Valuing the Future:
The Viability of Institutional Controls Over 1,000 Years

The report investigated the risks of losing institutional controls for the Onsite Buried Waste approach and examined issues surrounding very long periods of time: continuity of governments, language, ethical issues with leaving an enormous hazard to future generations and valuing future costs.

Institutional Controls Unreliable Over the Long-Term

Wastes that would be left at the site are extremely long-lived. For example, one of the longest lasting radionuclides, thorium-232, has a half-life of 14 billion years. If the buried waste is left at West Valley, government would need to monitor the waste for thousands of years; such monitoring and control activities are called institutional controls. However, controls are not foolproof and have failed at many sites resulting in the need for additional remediation. Controls failed multiple times at West Valley, including the overflowing trenches in the State Disposal Area. *These incidents are not unique to the site and such failures speak to the unreliability of controls as a long term strategy for preventing harm to people.* Understanding that there is no guaranteed place or technology to truly isolate long-lasting radioactive waste, these failures suggest that the real solution is to first minimize additional production of nuclear waste from atomic power, weapons and the nuclear fuel chain.

1,000 Year Continuity in Government and Language Improbable

Maintaining institutional controls at a nuclear waste site first requires a continuity of government and language. *A fundamental obstacle to maintenance of institutional controls is the improbability of thousand-year continuity in either government or language.* A thousand years is a long time for any government to endure, let alone institutional controls at a particular waste site. It is of course impossible to look forward in time and see the world of 3008; as an alternative, we can look the other way, at the world of a thousand years ago. In 1008, Vikings were attacking England; the Norman Conquest was still decades away. Of the governments and nations that exist today, only Iceland has an unbroken lineage spanning the last thousand years. If the government of any country (other than Iceland) had made a commitment in 1008 to protect an important site for a thousand years, there is no guarantee that anyone would still know about that commitment today.

A thousand years is also a long time in the history of language—long enough for a language to change beyond recognition. While something called the English language has existed for centuries, it changes fast enough so that modern readers cannot understand words written a thousand years ago. The English literature classic that dates back a thousand years, *Beowulf*, is no longer readable, and has to be translated into modern English in order for anyone but a few specialists to understand it. A warning from the author of *Beowulf* written in the English of roughly 1000 years ago would be incomprehensible to all but a handful of experts today. In 3008, when the English of this report is as ancient as the language of *Beowulf* is today, will casual readers and potential intruders on a waste site be able to read our warning signs? There is no reason to assume that the Department of Energy could adequately address safety and communication issues at West Valley for the Onsite Buried Waste option.

Protecting Rights of Future Generations

One of the best-known authors to address nuclear waste issues is Kristin Shrader-Frechette, a University of Notre Dame scientist who argues that burial of nuclear waste in repositories is mistaken, both because of the scientific uncertainty in predictions of geological events over the millennia, and because waste burial compromises the rights of future generations to equal treatment and free, informed consent. She calls for using monitored, above-ground waste storage so that future generations can make their own decisions and apply new technologies to the problem without facing additional risks from unretrievable buried waste disposal. Every generation should have the right to equal treatment and to give or withhold informed consent to avoidable hazards. *No generation has the right to impose its hazards on those who come later. These principles, rather than cost calculations, should determine our choices about nuclear waste.*

Ethical Policy Requires Zero Discounting Over 1,000 Years

Economists discount future costs and benefits, expressing them in present value terms—a process that is nothing more than compound interest in reverse. For instance, at a 3 percent discount rate, $103 next year has a present value of $100 today, because $100 is the amount one would have to put in the bank today at 3 percent interest, in order to end up with $103 next year.* For short- and medium-term private financial decisions, discounting is essential. For intergenerational public policy decisions, the case for discounting is much less compelling. Rather than any individual weighing complete costs against complete benefits, nuclear waste policy consists of choices about what this generation will or will not do for those who will come later. *That is, the choice of an intergenerational discount rate is a matter of ethics and policy, not a market determined economic decision.*

Fairness requires that all generations be treated as equally important. *This means that the discount rate that would apply if all generations had equal resources must be very zero, or close to zero.* Indeed, in 2001, the DOE in a *Report to Congress on Long-Term Stewardship* recommended that discounting should not be used when calculating future site maintenance costs for federal nuclear waste sites. The same conclusion—the discount rate for a 1,000-year analysis must be zero—can be reached by a different argument. The existence of regulatory requirements for protection of sites that will remain dangerous for 1,000 years must imply that we care today about health hazards that will be experienced in 3008. Costs and benefits incurred in that distant year must have a significant present value; otherwise, we could ignore them and we could "prove" via discounting that it is not cost-effective to spend anything today on our successors a thousand years down the road. At a discount rate of 1.4 percent, considered implausibly low by many conventional economists, $1 million in 3008 has a present value of $1 today. Thus it would not be worth spending more than $1 today to prevent $1 million of harm in 3008. To validate the commonsense idea that outcomes in 3008 matter today, the discount rate must be no more than a few tenths of a percent per year or zero. *If we care about the long-term impacts of today's nuclear waste, stretching across much more than a 1,000 years, then the only supportable discount rate is zero.*

(Excerpts from Section 5 of ***The Real Costs of Cleaning Up Nuclear Waste)***

*This example, like the entire discussion of discounting in the report, assumes the use of inflation-adjusted, or constant-dollar, amounts.