A VALUE-IMPACT APPROACH FOR REGULATORY DECISION MAKING: AN APPLICATION TO NUCLEAR POWER

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ABSTRACT

This paper presents an extended value-impact methodology which aids decision makers in ranking various alternative actions for reducing the risk associated with nuclear power reactors. It extends the state-of-the-art value-impact methodology by using the Analytic Hierarchy Process (AHP), a formalized decision making tool for ranking various alternatives based on judgment. The method has been applied to a value-impact study of the implementation of either a vented-containment system or an alternative decay heat removal system as a means for reducing risk at the Grand Gulf nuclear power plant. A ranking of several policy actions which could reduce the economic risk of nuclear power is performed herein. The results of this analysis show that the method provides considerable insight to the solution of topics of interest in the decision making area of nuclear power risk management.

KEY WORDS: Risk assessment; Decision analysis; Analytic Hierarchy Process (AHP); Nuclear reactor regulation; Cost-benefit; Value-impact

1. INTRODUCTION

Decisions regarding Light Water Reactor (LWR) safety involve processing large amounts of information. Major decisions require input from experts in technical, economic and political areas, as well as from those who have some interest in the future of nuclear power; these interested parties are called stakeholder groups and include the Nuclear Regulatory Commission (NRC), electric utility, ratepayers, investors, and the Public Utility Commission (PUC). Therefore, a method is needed to organize the decision maker's thinking process and to include data, both quantitative and qualitative. The purpose of this paper is to provide a formalism for structuring complex decisions in such a way as to incorporate subjective judgment in a quantifiable procedure.

The method proposed to accomplish this objective is the Analytic Hierarchy Process (AHP) developed by T. L. Saaty (1977). The AHP handles qualitative as well as quantitative factors in an organized structure, which allows for the use of multiple attributes. Although this formal analysis cannot be guaranteed to improve decision making, it can clarify a