NRC Sees Uncertainties in Reactor Accident Studies

The nuclear industry has, for the past several months, been hoping that new research on the consequences of severe reactor accidents would lead to relaxation of some regulations. However, a report on the research results, issued by the staff of the Nuclear Regulatory Commission (NRC), suggests that regulatory changes are still a long way off.*

Like several other recent studies, the NRC's long-awaited report indicates that the amount of radioactivity likely to be released into the environment from most major accidents is expected to be less than even the nuclear industry was estimating a few years ago (*Science*, 5 April, p. 31). However, the report emphasizes that there are still many uncertainties in the new estimates and it notes that for some types of accidents, the estimates may actually be increased.

The report, which has been published for public comment, assesses a vast amount of research and computer modeling that has been conducted by government laboratories and private industry since the Three Mile Island accident of March 1979. It concludes that the computer models provide an improved basis for estimating accident consequences. However, the report warns that these models cannot be used to reach sweeping conclusions because differences in plant designs could have a major impact on what happens in a severe accident.

There are five basic types of reactor in the United States, but even plants of the same type can differ in important features. For example, the report notes that the use of limestone concrete instead of basaltic concrete in a boiling water reactor cavity can result in much higher release of some radionuclides from reactions between the concrete and the molten core. Similarly, in some types of accidents, the positioning of pipes will determine whether radionuclides are released directly into the environment, into auxiliary buildings, or underwater. Thus, individual plants must be analyzed to gain a thorough understanding of potential accident consequences.

One key feature missing from the NRC report is an estimate of risks—an analysis that combines the consequences of an accident with the probability of its occurrence. Such an analysis was originally intended to be part of the study but insufficient data were available to do the calculations. The report does present calculations for one pressurized water reactor which indicate that early fatalities resulting from a severe accident would be a factor of 10 lower than previous estimates, and that deaths resulting from cancer and other causes would be a factor of 4 lower. However, detailed risk estimates for other types of plants will not be completed until next year.

According to a foreword to the report by Denwood F. Ross, deputy director of the Office of Reactor Regulation, a review of regulatory practices will await publication of the risk analyses. In other words, any regulatory impact of the past few years' research is still months, if not years, away.

—COLIN NORMAN

Reassessment of the Technical Bases for Estimating Source Terms, NUREG-0956 (Nuclear Regulatory Commission, Washington, D.C., 20555).

EPA Finds Acid Lakes from Maine to Florida

Calling it "the first page in the first chapter" of a long book, Charles Elkins—the acting air and radiation chief of the Environmental Protection Agency (EPA)—released a major acid rain study on 29 August. It is the first information to come out of the National Surface Water Survey, a $6-million project begun by former EPA administrator William Ruckelshaus.

The study describes the acidity and alkalinity of unpolluted waters east of the Rockies as reflected in a one-shot, random sample taken at 1620 lakes in the fall of 1984. A similar study of western lakes begins this week.

Nine percent of the lakes sampled in the Northeast had *p*H levels of 5.5 or less. (A reading below 7.0 is considered acidic, and biological changes begin to be noticed when *p*H falls below 6.0.) Nineteen percent of these eastern lakes had an acid-neutralizing capacity (ANC) of a precariously low level—50 microequivalents per liter or less. A reading less than 200 indicates a vulnerability to acidification. According to the EPA, the data reveal little about the role that acid deposition plays in the death of lakes, but this study is the best description so far of the condition of eastern waters.

One apparent shock was the relatively large number of lakes in the high-risk category in the far Southeast. About 20 percent of Florida's lakes had a *p*H of 5.5 or less, and over a third were in the vulnerable group with an ANC of 50 or less. Survey leader Richard Linthurst said this finding was an unwelcome surprise. However, he added, the problem may be more apparent than real. Southern "brown-water" lakes receive acidity from natural sources, such as decaying pine trees, which tip the *p*H readings but do not necessarily injure fish or other water life. The EPA is checking its data with other studies in Florida to determine whether the problem is as significant as the numbers suggest.

EPA officials were reluctant to draw conclusions from the research, but they did say that the number of vulnerable lakes they discovered fit their expectations. They warned that it is not correct to assume that a low ANC reading means a lake is moving toward acidity. Lakes may be buffered by acid-absorbing soil and vegetation, which neutralize acid rain.

Although official Washington has found nothing alarming in the data, Michael Oppenheimer, an Environmental Defense Fund scientist, sees the study as a "startling" indication of the damage that has already been done by acid rain. "This is very strong evidence that at least one-fifth of the otherwise undisturbed lakes in the Northeast have been significantly altered chemically and potentially biologically by acid precipitation." Oppenheimer calls it "a problem that cries out" for attention.

The EPA says it must develop a model of acid rain's effects and apply this to the surface water data before it can predict what will happen in the future. Oppenheimer says, "You don't have to wait for that." Given the existing levels of acid precipitation in the Northeast, he says, it is clear that "a serious problem that exists in many lakes already" will become worse in the next decade or two.

—ELIOT MARSHALL