TRENDS AND NEEDS IN REACTOR SAFETY IMPROVEMENT

M. C. Leverett

Electric Power Research Institute

ABSTRACT

The Three Mile Island accident produced a surge of interest in understanding the technology of nuclear reactor accidents. Most of the resultant research and development has been focused on what happens after the accident starts, with less extensive work on accident prevention. It is pointed out that probabilistic risk analysis is an effective tool for discerning where to apply accident preventive work, and it is recommended that each nuclear power plant should have a level one probabilistic risk assessment, primarily for reasons of protection of the owner's investment in the plant.

KEY WORDS: Safety, Nuclear, Reactor, Risk, Probabilistic, Assessment, Prevention, Accident, Scram, Frequency

Introduction

The safety of the public against accidents in nuclear power plants has been a preoccupation of both the industry and the regulatory authorities from the very first. Even the earliest plants had redundant safety systems. Additionally, because the primary requirement is that the reactor be kept cool, special means of assuring that the reactor could be cooled in spite of any possible failure of its normal cooling system or loss of integrity of its connected piping were provided. Large reservoirs of water, for heat absorption, were provided and connections to effectively infinite heat sinks such as lakes, rivers or oceans were made. Additionally, each reactor was enclosed in a containment structure, designed to prevent the release of fission products to the environs if, in spite of the already elaborate measures to prevent an accident, one should occur anyhow.

On the other hand, in these early years, interest in knowing in detail what would happen in an accident was not strong. It was considered acceptable to make some probably overly safe assumptions regarding the kind and amount of fission product release in a hypothetical accident. For example in the 1960s, the Ergen Committee, a group of highly knowledgeable technical experts from both the national laboratories and the industry, gave serious consideration to the question of what kind of research and development was needed for assurance of safety. A principal conclusion was that the most productive efforts would be those directed to prevention of accidents; efforts directed to understanding what would