Statement by William M. Murphy for the Blue Ribbon Commission Disposal Subcommittee

I appreciate the invitation and the opportunity to share my ideas with the Blue Ribbon Commission Disposal Subcommittee at their meeting on September 1, 2010, and I will try to address the questions posed to the panel members. I gratefully acknowledge support for my participation from the US Nuclear Waste Technical Review Board, of which I'm a member. However, I want to be clear that the opinions I express are my own, and not necessarily representative of the TRB or any other organization.

My main technical expertise is in the geochemical characteristics and evolution of proposed repositories (e.g., Murphy, 2004). I advocate permanent geologic disposal as a feasible and proper solution to the problem of high-level nuclear waste. The time frame for permanent geologic disposal and its regulation can be considered objectively in relation to the half lives of radionuclide wastes. For example, the half lives of neptunium-237 and iodine-129, which are notorious in consideration of their hydrogeochemical mobility, are about 2 million and 16 million years, respectively. A million-year time frame is realistic for technical evaluations of geologic stability and geologic isolation of nuclear wastes. One million years is an unrealistic human time scale (human species: about 100,000 y; human civilization: about 10,000 y; nuclear science and technology: about 100 y). Nuclear waste disposal regulations currently and appropriately address requirements for environmental protection, which extend beyond the realistic time period of concern for human health.

Confidence in performance/safety/risk predictions for geologic disposal of nuclear waste can be achieved through multiple lines of technical evaluation that lead to convergent conclusions. Lines of reasoning include site characterization (e.g., geologic stability, hydrogeochemical transport), engineering design and assessment, laboratory and field scale experimental studies, theoretical and statistical modeling and analyses (including performance/risk assessments), and natural analog studies. Repository strategies and designs and regulations should invoke multiple lines of reasoning and multiple barriers to help provide confidence in respect to uncertainties in predictions.

Retrievability must be considered in the context of the individual geologic and engineered system. Retrievability may be relatively impractical for certain systems that could otherwise serve as acceptable repositories, e.g., deep borehole disposal, which is a kind of geologic repository, or sub-seabed disposal. In recognition of inevitable social instability on the time scale of the hazard of high-level nuclear waste, retrievability is a potentially hazardous feature of a repository. A good geologic repository should disappear. The concept of retrievability for the purpose of maintaining access to a potential resource must be considered separately from retrievability for the purpose of gaining confidence in the adequacy of safe permanent disposal.

In the present state of high-level waste management in the US, geologic site selection needs reconsideration. Reasonable requirements regarding site selection from EPA (e.g., comparative performance assessments for long times), NRC (e.g., balancing favorable and potentially adverse conditions), and DOE (e.g., disqualifying conditions) were abandoned in the aftermath of the Nuclear Waste Policy Amendments Act of 1987. International (e.g., IAEA) guidance on site selection is valuable.

Reference: Murphy, W.M. (2004) Measures of Geologic Isolation. In Scientific Basis for Nuclear Waste Management XXVIII, Materials Research Society Symposium Proceedings, v. 824, p. 533-541.