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I am Dr. Edward P. Radford, Professor of Environmental Medicine at the Johns Hopkins University School of Hygiene & Public Health, and my principal emphasis in this brief presentation will be the public health implications of nuclear power development. My fields of current research and teaching include biological effects of ionizing radiation and of air pollution generally, as well as the effects of metals on man. In the past I have presented related testimony before the Senate Appropriations Committee, the Joint Committee on Atomic Energy, and other subcommittees of the U.S. Senate. I am presently active in developing the occupational health program in the State of Maryland. I formerly served as Chairman of the Power Plants and Human Health and Welfare Studies Group, advisory to the Department of National Resources of Maryland, and am currently a member of the Advisory Committee to the power plant siting program in Maryland.

Since becoming familiar with the problems of nuclear power development, my position has been that nuclear power should be developed, but with adequate safeguards that the health of the public not be sacrificed in the effort to convert to this new source of energy. In my opinion there remain formidable obstacles to achieving safe use of nuclear power; moreover, the sources of information concerning safety and health problems have often been difficult for the public to obtain and evaluate. The traditional procedures for disseminating information, such as public hearings for various permits and legislative hearings such as this one, have failed and coupled with the reluctance of the Atomic Energy Commission and the utility industry to discuss problems openly, this failure has led to distrust of the nuclear power program by the public.

The nuclear power industry faces two important dilemmas which are related. First, it is preferable to build power plants close to the industries and people who need electricity, but the health implications of a major accident, and subsequent evacuation that would be required to protect the public health, have caused the AEC to require that plants be built away from "major" population centers. In fact of course in the eastern U.S., there are few sites available not near at least several thousand people, and thus this restriction has been alarming to those who will be living near the reactors. Second, without development of an extensive breeder reactor program, reliance on power from fission technology development is a hoax, and thus justification of the current rapid expansion of nuclear energy depends critically on the likelihood of a viable breeder technology being accepted by the public. In this regard the safety of breeders is much more important than is the question of safety of the present generation of light water reactors, in my opinion.

Others on this panel can discuss the question of breeder reactor safety more authoritatively than I, but because of the dependence of breeders on the fast neutron component, coolant voids will result in a further augmentation of

fission and heat production, and thus prevention of a runaway reaction depends entirely on external control systems. It seems probable therefore that the engineering reliability of these controls must be at least ten times greater than for the light water reactors. For this reason I believe that the first generation of several large breeders (greater than 500 Mwe) should be built in truly remote areas, where an accidental release of radioactivity would pose no significant public health problems. Only when ten or more years of operating experience have been obtained will it be possible to say how reliable the control systems will be. Due to construction delays, the time needed to test reliability, and a fuel doubling tissue of fifteen years, a significant input of breeder fuel to the electric utility industry is not probable until around 2010 at the earliest. This is a time when most if not all low-cost domestic U235 will be exhausted, if the projected rate of reactor construction continues, and we will have again become dependent on foreign sources for an economically viable basic fuel. The issue of breeder safety and reliability of the nuclear industry is therefore one of the crucial issues that any energy policy must consider. The record of reliability in large reactors to date does not provide much comfort to the proponents of nuclear power as a solution of our electric energy needs.

With regard to the current nuclear technology, we have in addition to the reliability issue a number of health questions still remaining. These include:

1) Adequacy of standards for occupational exposures in mining or in nuclear plant operations.
2) Reliability of containment of radioactive materials in normal reactor operations.
3) Accidental release of radioactivity from reactor sites or from fuel in transit to reprocessing.
4) Degree of containment of radionuclides in fuel reprocessing plants, especially the transuranic elements.
5) Ultimate containment of radioactive wastes for long-term storage.

I believe the current occupational exposure limit of 5 rems/yr. whole body dose is excessive, and should be reduced by a factor of 5 or 10. Such a reduction will add significantly to the problem of maintaining reactors or other nuclear facilities. In addition I believe that the occupational standard for mining of 4 WLM per year should also be lowered.

Containment of radioactivity during normal operations of reactors should be possible to achieve at a level where the public health is not significantly affected, but the principal problem now is to develop monitoring strategies and assign responsibility for monitoring that can assure the public that no significant releases have occurred. The situation with regard to normal operations of nuclear fuel reprocessing plants is less clear. Escape of tritium and small amounts of plutonium "hot particles" could become serious problems from these facilities.

Others on the panel can comment about reactor safety itself, but I wish to mention that cesium releases from rupture of fuel rod transport units are an important health consequence of an accident during spent fuel shipment. Finally, the fact that the method of long-term fission product waste disposal is not yet decided at this late date is very disturbing in view of the rapid rise in the rate of production of these highly hazardous wastes.