The US government approach to management and geologic disposal of radioactive waste in the USA – 2013

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The US government released its "Strategy for the Management and Disposal of Used Nuclear Fuel and High-Level Radioactive Waste" (the Strategy) in January 2013 (USDOE, 2013). The Strategy is a policy statement that acknowledges that the previous federal government approach to siting major nuclear waste management facilities is not workable. Experience has shown that this previous top-down approach typically does not work if opposition is strong at high levels of local and regional/state government. The newly published strategy presents a way to create a more acceptable and sustainable programme to create an integrated system for transporting, storing and disposing of the higher-level wastes generated in both the civilian and the government sectors.

Schedules for creating the components of the new US waste management strategy

In response to the recommendations from the final report and recommendations of the "Blue Ribbon Commission on America's Nuclear Future" (BRC) (BRC, 2012) the new strategy proposes a phased, adaptive and consent-based approach to siting and implementing a radioactive waste management and disposal system consisting of a pilot interim storage facility, a full-scale interim storage facility and a geologic repository.

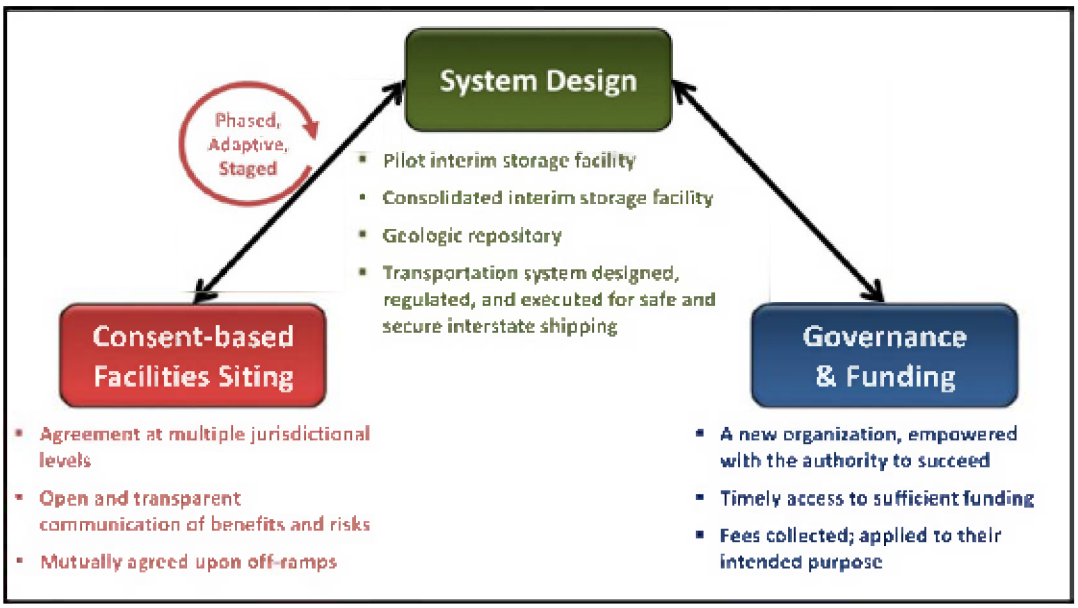
The strategy proposes that over the next decade the following will be accomplished:

- site, design, license, construct and begin operating the pilot interim storage facility by 2021 with an initial focus on accepting used nuclear fuel from shutdown reactor sites;
- advance toward siting and licensing a larger interim storage facility, to be available by 2025;
- make demonstrable progress on the siting and characterisation of repository sites to facilitate the availability of a geologic repository by 2048.

Strategy elements

As may be seen in Figure 1, taken from the Strategy, siting, design and governance/ funding are its key elements. Each of the descriptive phrases in this figure reflects recommendations made in the final report from the BRC.

Figure 1: Key strategy elements



Source: US DOE, 2013.

Prospects for the future

Perhaps in large part due to the positive manner in which the relationship between the host community for the Waste Isolation Pilot Plant (WIPP), the working deep geologic disposal facility in New Mexico, was described in the BRC report (2012), several locations in the United States, at several political levels, have indicated an interest in discussing how they might host a waste management facility as well. They have done this through written communications to the Department of Energy. These locations must be kept confidential for the present time.

The locations wishing to be considered for a deep geologic repository have proposed that sites in volcanic rock and sedimentary rock be considered. The majority of the proposed sedimentary rock sites that have been proposed for discussion and perhaps further consideration are in rock salt.

Rock salt as a geologic repository medium

Since the currently operating US deep geologic repository is in rock salt (WIPP), it is a medium that is well studied and understood. However, because the current US repository is disposing of long-lived transuranic waste with no appreciable heat loading, some testing has been proposed to confirm the suitability of salt as a host media for the disposal of heat-bearing wastes. The proposal is in two phases; the first phase would be a field test that addresses the lesser heat output of defence and research reactor related (US government generated and owned) wastes (US DOE, 2012).

The second phase (US DOE, 2011) would focus on the effects from hotter (largely civilian reactor sourced) waste streams. Although this two-phased testing programme would be conducted at the WIPP, its results would be directly applicable to any proposed bedded salt site, and can also be useful for judging heat effects in any proposed domed salt sites. In other words, conducting the tests in one location does not make the tests site-specific. Since rock salt deposits are the primary (bedded) or physically reworked

(domed) remnants of seawater evaporation, many tend to have much in common physically and chemically, regardless of their location in the US or even the world.

The first phase of testing proposed is being defined, and will serve as a test bed for the design of the second phase. Therefore, only the conceptual layout for the first phase of testing will be illustrated here. This first phase focuses on the heat output expected from government generated and owned wastes currently being managed under the Department of Energy's Environmental Management (EM) programme. Figure 2(a) illustrates the layout for the testing. The concept for testing the lower heat output portion of the government owned wastes is illustrated in upper part of Figure 2(b), and the concept for testing the higher heat output portion of that same set of radioactive wastes is shown in the lower part of the same figure. The differences between both concepts lie in the spacing between the heater containers to control the temperature in the host rock. Instrumenting these tests to allow maximum data collection on processes of interest is a current challenge.

Figure 2(a): Conceptual layout for the government owned and managed waste heater tests showing two test drifts with different spacing between the heater containers

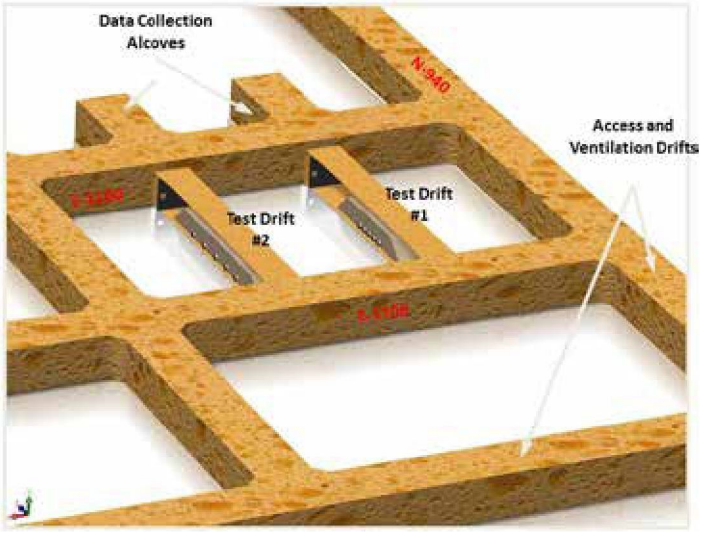
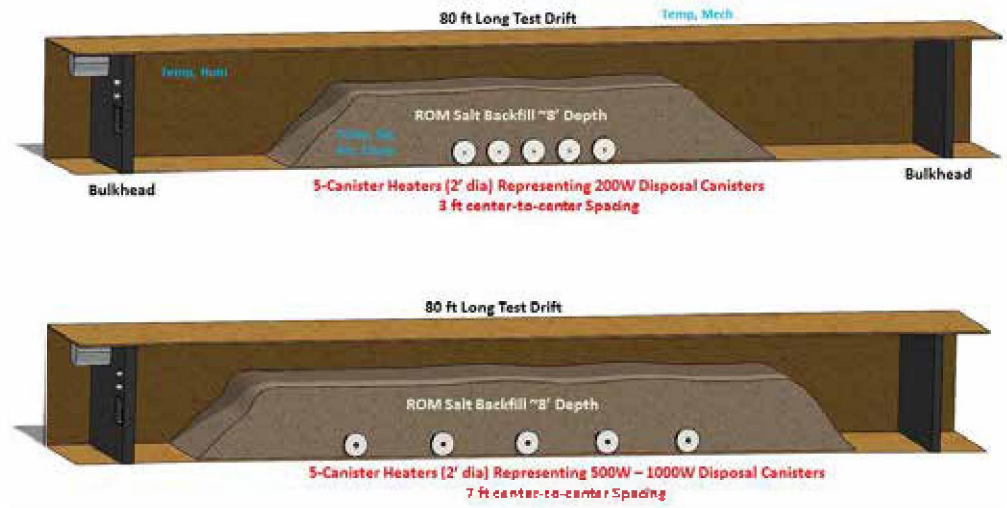


Figure 2b: Conceptual layout for Test Drifts 1 and 2 showing the two test drifts with different spacing between the heater containers



Other geologic repository media under consideration in the United States

The Strategy (US DOE, 2013) indicates that the US focus for a future deep geologic repository will be on several types of host rock. Current work in the Department is looking at the potential for using crystalline intrusive or metamorphic rocks, and at sedimentary rocks like bedded or domed salt, shale or clay formations. The Strategy indicates that an effort will be made to co-ordinate with and learn from the repository programmes of other nations that have significant experience with these various geologic media.

The current administration policy on the management of radioactive wastes reflects experience

The Strategy strongly suggests that the days of making a high-level decision about siting a nuclear waste facility are behind us (US DOE, 2013). Experience with a Nuclear Waste Negotiator in the 1990s and with siting the proposed Yucca Mountain repository during the last three decades indicates that in the US as elsewhere, smaller communities, counties or native American territories may show interest, but if at the state level there is strong opposition, there is no way to make progress in siting a facility. In the future, all levels of government with a say in the matter need to be consulted and co-ordinated with in order to achieve acceptance of a facility. The success of the Waste Isolation Pilot Plant Repository is hailed in the BRC report several times as a model for state to county to community involvement – a co-ordination leading to a successful outcome. In that process the federal government had to make adjustments to what it desired to do, the state imposed some limitations of waste volumes and types, but that is the whole idea behind a serious effort at consultation. In the end there was a binding written agreement between the state and the federal government that allowed the repository to open, and it has now been operating since 1999.

A fundamental problem with siting nuclear facilities

The opposition to the siting of nuclear facilities is a world-wide phenomenon. Fear of radiation and radioactivity is the basis for this opposition, augmented by very rare nuclear disasters. This fear exists in the public, in politicians, scientists and regulators. Fear of radiation, and the precautionary way that some radiation contamination incidents have consequently been managed, in some instances has been more detrimental to the affected public's well-being than the radiation itself.

Perhaps a fertile area for future co-operation between nations is to create effective ways to bring understanding into schools and other appropriate public educational forums on radiation, its nature, sources and effects. Part of this curriculum should explain the precautionary nature of national and international regulations that assume effects from low-doses of radiation that have been predicted, but have never been observed in normally healthy whole organisms.

References

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