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White Paper on a Conceptual Example of a Proposed Risk Management Regulatory Framework Policy Statement

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General Comment

Firstly addressing the broad applicability of the Framework, either no policy statement should be issued at this time or the draft white paper needs softening to provide greater flexibility regarding what constitutes an appropriate consideration of risk and what constitutes an acceptable consideration of defense in depth measures. The potential hazard associated with controlling and containing the radioactive inventory of a nuclear power plant makes it unique relative to most of the other regulated activities with regard to the need for formal methods of risk assessment and levels of defense in depth. The Findings of the NUREG-1250 document don't provide a convincing argument that in general a major change in regulatory approach is required for all of the areas of regulation. In each area of NRC regulation some consideration is currently being given to risk and some consideration is given to at least the barrier concept of defense-in-depth. The formality by which risk is considered and the extent to which defense-in-depth measures are required depend on the associated hazard. In Section A of the white paper, a general process is described for regulatory oversight that is appropriate, as long as the effort required and the tools used are consistent with the magnitude of the threat. In Section B, there is a requirement to develop and utilize risk assessment tools, where practical. In many cases, this is just not warranted by the level of hazard. This requirement could lead to unnecessary demands on the licensee or lead to over-emphasis on the quantitative magnitude of the assessed risk. It isn't clear that we aren't trying to fix some problems that don't exist. Section C describes an approach to provide consistency in the application of Defense-in-Depth. The common decision criteria that are proposed are too prescriptive. For example, they could lead an applicant to undertake the same level of defense in depth for the transportation of a cesium radiation source as for a nuclear power plant. Very prescriptive deterministic defense in depth requirements are inconsistent with risk-informed regulation.

The proposed white paper does not address two aspects of risk management for operating reactor safety that

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have been made apparent by the Fukushima accident. Perhaps the NRC is still evaluating these issues and has the intent to prepare a subsequent white paper addressing them. The first issue is the lack of a coherent treatment of Beyond Design Basis Events (BDBEs). The Fukushima accident and subsequent review of the manner in which the industry has addressed risk-significant BDBEs indicate that the licensing basis for nuclear power plants should be extended in a risk-graded approach to include regulatory oversight of some portion of BDBE space. This does not imply that, from the viewpoint of health risk, nuclear power plants in the United States today don't satisfy the NRC's safety goals. Quite to the contrary, from my examination there is no aspect of the Fukushima accident that would indicate that U.S. nuclear power plants don't satisfy the safety goals with large margin. In fact, the very low doses that have been received (and will be received) by members of the Japanese public despite the meltdown of three reactors with poor containment performance provide additional evidence that the risk of early fatalities in a light water reactor accident is so low as to be effectively non-existent. The other observation from the Fukushima accident is that the societal risks associated with land contamination (particularly from cesium isotopes) and the need for the relocation of members of the public has not been adequately recognized in the past. This is not only an important aspect of reactor accident risk, it is the dominant aspect of reactor risk. The NRC does have qualitative societal goals but not quantitative objectives, as were developed for health risk. It is not clear that the development of such quantitative goals is necessary but increased regulatory consideration is appropriate. The concept of what constitutes a large release of radioactive material is entirely different when considering the potential for early fatalities versus the extent of land contamination that would require relocation (not necessarily evacuation) of a large population. The implementation today of risk-informed regulation for nuclear power plants largely relies on surrogate risk measures: LERF and CDF. Historically, LERF has been closely associated with the NRC's early fatality safety goal. As methods of analysis have improved, it has become apparent that the potential for early failure of containment is much less than indicated in early risk studies. Reconsideration should be given to use of a LRF measure, perhaps based on a quantity of ^{137}Cs release, rather than the use of LERF. I strongly support the recognition of the importance of risk assessment in managing the sabotage threat for nuclear power plants.