CHERNOBYL ACCIDENT CONSEQUENCES IN GERMANY: NUCLEAR SAFETY AND RADIATION PROTECTION

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1. Working Programme of the Government of the Federal Republic of Germany on the Consequences of the Chernobyl Accident

A working Programme of the Federal Government was initiated on 26 May 1986 to cover all aspects of nuclear safety and public health, including research and public affairs in the light of the European and international activities resulting from the accident.

This programme included:
- legislation to introduce a programme for radiation protection and large-scale environmental surveillance
- improvements on emergency preparedness regulations
- review of the current safety status of all German nuclear power plants; intensifying research on severe accidents
- international co-operation on information and help in the case of nuclear accidents

2. Programme for Radiation Protection, Environmental Surveillance, and International Co-operation

In December 1986 a new Radiation Precautionary Law (Strahlenschutzvorsorgegesetz) entered into force in Germany. It has two main objectives:

- the optimisation of radiation protection in situations with a large-scale contamination of the environment
- the permanent surveillance of the environment.

The specific regulations of the law cover the following areas:
- the establishment of a nation-wide radioactivity information system IMIS
- the assignment of the competence for the assessment of the results of the radiation surveillance to the Federal Ministry for Environment, Nature Conservation and Nuclear Safety (BMU)
- the authorisation of the BMU to establish and enforce national dose- and contamination intervention levels
- the authorisation of the competent Federal Ministries for Health, Agriculture and Environment to impose restrictions on contaminated food and feed
- the authorisation for border entry control in emergency situation.

In 1987 the German Commission on Radiation Protection (SSK) established national dose intervention levels and a methodology for the determination of secondary contamination levels. Upper limits of the contamination of four types of food and of feed and four classes of radionuclides have been established by decisions of the Councils of the European Community in 1989 and 1990. The upper limit of the I-131 contamination of milk for example is set to 500 Bq/kg.

International agreements on early notification and mutual assistance of the IAEA and the European Community have been established in 1986 and 1987, respectively. On the basis of bilateral agreements with France, Russian Federation, Poland, Czech and Slovak Republic technical systems for the exchange of radiological data and information have been established.

The establishment of the nation-wide radioactivity information system IMIS was completed in 1993. IMIS consists of five nation-wide networks for the permanent surveillance of the
- γ-dose rate near ground (2150 stations),
- activity concentration in the air (50 stations),
- γ-dose rate in rivers as well in the coastal regions of the North Sea and the Baltic Sea.

The networks operate in an automatic mode. They provide early warning messages to the competent authorities. In emergency situations data collection is every two hours. IMIS also includes the operation of computer-based codes for the diagnosis and prognosis of the long-range atmospheric transport of radioactivity and for the assessment of the dose and the radiological situation of the environment. A total of 43 authorised laboratories in the 16 federal states of Germany is in permanent operation. The main emphasis is the surveillance of the food chain.

Computer-based information systems provide the technical services which are required for a standardised collection, processing, and visualisation of the data as well as for the fast exchange of information between the 60 institutions which participate in IMIS and with international organisations.

3. Safety Review Programme by RSK and its Results

Programme

Shortly after the accident of Chernobyl the Federal Government of Germany launched a programme to review the safety of all operating nuclear power plants in Germany in the view of this accident. The competent Federal Minister in charge of nuclear safety asked his advisory body, the Reactor Safety Commission (RSK), to perform this review.

RSK Report

The Reactor Safety Commission presented its results in its "Final Report on the Results of the Safety Review of the Nuclear Power Plants in Germany" on 23 November 1988. This report covered in its main parts generic statements relevant to all nuclear power plants as well as plant specific conclusions for individual plants. In addition, periodic safety reviews on ten year intervals were proposed for the future.

Summary of conclusions and results

In general the RSK stated, that the safety of the German NPPs is based on a well balanced defence in depth concept and that the corresponding equipment is adequate to cover all necessary precautions. The safe operation of the plants is assured.

To further reduce the already very low risk of nuclear accidents, the RSK recommended to consider severe accident management measures with the aim of core melt prevention or mitigation. These proposals include:

- administrative and operational measures taking advantage from the capability of the operational systems
- assuring the direct current power supply for safety related systems using batteries for a minimum time of 2 -3 hours,
- secondary bleed and feed for PWR
- measures concerning hydrogen distribution and combustion
- sampling system for the containment atmosphere
- venting system for the containment to prevent its failure including filters for aerosols and iodine
- filtering of the air supply for the main control room
- diverse pressure control for the reactor pressure vessel of BWR

All German utilities agreed to voluntarily implement accident management measures and to carry out Periodic Safety Reviews (PSR). These PSRs include a probabilistic safety assessment and are supplementary to the routine and legal regulatory control.

4. Support to Enhance the Safety of Nuclear Power Plants of Soviet Design

Because of its high standard in nuclear safety technology, Germany has taken a leading function in the support of the New Independent States (NIS) and Eastern European Countries in improving nuclear safety. In addition to its involvement in the G7 Action Programme from 1992 and in the EU-Programmes TACIS and PHARE a number of bilateral programmes have been started, covering the following aspects.

Support for licensing authorities, regulatory bodies and reactor personnel

This programme covers training, technical equipment and qualification. More than 20 seminars with over 600 participants have been carried out. Over 200 individuals from reactor shift personnel have been trained in the simulator centre of Greifswald.

Supply of testing equipment

For the VVER-1000 and VVER-440 nuclear power stations in Balakovo and Rovno testing and inspection equipment was made available, e.g. manipulator for reactor pressure vessel testing, ultrasonic testing probes. It can be expected, that this pilot project will have a positive effect also on other NPP's.

Safety analyses and calculation codes for accident analyses.

Already since 1989 a scientific-technical co-operation on nuclear safety research is in place. Within joint projects western procedures and methods of safety analyses (e.g. calculation codes) are fitted to soviet types nuclear reactors and tested. This qualifies the Eastern European experts to successfully use these codes for further safety analyses to enhance the nuclear safety of reactors.

This support Programme, in place since 1991, will continue. By the end of 1995, the total expenditures exceeded 130 million DM.