)
  - closed door – expert opinion
  - technocratic – MAA etc.
- Volunteering
  - cold start; raised hand
  - prior engagement
- Consent/assent
  - legal requirement
  - negotiated
- “Hybrid”
  - e.g. technical siting factors indicate where siting is excluded

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DAD(A)

DAD(A), Decide – Announce – Defend –(Abandon): Examples:

- Gorleben site in Germany
  - Site was not on original salt dome list
  - Led eventually to “white map” of Germany
- Wellenberg (WLB) and Benken in Switzerland
  - WLB rejected in legally binding referendum
  - Benken prematurely proposed with limited data and no comparisons
  - Led eventually to “white map” of Switzerland
- (most likely) Yucca Mountain (YM) in the USA
  - YM selected from 3 candidates in political process
  - Led nowhere as yet

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Volunteering: examples

- Sweden
  - early widespread cold start attempts – unsuccessful
  - moved to engagement and voluntary acceptance of veto rights
- Japan
  - 2001 open solicitation – unsuccessful
  - currently still open (with government support)
- Canada
  - more measured, adaptive approach shows promise
- South Korea
  - success for L/ILW repository: 4 communities voted in favour

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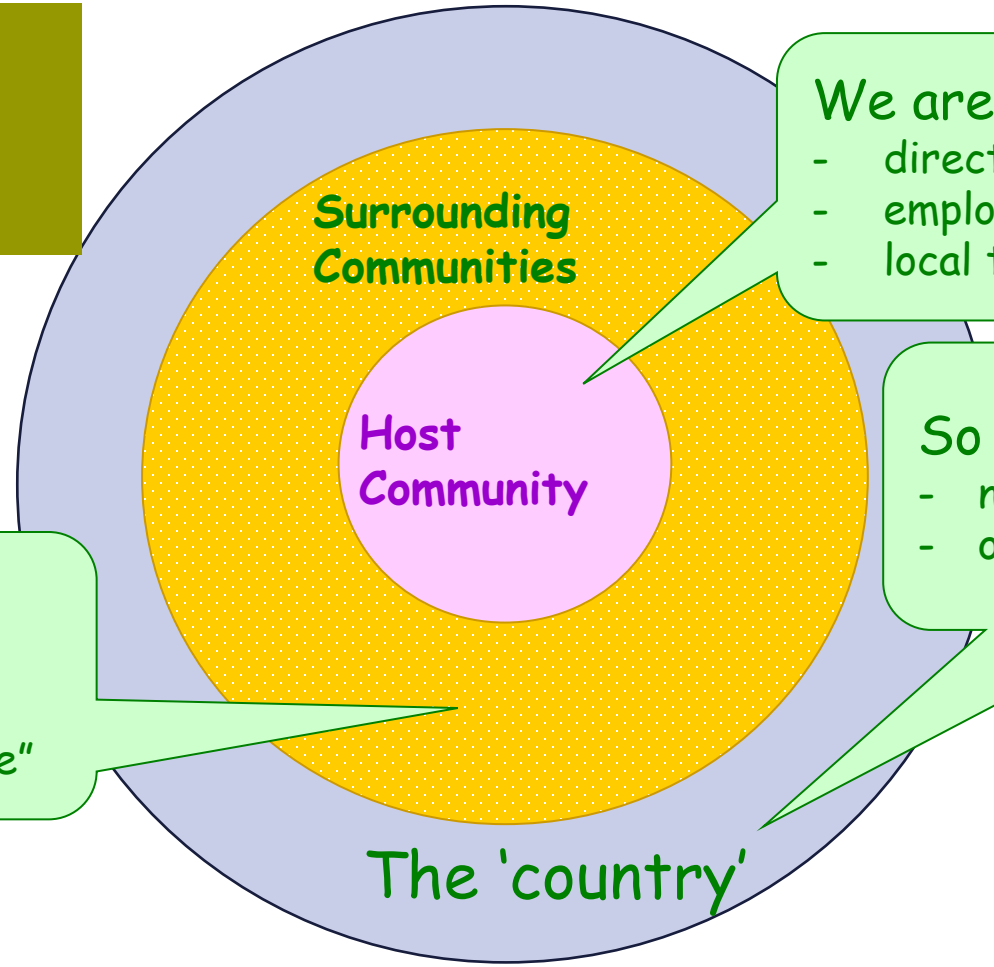
The 'doughnut effect' in national GDF siting

Wellenberg CH
Cumbria UK
Yucca Mtn USA



We are happy:
- direct benefits
- employment
- local trust

So are we
- national headache gone
- others "off the hook"

We are NOT
- no benefits
- transport
- regional "image"

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Avoiding the 'doughnut effect' for an MNR

Consensual Siting

- Extended discussion, information and negotiation phases with a number of communities are initiated – always on the understanding that the community can withdraw from discussions at any time up until the final single site decision is taken.
- Communities need to be attracted by the project, actively engaged with government/regulators/implementers, properly involved in the process, see the benefits, possibly become partners in DGR development
- The most successful national siting programs today are in Finland, Sweden and France, each of which is employed a consensual approach.
- How could this approach be used in a multinational siting programme?

See Neil's talk

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The End

Extras

Questions for discussion

- Is it necessary to have a narrowing down parallel process starting with multiple potential sites or could one assess potential sites in a sequential fashion?
- If multiple sites are to be looked at, how many must be included in the process?
- How should communities at or near the chosen site benefit from the project? How was the level of “compensation” decided? How should the benefits be distributed?
- Is it ever justifiable to present a final site recommendation as the “safest site” from the initial candidates or even in the proposed siting region or country?
- What can/should a government do if there are no communities willing to accept the repository? Appropriation of land, use of government land, postpone the problem by storage, or what?

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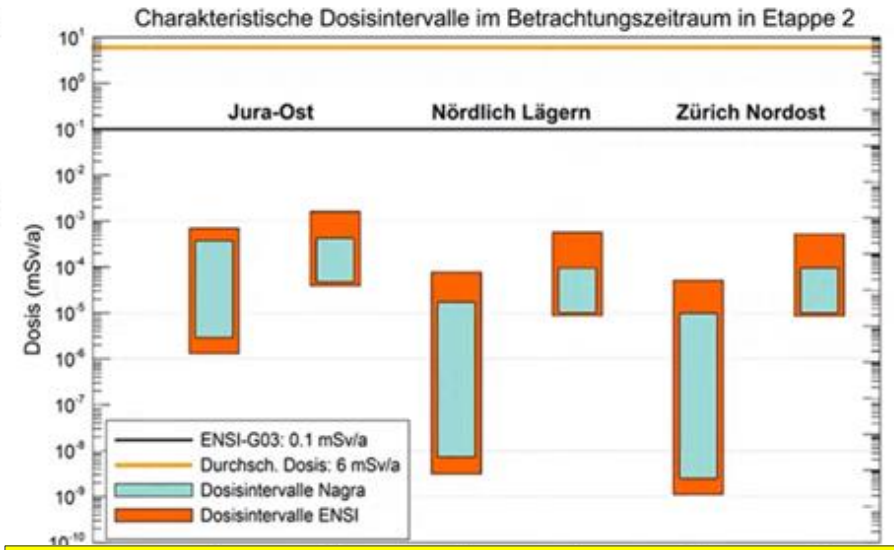
Site comparison - Switzerland

Stand Ende Etappe 2 (2018): Bewertung ENSI

- Gebiete JO, NL und ZNO für ein Lager für SMA- als auch HAA als **geeignet** bewertet
- Bevölkerung mittlere Dosis rund **6 mSv/Jahr**
- ENSI-Richtlinie G03: Schutzkriterium von **0.1 mSv/Jahr**
- Berechnete Dosen an den drei Tiefenlagerstandorten liegen zwischen **0.00001 und 0.001** mSv/Jahr



ALL around1000 times lower than reg limit

Estimated commissioning dates of national DGFs

- Belgium 2035
- Canada 2035
- China 2050
- Czech Republic 2065
- Finland 2023
- France 2035
- Germany ?
- Hungary 2045
- Italy ?
- Japan 2035
- Netherlands after 2100
- Slovakia 2037
- Slovenia 2066
- Spain 2035
- South Korea open
- Sweden 2032
- Switzerland 2050
- United Kingdom open
- USA ?

Only few definitive sites today

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International Consensus on Siting of GDFs

IAEA Safety Series No 111-G-4.1 (1994)

„A suitable site may be identified either by narrowing the field of candidates ..... or by objectively evaluating one or more designated potential sites. For either method it is not essential to locate the best possible site but to provide an overall disposal system which can be convincingly shown to comply with safety and environmental protection requirements“