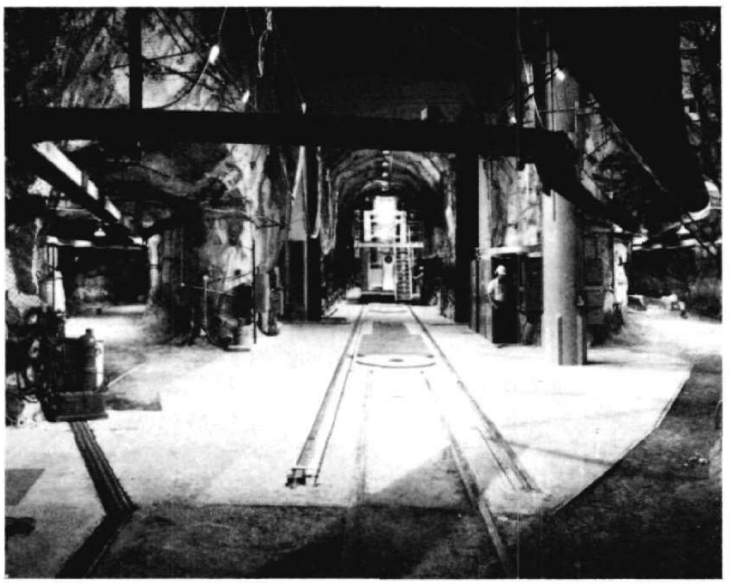

The Climax mine in Nevada, USA, is among the storage sites that have demonstrated safe geological disposal of high-level nuclear wastes, one topic covered by WHO's working groups.

Nuclear power: WHO examines health risks

by Dr Michael J. Suess

Among the many organizations regularly examining the health and environmental sides of nuclear energy is the World Health Organization (WHO) of the United Nations. Through its Regional Office for Europe, WHO since 1975 has marshalled the expertise of health and environmental specialists, convened as working groups, to prepare and publish a series of reports addressing specific topics of public concern. Following is an update of that work.

Risk assessment studies have shown that more traditional forms of energy actually may be more hazardous to those involved in their production and utilization than is nuclear technology – even though the older power industries have had a much longer time to establish and improve safety standards. Yet the public perception of risk is often different.

It is essential, then, that decisions concerning the potential effects on human health of different forms of energy production are based on adequate scientific data. It is equally important that accurate information is made available to the public. Working groups WHO has convened over the past decade have sought to clarify health issues surrounding nuclear power while providing health and environmental authorities in Europe with general guidelines based on factual information.*

Radiation accidents: improving emergency planning

One primary problem revealed by the accident at the Three Mile Island nuclear power plant in 1979 was the psychological impact on the public of the accident itself, as well as the confusion associated with the responses of various governmental authorities. Many of these problems could have been avoided through better emergency planning, particularly in terms of public education and public health action.

To assist health authorities, WHO recently has published *Nuclear Power: Accidental Releases – Principles of Public Health Action,* a report of an expert working group convened in 1981. It is hoped this report will enable national authorities not only to develop better capabilities to respond to accidents in nuclear installations – thereby reducing the health impact – but also to avoid unnecessary socio-psychological impacts on affected population groups.

Specifically, the report provides guidance for dealing with an unexpected event or situation that may occur in a nuclear facility and that has a potential for the accidental release of radioactive material into the environment in excess of authorized limits. The experts

Dr Suess is Regional Officer for Environmental Health Hazards at the World Health Organization Regional Office for Europe, Copenhagen.

* Working group meetings, which were held in collaboration with the Government of Belgium, were attended by temporary advisors from various European and non-European countries who acted in an individual capacity and not as representatives of their countries or organizations. Although reports and guidelines were issued by the groups, it was not their purpose to express any opinions on the advisability of the construction of nuclear power facilities. Major disciplines represented in the groups included health administration, health physics, human and radiation biology, human genetics, toxicology, environmental science and technology, and nuclear engineering, while professional categories included physicians, biologists, engineers, physicists, and chemists, thereby ensuring a multidisciplinary approach to discussions. Also attending were representatives from other international governmental and nongovernmental organizations.

of the working group considered the primary health actions that would be taken in response to such an accident, including the development and implementation of emergency plans to mitigate the impact on health of radiation releases.

Although health authorities are not always the only ones who would be involved in emergency planning, which is often the responsibility of several bodies, they will be expected to participate to different degrees in the planning and implementation stages.

Furthermore, they will have to ensure that staffing levels for coping with health aspects of accidents are provided, that public health actions in response to accidents are properly co-ordinated with other bodies involved, and that the responsible health personnel are trained. Finally, they will have to ensure that the means for assessing an accident situation are available, that methods for initiating countermeasures can be implemented, and that procedures for recovery and re-entry into contaminated areas can be developed.

To summarize briefly, the report's guiding principles are based on the philosophy developed by the International Commission on Radiological Protection (ICRP). It deals with sources of exposure – defining categories of releases and their importance in regard to countermeasures – describes the consequences, and identifies routes of irradiation of major importance. The report also provides an evaluation of radiological hazards, emphasizing individual risk, especially for non-stochastic effects related to the accidental release.

Other aspects evaluated

Over the years, WHO has convened other expert working groups that have examined health and environmental aspects of several other areas of nuclear power – namely, electricity production, transuranium elements, and radioactive waste.

The first working group, which met in December 1975, reviewed the experience gained from building and operating nuclear facilities and made estimates of attendant health risks. The group also considered estimates of the risks associated with the generation of electrical power from other types of fuel. The report on this meeting, published in 1978, is entitled *Health Implications of Nuclear Power Production.*

Among other things, the report discusses the implications for health in quantitative terms based on the studies of the ICRP, the United Nations Scientific Committee on the Effects of Atomic Radiation (UNSCEAR), and the US National Academy of Sciences Committee on the Biological Effects of Ionizing Radiation (BEIR). Also included are specific observations and recommendations on comparative effects of nuclear and alternative energy sources, radiation exposure, genetic-somatic effects and the need for epidemiological surveys, chemical and radioactive waste, thermal effects, siting and decommissioning, accidents and sabotage, and inspection, personnel training, and public information.

Transuranium elements

A second working group was convened in 1979 to satisfy public concern about health aspects of transuranium elements – namely, neptunium, plutonium, americium, and curium. Three major facets were considered: (1) physiological, toxicological, and dosimetric aspects; (2) application of occupational health control, including health physics; and (3) environmental behaviour together with public health implications associated with transuranium elements.

The intention was to cover all aspects relevant to health, with respect both to those who work with such elements and to members of the public who might be affected by such operations. Consideration also was given to routine and emergency situations. Published in 1982, the report on this meeting is entitled *Nuclear Power: Health Implications of Transuranium Elements.*

Radioactive waste

Since the first working group met in 1975, there have been developments that, though they do not materially affect the fundamental conclusions, do change the emphasis and importance associated with health and other implications of nuclear power. Moreover, although the development of nuclear energy since has declined, European countries are deriving an increasing proportion of their electricity supply from nuclear power reactors and the trend may be expected to continue.*

With this trend, there is a natural and increasing concern about possible exposure of workers and the general public to high-level radioactive waste and about the environmental consequences of its handling, treatment, transport, storage, and disposal. Accordingly, WHO convened in 1981 an additional meeting and subsequently issued a report entitled *Nuclear Power: Management of High-Level Radioactive Waste.*

The report may prove of particular interest in those countries now developing their nuclear technology and industry.

In countries with active nuclear energy programmes, there may be enough specialist advisors to keep abreast of all the knowledge and voluminous technical literature that now exists. In other countries, however, the same detailed knowledge and appreciation of the literature may not be available. Yet, in all countries, there is a need for a balanced survey – independent of the nuclear energy industry – that summarizes and appraises the literature in straightforward language. This report attempts to fill that need. Both the disposal of aqueous waste from the first extraction stage of reprocessing and of spent fuel are considered.

There has always been a greater emphasis on the safe handling and disposal of radioactive waste than of most,

* Williams, L., "The World Energy Situation and the Response of the European Community," *Journal of the Institution of Nuclear Engineers,* 21 (1):3, (1980).

if not all, other hazardous waste, and most knowledgeable workers in this field believe that the technology required for safe disposal of radioactive waste already is available. What remains is to decide which of several approaches should be selected, and when to implement them.

The report briefly describes the methods that have been suggested for high-level radioactive waste disposal, and provides a fuller account of those that show most promise and to which most effort now is being devoted. Disposal in geological formations seems at present to be the most promising method, but disposal under the sea bed and, possibly, on the deep ocean bed deserves further research. Disposal of radioactive waste into international waters, territories, and space should be subject to international agreement and supervision, with the participation of international organizations and the national authorities concerned.

Keeping high standards

While there is no such thing as absolute safety, all new as well as old technology must attempt to reduce risks to a minimum. In the case of nuclear power production, safety standards generally have been extremely high and it is important that these should be maintained.

In developing countries, where traditional industries often exist side-by-side with the most advanced technology, there are, unfortunately, no low-cost solutions to problems created by high technology such as nuclear power. Effective health protection for workers and the community by high standards of construction and operation, and by comprehensive monitoring and control procedures, must, therefore, be regarded as essential, whatever the level of economic development of the country deciding to adopt them.