

One issue that was considered was the fact that encapsulated spent nuclear fuel might in the future be regarded as a valuable resource. The resource would be owned by the owner of the repository property. When SKB ceases to exist the state will own the resource as the new property owner. Because of this the state would also be responsible for monitoring the site and taking the necessary action to prevent intrusion and to prevent man and nature from being exposed to danger.

The study outlines some outstanding questions relating to property rights and who would own the site including the ownership of the spent fuel, who would own it after final disposal and the fact that legislation on safeguards has not yet been established for a closed facility. However, the need for safeguards will not stop after closure of the facility, which needs to be thought about internationally.

The committee has sent their work to the government who has passed it on to stakeholders for comment. Responses to the proposals are expected in the summer of 2007, when the government will make a decision about what to do next. It is the government's responsibility to talk to the municipalities and get their feedback on the committee's proposals to identify the way forward.

A major theme of the ensuing FSC discussion was 'when will the implementer be freed of responsibilities?' Should this take place before or after sealing? During the post-closure monitoring period? Some FSC members thought that future government liability may prove to be a controversial issue in countries other than Sweden.

It was noted that although responsibility for the site ends at closure, financial obligations post-closure will still remain. The criteria to be used to set up the fund for this, has still not been decided but it is recognised as an issue that needs to be addressed.

Some participants noted the obligations on the state but pointed out that there is a risk that the state itself will not exist. People in Sweden do not consider that Sweden will not exist in the future. There may be issues of stability in the future and possible changes in society but it is only possible to work with the current situation and assume that it will continue.

After closure of the repository there will be post-closure monitoring, possibly for a few hundred years. This will be a part of the conditions on SKB which will be set out at the time. Some activities will end at the closure of the facility but monitoring and safeguards obligations may continue. The exact nature of this monitoring and safeguard work needs to be discussed and agreed upon. With the proposed approach most of the liabilities rest with the state in the long term, the waste producers only have liabilities in the short term but their decisions could have big impacts on long term liabilities.

## **TRANSFER OF SAFETY RESPONSIBILITIES TO FUTURE GENERATIONS: REGULATORY TOOLS**

**Janet P. Kotra, USNRC**

The case study reported views presented by the Nye County last December (Janet Kotra was not speaking for the County). At the Nye County, we see a shift from plans for passive safety, to a community taking the lead to organise active safety and stewardship. In a forward-looking local

development plan, Nye County defends a series of principles like safety, equity, and societal acceptability of responsibility (safety being foremost).

Janet Kotra distributed a brochure “Judging the Safety of a Repository at Yucca Mountain, Nevada: U.S. Nuclear Regulatory Commission Requirements”. In her presentation, she spoke of how the regulator can respond to the conditions set by the community.

The Nye County community clearly advocates permanent oversight of facilities. Locals now are advocating in a forceful way – saying “we are the ones responsible for our long-term safety. The relationship with this site is part of our identity.” The Nye County is also preparing to meet the energy needs of an expanding desert community. The link with the future is the community itself. They need to create a culture of foresight. With today’s projects they are creating human capital that will continue to put the pressure on existing government structures.

Continued oversight has its own important issues like financing the system in a credible way. The Nye County invests much of the funding provided now in e.g., infrastructure programs that should increase the sustainability of the community.

To respond to community requirements the regulators can establish requirements and guidance to ensure that safety obligations that can reasonably be discharged are in fact carried out and that remaining obligations are transferred as responsibly as possible, so that subsequent generations have the maximum flexibility to discharge their responsibility. There are transferred burdens of cost, risk and effort and these need to be at least partially compensated for by ensuring a subsequent transfer of information, resources and continuity of education, skills and research.

The US regulatory requirements for disposal in a geological repository set out obligations in terms of landownership and control, records maintenance, performance confirmation, post-closure monitoring, monuments and markers, archives and records preservation and post-closure oversight.

There are many active regulatory controls before closure of a repository which aim to ensure the maintenance of proper records from the outset of the project and that land ownership and control including water rights are properly managed. There are controls that restrict the access to the facility and avoid disturbances that could affect safety, and also there are performance confirmation and pre-closure monitoring to ensure that the site is fully understood.

There are also active regulatory controls after closure of the facility. These will include post-closure monitoring and maintenance of institutional and physical access controls. Participation in and updating of local, state, federal and international archives and land record systems is required along with an active programme for continuing oversight of the facility.

There are also regulatory controls which are set out as requirements, for example monuments and markers are to be designed, fabricated and emplaced to be as permanent as practicable and comprehensive records must be maintained at multiple archives around the world.

However, apart from the post closure oversight requirement, the requirements have remained essentially unchanged for 25 years. They were first established as part of the generic repository regulations in 1983 and they have been adopted virtually unchanged for Yucca Mountain specific regulations in 2001. The parts that have changed are related to the requirement for active repository oversight in perpetuity. There is now recognition that technology continues to advance and that advances should be taken into account in the design and the evolving vision for protecting future generations including an emerging stewardship role for the local community.

The Energy Policy Act of 1992 section 801 part C states that following repository closure the implementer shall continue to oversee the Yucca Mountain site to prevent any activity at the site that poses an unreasonable risk of:

1. breaching the repository's engineered or geological barriers, or
2. increasing the exposure of individual members of the public to radiation beyond allowable limits.

Various advances in technology related to the durability of monuments and markers, information technology and global access, archival media and techniques and remote sensing have to be integrated into the project design to make sure that best practice is being followed at all stages.

The Nye County seems to be developing a stewardship role despite vigorous opposition to the principle of hosting a repository from the state of Nevada. The Nye County continues to pursue cooperative agreements and relationships with the federal implementer. The county is planning for a separate, active role in the regulator's decision making process and is looking for long term responsibilities for and a relationship with the Yucca Mountain site and the repository.

The Nye County government is aiming to ensure the protection of present and future populations in the community and they want to ensure that the repository project is a success in every way possible. They want to make sure that the Nye County benefits economically from the project.

The county has set up various oversight initiatives over the years to follow the project. They set up an independent scientific investigation programme in 1995 and an early warning drilling programme at the same time. Their quality assurance programme was accepted by the US NRC in 1999 and the community protection plan was approved by the county commission in 2006.

For the future the Nye County is proposing that there would be a co-ordinated involvement of the county in planning, development, operation and long term monitoring of the repository. They want to encourage the development of a live-work community for the repository workers so that they will be engaged in the local community as well as working at the facility. They want to encourage the full integration of the federal repository facility with the local infrastructure development for example by setting up a visitors centre, and by working to get the emergency responses in place and medical training facilities.

The county is looking to develop the Amargosa Valley Science and Technology Park and Museum so that it links with the facility. The county wants to hold the repository sample management and archive facility and they are looking at an advanced energy and water management facility related to the site including a solar power farm. The county wants to see itself as a test bed for energy technology applications for the US; however the role of the local community in the long term future of the site remains unclear. The congress will need to approve land withdrawals to enable the facility to be completed. In order to have a role in the process the community will need to get the co-operation and funding of the implementer. There is also the issue of continued state opposition to the facility which impacts on the ability of the Nye County to engage in the process. Certain aspects of their proposals may require regulatory acceptance to enable them to be put in place.

Although there are some regulatory tools in place these may need to adapt and change to the changing requirements of the community. There was also a change in technology and expectations that will need to be integrated into the programme. The emerging role of the community in partnership

with the implementer and regulatory authorities has the potential to profoundly influence the effectiveness of the regulatory tools and technology that are in place.

Experts used to think that the safety panacea was passive safety but communities are now saying that they want active safety and prolonged stewardship including monitoring. However this raises the issue about long term financing of programmes. There is a strong articulation of the polluter pays principle in US law which means that the fund for the repository design, construction, operation, local governance, oversight and protection measures are negotiated by the county with the implementer.

The government is to provide monitoring and oversight in perpetuity but this relies on the nuclear power levy and long term plans. However if the community is saying that Nye County needs a long term role and that the link between the facility and future generations is the community itself then there is a need to promote the long term role of the community as they will provide the human capital to pass on knowledge about the facility to future generations. To enable this to really develop will need cultural links to the facility possibly through energy development.

The regulations rely on “no active control” of the facility over the long term. It will be the congress who will decide whether to have active controls in place and there will need to be an alignment of these two approaches. It may be possible to take credit for controls over a period of a few hundred years but ultimately this will not be possible.

To date in the US, this long-term active oversight orientation has been superimposed on existing regulation and some specific rules have not yet been worked out. Long-term oversight may mean an obligation to refurbish markers and monuments, and proper ways to maintain records in order to transfer knowledge to future generations. In some regulatory frameworks credit is given for safety provided by existing institutional controls. One starts to worry about passive safety AFTER the institutional control period (representing a bonus of a few hundred years).


The ensuing FSC discussion highlighted new trends in regulatory culture. Reflecting public demand, there is a shift in the regulatory field towards a requirement for “permanent” oversight of a repository. For instance, WIPP was designed with the intention to maintain active surveillance for 100 or 300 years. The 2000 report “Disposition of SNF and HLW - Societal and technical challenges”<sup>1</sup> analysed OECD ethical statements and saw a similar shift, from a view that assuring passive safety immediately is ethically correct, to an emphasis on leaving pathways open for later decisions. That group interpreted the shift as a greater recognition of the fact that we do not have all the answers, we are not the final generation. There may be other ways of viewing and behaving later and we must respect those differences and provide resources for that. There is more emphasis now on passing responsibility down the chain of generations, rather than on a far-future scenario in which a new civilisation stumbles onto the repository site.

There appears to be a trade-off between the focus on passive safety, no reliance on active institutional controls and no undue burden on future generations versus a focus on active oversight in perpetuity, the preservation of options and the responsible transfer of unavoidable burdens. This in turn brings out an emerging role of local stewardship for local communities.

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<sup>1</sup> US National Academy of Sciences, Board on Radioactive Waste Management, National Academy Press, Washington, D.C., 2001.

Slides provided by Janet P. Kotra, NRC




**U.S. NRC**  
UNITED STATES NUCLEAR REGULATORY COMMISSION  
*Protecting People and the Environment*

**Transfer of Safety Responsibilities to  
Future Generations: Regulatory Tools**

8<sup>th</sup> Meeting of the RWMC  
Forum on Stakeholder Confidence  
Topical Session 10.b.

Janet P. Kotra  
Division of HLW Repository Safety  
U.S. Nuclear Regulatory Commission  
June 6, 2007

1




**U.S. NRC**  
UNITED STATES NUCLEAR REGULATORY COMMISSION  
*Protecting People and the Environment*

**What duties to future generations can or  
should regulators address?**

- Safety?
- Equity?
- Social acceptability?

“Focus on Safety”  
After a certain time, “...attend to safety only”

2



**U.S. NRC**  
UNITED STATES NUCLEAR REGULATORY COMMISSION  
*Protecting People and the Environment*

**Regulators can establish requirements and  
guidance to provide that**

- Safety obligations that can reasonably be discharged are, in fact, carried out
- Remaining obligations are transferred as responsibly as possible to afford subsequent generations maximum flexibility to discharge *their* responsibilities
- Transferred burdens of cost, risk and effort, are at least partially compensated by ensuring transfer of
  - Information
  - Resources
  - Continuity of education/skills/research

3



### **U.S. Regulatory Requirements for Disposal in a Geologic Repository**

- Land Ownership and Control
- Records maintenance
- Performance confirmation
- Post-closure monitoring
- Monuments and markers
- Archives and records preservation
- Post-closure oversight

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### **Active Regulatory Controls Before Closure**

- Maintenance of proper records from the outset of the project
- Land ownership and control, including water rights
- Controls that restrict access and avoid disturbances that could affect safety
- Performance confirmation and pre-closure monitoring

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### **Active Regulatory Controls After Closure**

- Post-closure monitoring
- Maintenance of institutional and physical access controls
- Participation in, and updating of local, State, Federal and International archives, land record systems
- Active program of continuing oversight

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**“Less Active” Regulatory Controls**

- Monuments and markers that are “designed, fabricated, and emplaced to be a permanent as practicable”
- Comprehensive records in multiple archives around the world

7



**Except for post-closure oversight, requirements essentially unchanged for 25 years**

- First established as part of generic repository regulations in 1983
- Adopted, virtually unchanged, for Yucca Mountain-specific regulations, in 2001

8



**What has changed ?**

- Requirement for active repository oversight in perpetuity
- Technology continues to advance
- Evolving vision for protecting future generations
- Emerging stewardship role of local community

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### Energy Policy Act of 1992

- Section 801 (c)
  - “Following repository closure the [implementer] **shall continue to oversee the Yucca Mountain site** to prevent **any** activity at the site that poses an unreasonable risk of–
    - (1) breaching the repository’s engineered or geologic barriers; or
    - (2) increasing the exposure of individual members of the public to radiation beyond allowable limits.

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### Advances in Technology that affect

- Durability of monuments and markers
- Information technology and global access
- Archival media and techniques
- Remote sensing

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### Evolving vision for protecting future generations

- Focus on “passive safety,” “no reliance on active institutional controls”, and “no undue burden”
- vs.**
- Focus on active oversight in perpetuity, preservation of options, responsible transfer of unavoidable burdens, and emerging role of local stewardship

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**Emerging Role of Local Community:  
Nye County, Nevada**

- Despite vigorous opposition from State of Nevada, Nye County continues to
  - Pursue cooperative agreements and relationship with federal implementer
  - Plan for separate, active role in regulator’s decision-making process
  - Prepare for long-term responsibilities for, and relationship with the Yucca Mountain site and the repository

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**Stated Objectives of the  
Nye County, Nevada Government:**

- Assure protection of present and future populations in the community
- Assure that the repository project is a success in every way possible
- Assure that Nye County benefits economically from the project

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**Active County Oversight Initiatives**

- Independent Scientific Investigation Program (since 1995)
- Early Warning Drilling Program (since 1995)
- QA program accepted by U.S. NRC (since 1999)
- Community Protection Plan (approved by County Commission August, 2006)

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### **Nye County Proposals**

- Coordinated Involvement of County in planning, development, operation and long-term monitoring of repository
- Encourage development of “Live-Work Community” for repository workers
- Encourage full integration of federal repository facilities with local infrastructure development (e.g. visitor center, emergency response, medical, training facilities)

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### **Nye County Proposals (cont.)**

- Amargosa Valley Science and Technology Park and Museum
- County custody of repository sample management and archive facility
- Advanced energy and water management facility, including “solar power farm”
- “Test Bed for Energy Technology Applications”

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### **Role of Local Community in Long-term Stewardship of Site Remains Unclear**

- Congressional approval for land withdrawals
- Cooperation and funding of implementer
- Impact of continued State opposition
- Certain aspects may require regulatory acceptance

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### **Closing Thoughts**

- Regulatory tools in place
- Changing technology and expectations
- Emerging role of local community, in partnership with implementer and regulatory authorities, has potential to profoundly influence the effectiveness of these tools

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### **NOTE:**

*The views expressed in this presentation are the observations of the author and do not reflect any judgment or determination by NRC on matters addressed or the acceptability of a license application for a geologic repository at Yucca Mountain.*

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