'Current and future Challenges for Nuclear Power Regulators'

Symposium on the occasion of Ulrich Schmocker‘s retirement

Disposal of Radioactive Waste – the Development of Disposal Facilities

The role of the implementer and his expectations towards the regulator

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Director, Nagra

Brugg, 20 January 2011

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Nagra (National Co-operative for the Disposal of Radioactive Waste) is the implementer in Switzerland

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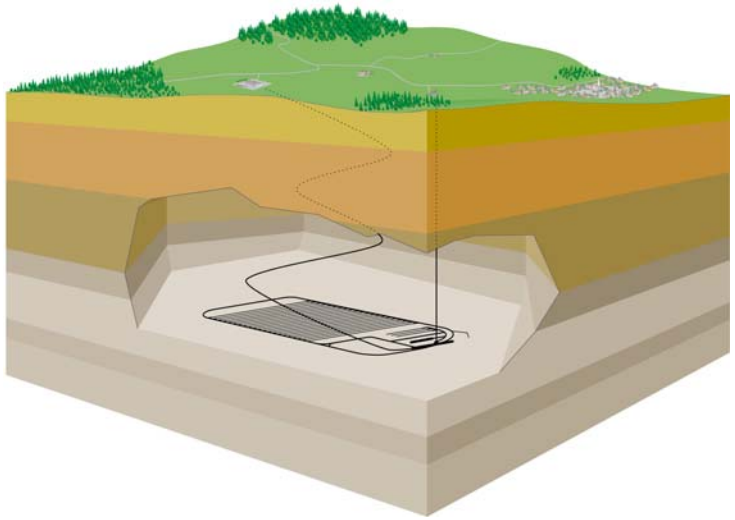
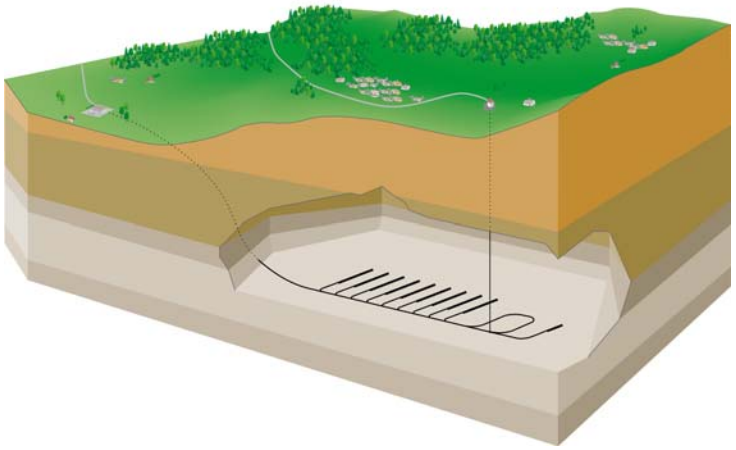
Status of Swiss Waste Management Programme

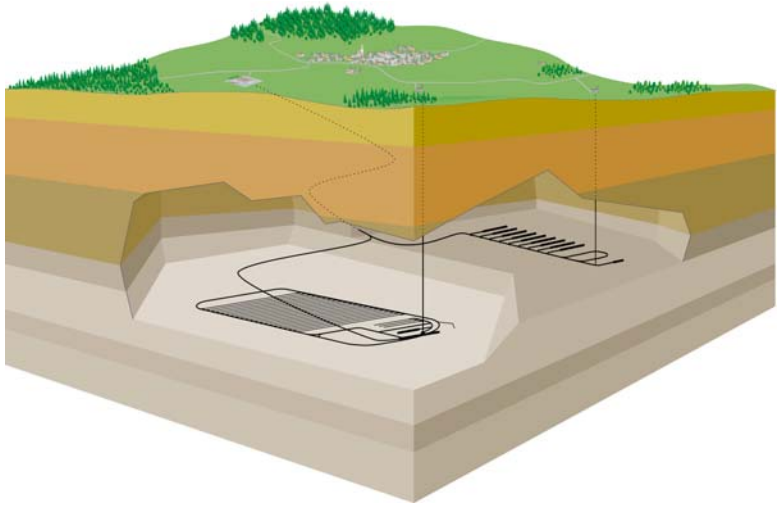
- **Waste**
  - Minimisation, treatment/packaging, characterisation: well established, **disposability of waste types ensured**
- **Interim storage**
  - **Sufficient capacity** for existing NPPs
- **Geological disposal**
  - **All waste** (incl. LLW) to be disposed of in **geological repositories**
    → 2 repositories planned (L/ILW; SF/HLW/LL-ILW)
  - **Scientific basis** is available (more than 30 years of research): demonstration of **disposal feasibility** formally accepted
    → ***'We know how to do it'***
  - **Site selection process** in 3 stages → 1st stage close to completion (**siting regions proposed & technically accepted**)
  - **General license** until 2020?

Geological repositories





- **HLW repository**
- **L/ILW repository**
- Option for **'combined repository'**



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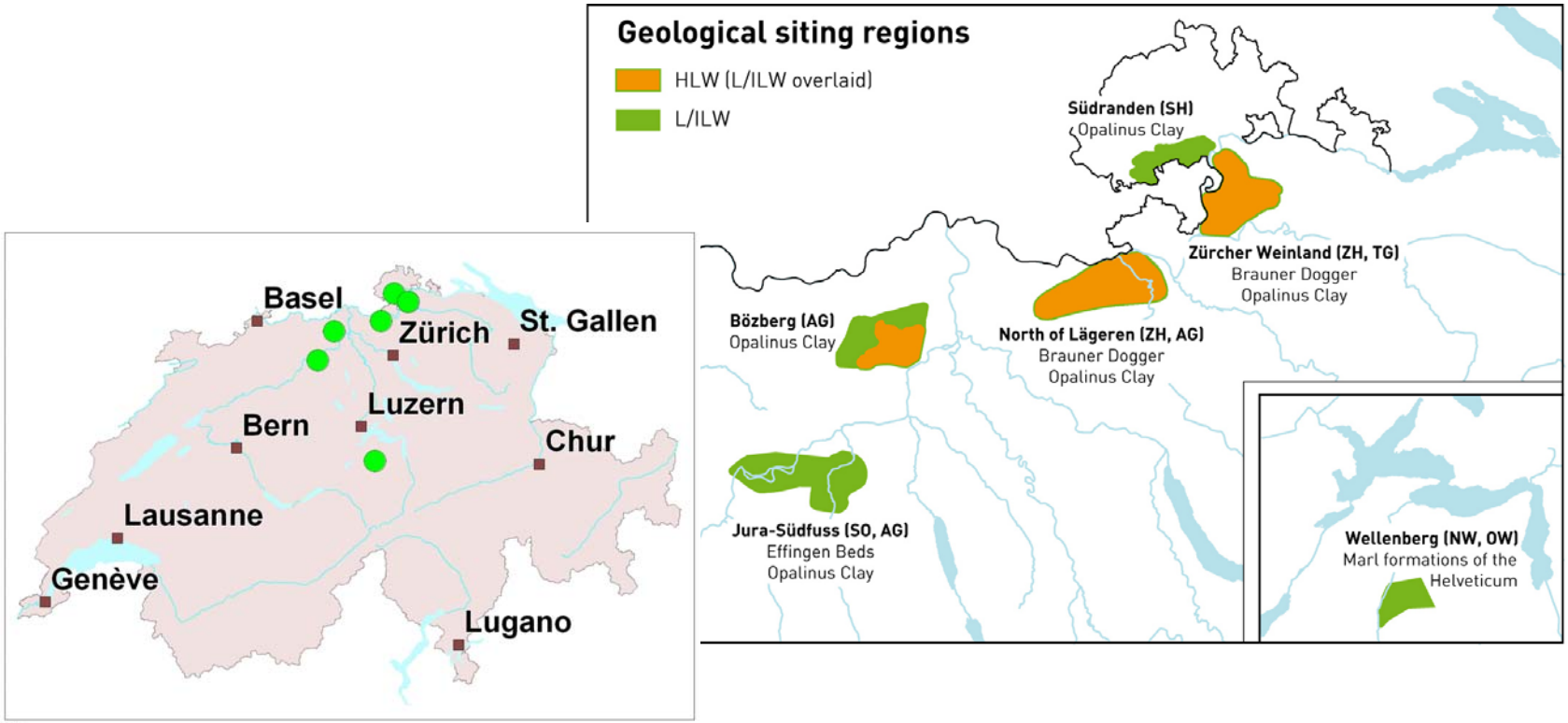
Current status: Nagra's proposal for siting regions …



… supported by the Swiss safety authorities and other committees in their formal review published in 2010

as input for the next stage for further narrowing down the number of potential sites

… with a decision by the Federal Government in 2011

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Some remarks about repositories …

A geological repository …

- … relies strongly on **geology as a barrier** (long-term stability, radionuclide retention)
- … with **geology being different** (to some extent) **within each project** (site)
- … means that **each repository** is an undertaking with **several very demanding project-specific aspects** (geology!)

Success with implementing repositories requires …

- … good projects based on a **sound scientific and technological basis**
- … **acceptance by society** (importance of confidence and trust on the local, regional, national & international level, incl. the broad scientific community)
- … **a stepwise process** with several decision points that lasts several 10s of years from start of the programme until start of repository operation

Thus, **the Swiss programme** has to be able …

- … **to address the relevant specific aspects** of the Swiss repository systems
- … **to involve the public** (& consider their concerns) in decision-making
- … and **to take the necessary decisions in a timely manner** to ensure adequate progress

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Both the technical and the societal dimension are important

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The scientific-technological issues

Basic requirements: Safety & Technical feasibility

- **Long-term safety**
  - **long-term stability** due to suitable geological situation (*the site counts*)
  - **nuclide isolation/retention** by geology & engineered barriers
- **Construction**
  - A repository in a broad sense involves construction of **a mine**, but excavation needs to be done with special care (limit damage to host rock)
  - The fabrication of **engineered barriers** is partly a novel task, but the necessary quality can be achieved (see prototypes)
  - The **equipment for handling** the waste packages & engineered barriers needs specific developments, but is no unusual challenge
- **Operation**
  - Disposal facilities are **simple** compared to other nuclear facilities
  - **Handling** of the waste packages (incl. encapsulation, ..) is partly novel, but feasible
  - **Industrial scale** can be a challenge (throughput), but not for Swiss case

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Site selection is of key importance with the main emphasis on long-term safety while ensuring technical feasibility

Ensuring long-term safety

- Selecting an **appropriate site** is the most important step for ensuring long-term safety (*it is the geology that makes the difference*)
- However, there are **several possibilities** to achieve a safe system & several sites may be suitable → the **need for a thorough evaluation**
- Important to have a scientifically suitable **framework** to **evaluate the different siting possibilities** → the importance of corresponding ***regulatory guidance***
- **Periodic safety analyses** are the tools to **evaluate** expected levels of safety & to evaluate possibilities for optimisation → the importance of a stepwise approach that **allows for optimisation**
- An ***in-depth qualified review by the regulator*** (& the corresponding process → dialogue) is essential

Proposals to be developed by the implementer

Capabilities needed by implementer

- to develop the necessary **concepts**
- to evaluate **what is important** for a safe & feasible repository
  → **setting priorities** on what to investigate in more detail
- to **acquire** the necessary **data**
- to be able to **interpret** the **data** & to **draw** the correct **conclusions**
- to **decide and justify** which proposals to submit

… this is not done by the implementer alone

- the need to have a network of well **recognised specialists**
- the need to be involved with the **scientific community** & to take advantage of their knowledge

… and the proposals are refined in a **stepwise approach**

Stepwise approach: important issues

- The need for a **clearly defined process** (*what is decided when? what is needed for each decision? who has to do what?*)
- Continuity in **overall guidance** (*what is good? what needs to be avoided?*)
- The importance of clear **evaluation rules** for each milestone (importance of **safety case** as tool for evaluation process)
- The recognition that **not everything needs to be known** upfront
- To be clear that **not everything can be left open** until the end
- The **discipline** to take decisions and to stick to them

- ***The regulator is essential for all these issues!***

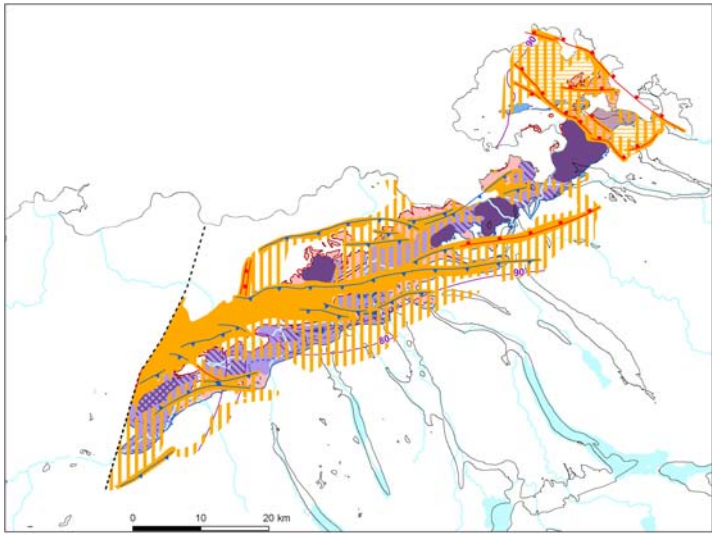
The technical basis: what has been achieved?

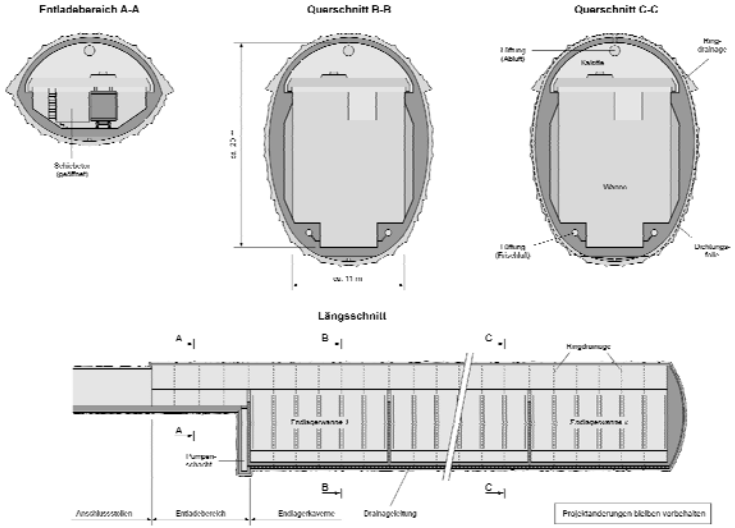
- **Improvement of the geological data base** (boreholes, seismics, …)
- **Improvement on detailed understanding on behaviour of host rocks** (rock laboratories, laboratory, …)

The technical basis: what has been achieved?

Based on our geological understanding

- Suitable geological **rocks & regions** have been identified
- **Design studies** have been performed
- **Safety analyses** have been made
- Active **communication & information** of the public takes place





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The interaction with the regulator

- Very early: **regulatory guidelines** (R-21, 1980), with two (evolutionary) revisions (1993, 2009) taking into account experience (& dialogue)
- Several milestones with **in-depth reviews** by HSK/ENSI & experts of safety reports, geological syntheses, design concepts
- Regional & local **geological investigations**, incl. **rock laboratories** cleared & followed by HSK/ENSI
- **Waste treatment/packaging** (R-14/1988, B03/2007): involvement of Nagra in clearance process of waste treatment procedures
- **Review of cost studies** by HSK/ENSI & experts provided valuable input for project refinements
- **...**
- Conclusions:
  - **Interaction & dialogue** (while maintaining the independence of the regulator) are essential
  - HSK/ENSI's tradition to also **involve experts & scientific community** is considered valuable, with the overall responsibility being with ENSI

The societal dimension: public confidence

- Public confidence is achieved through **trust**
- Trust depends upon the **decision-making process** …
  - the existence of **rules**
  - the clarity in the **sequence of decisions**
  - the behaviour of the **people / organisations** involved
- … and upon **the specific project**
  - properties of the **system**
  - the way in which the system is **implemented** (incl. monitoring, reversibility, institutional control, …)
  - the **understanding** about the system
  - the way in which the system has been **assessed**
  - p.m.: this includes also **non-nuclear aspects** (EIA, …)
- … and requires the engagement of **stakeholders**
  - **who** is legitimated?
  - **how** are they engaged?

Trust is generated (through the implementer & by science)

… through **good projects** (a pre-requisite for trust)

- based on a **sound scientific basis**
  - 'home work' done through adequate **RD+D programme & integration of science**
  - involvement of the **scientific community** (contributions, reviews, etc.)
- consistent with **siting, design & implementation principles**
- assessed with a **proper & transparent analysis** (incl. documentation)
  - adequate **working process** (incl. QM)
  - suitable **methods, tools & information**
  - compilation of understandable **key arguments** for safety
  - comprehensive **documentation** (→ 'auditability')
  - detailed **reviews**

… and through **'good behaviour'** of the implementer

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Trust is generated (implementer expects from regulator)

… through adequate **criteria & guidance** and a high quality, transparent & independent **review process** with emphasis on:

- Understandable **overall system requirements**
- Transparent **siting criteria** (safety, interface to other issues (EIA, ..))
- Requirements and guidance for **design**
  - **long-term safety** issues
  - **operational aspects**
  - other issues (**monitoring, reversibility/retrievability,** …)
- **Stepwise approach**
  - **development** of project (e.g. site selection, design)
  - **implementation** of repository (stepwise clearance of construction)
- **Review**
  - **scope** (& level of detail) in accordance with the stage of the project
  - **independent**, but allowing interaction with implementer
  - **responsive** to the needs of all stakeholders

Trust is generated (by policy maker & politics)

… by providing an **adequate framework** (legislation) and assuming **leadership** ensuring …

- Reasonable and balanced (and understandable) **overall goals**
  - be clear about the need to solve an **issue of national interest** with **clear progress** within reasonable timescales (stepwise approach)
  - consider the **needs of society** (stepwise implementation, appropriate level of reversibility, consider non-nuclear issues)
- Process
  - clarify role of **stepwise approach** (adaptive staging: allows to take reasonably sized steps)
  - **involvement of all interest groups** with clearly defined roles
  - maintain **momentum** & provide **stability** of process (duration of project phases longer than duration of 'term of office')

Implementer: role & expectations

Role of implementer

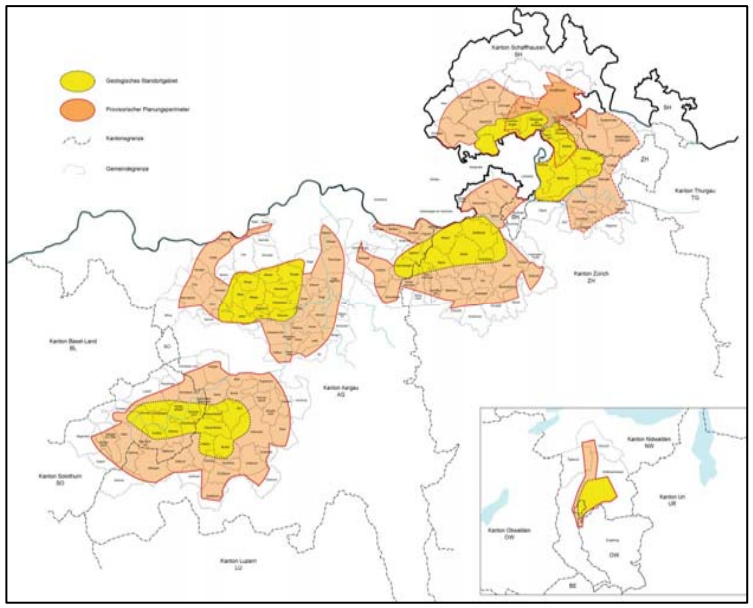
- Develop sound **projects**
- Interact with **public** with respect to implementer's tasks
- Be **responsive** to the needs of all stakeholders

What does implementer expect from regulator & policy maker

- Suitable **legal & regulatory boundary conditions** (law, regulation, and their enforcement)
- **Stability** in legal & regulatory boundary conditions (stable planning framework)
- Appropriate **interpretation** of requirements in stepwise approach in the reviews ('***how good is good enough for each step?***')
- Regulator (& his advisors) to be **'science & technology'-oriented in the reviews**, politics in decisions to be considered by policy maker

The overall process: what has been achieved?

- **Rules** established
- **Siting regions** defined (broad documentation)
- **Process** involving all stakeholders (reviews, discussions, …)
- Policy maker, regulator & implementer **act**, each with his **specific role**



Informationsveranstaltungen

18. November 2008	Südranden (Neuhausen, SH)
20. November 2008	Nördlich Lägeren (Glattfelden, ZH)
24. November 2008	Zürcher Weinland (Marthalen, ZH)
25. November 2008	Wellenberg (Engelberg, OW)
27. November 2008	Jestetten, Deutschland
3. Dezember 2008	Wellenberg (Stans, NW)
4. Dezember 2008	**Jura-Südfuss (Niedergösgen, SO)**
11. Dezember 2008	Bözberg (Oberbözberg, AG)
17. Dezember 2008	Jura-Südfuss (Aarau, AG)

The interaction with the regulator

- (Regulatory) guidance provides **suitable framework** for developing proposals (siting regions), although leading to a high level of complexity (justification of proposals)
- In-depth **review** of Nagra‘s proposals that included an intense **dialogue** resulting in additional documentation (all relevant issues have been covered in depth)
- All actors are **interacting with the public** and act according to their role (regulator, policy maker, implementer), involvement of public is ensured
- In-depth **discussion** of key questions with all stakeholders involved (Technisches Forum)
- Conclusions:
  - The **process** (site selection) is established and well underway
  - Implementer, regulator & policy maker stick to their **distinct roles**

Summary & conclusions

- The **implementation** of geological repositories is a **challenging** task both from the **technical** and **societal** point of view
- Successful implementation can only be achieved with a **suitable legal & regulatory framework**
- In Switzerland, the **interaction** between regulator and implementer has always been open & constructive, while maintaining the necessary **independence** of the regulator
- In the period of Ueli Schmocker being the director of HSK/ENSI, a number of very important **achievements** have been reached
  - **Disposal feasibility** of Spent Fuel, HLW & long-lived ILW broadly accepted (based on Nagra project, reviews by HSK and others → decision by Federal Government)
  - The rules & responsibilities for **site selection** have been defined (by SFOE)
  - **Siting regions** proposed by Nagra are accepted from the technical point of view by the different formal reviews

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Thank you, Ueli Schmocker

for the guidance & feedback over all the years!

Thank you!

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