APS calls for reactor safety research

An independent study of the safety of conventional nuclear reactors, sponsored by the American Physical Society, tends to confirm official estimates that chances for a major lethal accident are small, but adds that should such an accident occur, the chances for fatalities are higher than previously thought. The study also concludes that not enough is known about how well emergency back-up systems will perform in preventing a developing accident from getting out of hand; more research is needed before confidence in these systems can be assured.

At a press conference during the annual APS meeting in Washington this week, Harold W. Lewis of the University of California at Santa Barbara, chairman of the study group, summarized the report's conclusions: "We find no reason for short-range concern about the safety of these light water reactors." The report notes that "there has been no major release of radioactivity." But Lewis urged that more safety research be performed to find ways of preventing loss of life in event of an accident and to establish quantitatively the effectiveness of various emergency systems. The study was funded by the National Science Foundation and the former Atomic Energy Commission and did not deal with breeder reactors or nonatomic energy sources.

Frank von Hippel of Princeton summarized the group's findings on the possibility of fatalities following a reactor accident in which a large quantity of radiation would leak into the atmosphere. The official AEC report (usually called the "Rasmussen report," SN: 8/24/74, p. 117) underestimated resulting deaths by a factor of 50, he said, by not adequately considering contamination of land areas under the plume of escaping radioactive material or the increase in cancers caused by the radiation, appearing perhaps only decades after the accident. The Rasmussen predictions of genetic and other nonfatal injury, especially thyroid damage, were also seriously underestimated, von Hippel said. Whereas the AEC report predicts that 300 cancer deaths could result from a serious accident, the APS study say the figure is closer to 10,000 to 20,000.

A typical accident, which could conceivably cause release of volatile radioactive material into the air, is the bursting of a major pipe carrying water to cool the reactor core. If all the water were lost, the fuel elements of the core would overheat, buckle and melt. To prevent this, an emergency core cooling system (ECCS) is provided to quickly replace the lost coolant, but in such an unstable system—with pressure rising as water changes to steam and structural braces holding the core beginning to melt—the performance of the ECCS is extremely hard to predict.

Prediction is usually tried in two ways: computer simulation and small-scale experimental testing. Unfortunately, the APS report concludes, experimental accident tests have so far been conducted on unrealistically small reactors (about one-thousandth the power capacity of commercial reactors), and computer calculations don't necessarily correspond to the results of these small tests.

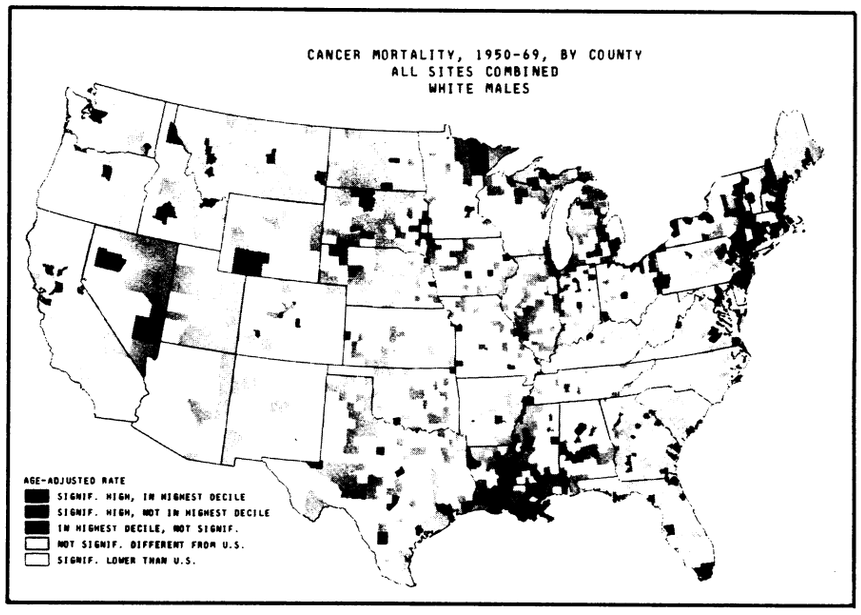
Steady-state operation of a reactor is relatively simple to program, but to deal with a rapidly changing system of melting fuel elements, turbulent coolant flow and rising steam pressure "would instantly exhaust the potential of the largest computers." The alternative is to make certain simplifying assumptions in the calculations. The results so far, concludes the report, have been "poor."

The study group also noted that delays in creating larger-sized accident-testing reactors have contributed to the problem of predicting how well the ECCS now installed in the nation's 50-odd commercial reactors would work in a real emergency. The largest test facility now planned is the LOFT (Loss of Fluid Test) reactor in Idaho, which has only one-sixtieth the power of commercial reactors, and the APS study concludes that this size is still inadequate to prove the reliability of ECCS.

Finally, the report mentions several other specific areas that need more attention: To prevent sabotage, more physical barriers should be erected around nuclear installations, rather than turning them into what one panel member called "an armed camp." Alternative siting policies should be considered, including underground construction or clustering reactors and fuel processing plants together in "nuclear parks."

Study group members refused to answer the qualitative question: Is massive deployment of nuclear reactors all right? This question, they said, would depend on a risk-benefit analysis that was beyond the scope of their study. So far, however, they found the safety of reactors "excellent," and licensing and operation procedures "conscientious." □

Cancer and chemicals: Risks mapped



Epidemiologists have just completed a study that literally puts cancer on the map. National Cancer Institute researchers analyzed cancer mortality rates by geographic areas in the United States and developed 34 maps. These maps, to be published next month, reveal previously unseen correlations between proximity to certain types of industrial activity and some types of cancer.

The maps are part of an ongoing National Cancer Institute project to amass cancer statistics and analyze them for possible underlying social, economic and geographic patterns. They, along with the compiled data they present visually, will appear in the NCI *Atlas of Cancer Mortality for U.S. Counties 1950-1969*.

Two project participants, using the maps and data, have also completed a separate study that correlates cancer mortality with an environmental factor