Theses on the Chernobyl topic for use in working with journalists, foreign citizens and agents abroad developed by the 1st Department of the KGB of the Ukrainian SSR

March 11, 1988
Secret

We are sending you targeted information on the problems of eliminating the consequences of the Chernobyl nuclear power plant accident, developed jointly with the First Directorate of the KGB of the Ukrainian SSR and coordinated with the First Main Directorate of the KGB of the USSR, for use in work on foreigners, information support for agents traveling abroad, and in other activities aimed at countering enemy attempts to discredit the achievements of the domestic nuclear energy industry.

It would be appropriate to conduct campaigns on this topic if proactive interest in the problems of eliminating the consequences of the Chernobyl accident, including in connection with the publication in "Socialist Industry" on December 4, 1987, is expressed by foreign scientists, specialists, and journalists who, by virtue of their official position or connections in circles on which trade and economic cooperation in the field of nuclear energy largely depends, are capable of formulating solutions and approaches to these issues that are beneficial to us.

We request that the preparation and implementation of specific events on this issue be coordinated with the local first responders (instruction of the KGB of the Ukrainian SSR, secret, number 10923, dated July 11, 1987).
Appendix: 9-page summary, unclassified.
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Abstract

Following the Chernobyl accident, specialists and experts from the Nuclear Regulatory Commission and the US Department of Energy, employees of the French Institute for Radioelectronic Defence and Nuclear Safety, the Japanese Atomic Industrial Complex, Indian nuclear physicists, representatives of numerous foreign companies specialising in the production and operation of nuclear power equipment, and Western journalists visited the republic. Most of them had the opportunity to witness the successful implementation of the priority tasks of eliminating the consequences of the Chernobyl accident by the Soviet side.
Today, much has been done at the plant to significantly improve the safety level of its operating reactors and the reliability of their protection.

A number of safety improvements have been implemented for all operating RBMK reactors, including:
− Reducing the void coefficient of reactivity by replacing 80 fuel assemblies with absorber rods and using more enriched (2.4%) fuel;
− Increasing the response time of the protection system, including by inserting control rods 50–80 cm into the core;
− Increasing the information content of the core status in the control rooms.

The RBMK reactor, commissioned in 1973 at the Leningrad Nuclear Power Plant, was inaugurated and widely demonstrated to foreign specialists. The plant was visited by Americans, British, French, and Japanese. Everyone could clearly see its reliability. The Chernobyl accident on April 26, 1986, was the result of underestimation of the human factor, errors, and violations of instructions and regulatory requirements by personnel.
85% of the Chernobyl personnel returned to the plant after the accident and continue to work.

Before the accident, the four units of the Chernobyl Nuclear Power Plant generated 2% of the country's electricity. The capacity of one unit was 7 billion kilowatt-hours per year. In 1987, the Chernobyl Nuclear Power Plant generated approximately 13 billion kilowatt-hours.

As for the facts presented in the article "Broad Tasks and Meagre Decisions" by L. Sotnik, a special correspondent for the newspaper "Socialist Industry," published on December 4, 1987, about the Plenum of the Kiev Regional Committee of the Communist Party of Ukraine, they were deliberately "played up" by the Western press in an anti-Soviet manner.

The 10-month data on 36 accidents, including three fatalities, are unrelated to violations of radiation protection and safety standards. The cases of overexposure that did occur do not exceed control figures, and relatively higher radiation doses were received by individual workers due to personal negligence and indiscipline. This was discussed in detail at a briefing for foreign journalists at the USSR Ministry of Foreign Affairs press centre by Comrade Filimontsev in mid-December 1987.

In this regard, every violation, even the most minor, is subject to the strictest assessment by the Chernobyl Nuclear Power Plant management and party organs. This is dictated by their heightened attention to occupational safety issues, their desire to make them a top priority for business managers and trade unions, and to enhance the personal responsibility of the workers themselves.

Approximately 300,000 cubic meters of concrete and 10,000 tons of steel structures were used in the construction of the "Sarcophagus." Its construction began in June and was completed on November 31, 1986.

More than 300 sensors are installed inside, recording changes in the gamma radiation, temperature, neutron flux, heat flux, hydrogen concentration, and other factors. The temperature inside the "Sarcophagus" is constantly decreasing. In February 1987, the maximum recorded temperature was 112°C; in August 1987, it was approximately 95°C. In January 1988, it was 34°C. Gas analysers show a complete absence of hydrogen, the release of which indirectly indicates a possible chain reaction.

To suppress a possible spontaneous chain reaction during the disintegration of the fuel masses within the Shelter, a potassium metaborate injection system is installed.

Currently, the emissions from Unit 4 are significantly lower than from a normal reactor at the Chernobyl Nuclear Power Plant. The Sarcophagus is equipped with a forced ventilation system with an air flow rate of 3,200 m^3/hour and the use of special filters, which is currently disabled. Natural ventilation is sufficient.

The total release of radioactive substances (excluding radioactive gases) as of May 6, 1986, was approximately 1.9×10^{18} Bq [1.9 EBq], which corresponds to 3.5% of the total amount of radionuclides in the reactor at the time of the accident.

The release of the most significant nuclides from a medical and biological perspective, such as strontium-90, iodine-131, and cesium-137, amounted to 8.1×10^{15} [8.1 PBq], 2.7×10^{17} [270 PBq], and 3.7×10^{16} [37 PBq], respectively (the unit of activity is one nuclear transformation per second, known in the SI system as the becquerel, Bq. Another unit of activity is the curie, Ci, 1 Ci = 3.7×10^{10} nuclear transformations per second).

Until 9:00 PM on April 26, 1986, on certain streets in Pripyat, the gamma radiation exposure rate, measured at a height of 1 meter above the ground, ranged from 140 to 1,400 µSv/hr. During the night of April 26-27, the radiation situation in the city began to deteriorate. By 7:00 AM on April 27, 1986, in the area closest to the nuclear power plant, the gamma radiation exposure rate reached 1,800-6,000 µSv/hr, and in other areas of the city, 1,800-3,000 µSv/hr.

Considering that the predicted external radiation dose to people in the first few days after the accident could have exceeded the level adopted in the USSR as a criterion for deciding on emergency measures to protect the population, it was decided to evacuate the residents of the city and several nearby settlements. The evacuation of the city of Pripyat began at 2:00 PM and was completed by 5:00 PM on April 27.

A total of 135,000 people were evacuated from the accident zone. Fifty new settlements, 13,000 stand-alone houses, and 8,000 apartments were allocated for them in the cities of Kiev and Chernigov.

The 30-kilometer zone is not a geometric concept. In some places, it is much closer to the Chernobyl Nuclear Power Plant, while in others, it is much further. Therefore, the evacuation and return of the population was determined not by distance, but by the actual contamination of the areas and the results of decontamination.

Large-scale decontamination, dust suppression, and continuous monitoring of all environmental factors made it possible to re-settle 16 settlements from which the population had previously been evacuated.

The use of new technology and decontamination agents has significantly reduced contamination in Pripyat, allowing buildings in entire neighbourhoods to be used for industrial activities. The annual radiation dose for residents in these neighbourhoods will be up to 1.2 mSv.

In Pripyat, the entire soil layer was removed during the first stage of decontamination. Currently, a thinner layer is being removed a second time, and the treated surfaces are being covered with clean soil. When removing soil, in some cases it is bound with an adhesive. To

prevent contaminated soil from being carried by the wind, it is secured with polymer compounds and planted with special grass varieties.
Radioactive soil is disposed of in repositories located within a 30-kilometer zone.

Contaminated water is processed in special evaporation units. Concentrated radionuclides in the liquid phase are stored in liquid waste storage facilities, which are available at every nuclear power plant. Solid waste will be stored mixed with bitumen in special storage facilities and will pose no environmental hazard.

In Chernobyl, radiation levels are 1 µSv/hr, placing Chernobyl in Category B (for nuclear power plant satellite towns, where the annual dose should not exceed 5 mSv/year).

Based on the experience gained during the clean-up, new decontamination methods are being developed. For example, a type of bacteria has been developed that can "eat" radioactive, water-insoluble substances, converting them into salts that are readily soluble in water and therefore easily washed away.

In the future, plans are underway to return part of the 30-kilometer zone to economic activity. The 10-kilometer zone will be used solely as a testing ground for various types of research.

Radiation monitoring in the zone is carried out using an automated radiation monitoring system (ARMS). Plant personnel are monitored by individual detectors, which are replaced every 15 days.

Until January 1, 1987, the maximum permissible annual radiation dose for NPP workers who had undergone a medical examination was set at 250 mSv. Since January 1, 1987, the international dose has been set at 50 mSv.

Domestic and imported robots were used to clean the roofs of the turbine halls of Units 3 and 4. At radiation levels of several tens of millions of microSieverts per hour, imported radio-controlled robots failed. Electronic components quickly stopped operating. Of all the cable-controlled robots, domestically produced ones performed more reliably.

The "Combine" production association of the USSR Ministry of Atomic Energy employs 6,000-7,000 permanent personnel and 2,000 seconded personnel and military personnel. Military reservists are over 35 years of age. People of reproductive age are not conscripted, as the genetic consequences of staying in the zone for two to six months are unknown.
They are primarily used for unskilled work (soil transportation, decontamination, dismantling contaminated structures, etc.).

After the Chernobyl accident, a radiobiological laboratory was established at a greenhouse facility in Pripyat. Its research objectives are:
− identifying plants that accumulate radionuclides from the soil to a greater extent;
− producing “elite” seeds;
− determining the effects of radiation on plant growth.
More than 200 plant varieties and species, and more than 60 flower varieties, were studied. No stimulation of plant growth was detected. Data was obtained on plant varieties

accumulating varying degrees of strontium, caesium, niobium, and zirconium radionuclides. No attempts were made to develop new plant varieties or species during the research. A large number of varieties used for cultivation in Ukraine were tested to ensure a practical outcome from the experiments. Several patterns were confirmed and it was established that the composition of nuclides and their concentration in certain areas of the 30-kilometer zone allows for the production of clean agricultural products.

Before the Chernobyl accident, the USSR, like other countries, only set standards for the permissible annual intake of radioactive substances with food. A permissible concentration of nuclides in drinking water (NRB-76) was also established. The nuclide content of individual food products was not regulated. In the event of an accident, a standard was established for a critical product (cow's milk) and the most important nuclide in an accident, iodine-131.

After the Chernobyl accident, it became necessary to quickly resolve issues related to the culling and prohibition of consumption of specific food products.

Since the primary hazard initially was iodine-131, which humans ingest in the spring and summer primarily through milk and leafy greens, immediately after the accident, standards for permissible iodine-131 levels in milk and dairy products (cottage cheese, sour cream, cheese, butter), as well as in leafy greens, were put into effect. These standards were calculated so that irradiation of the thyroid gland (a critical organ for iodine-131) in children would not exceed 300 mSv. This condition was met with a permissible iodine-131 content in milk of up to 3,700 Bq/L.

A similar standard was introduced in England in 1957 following the Windscale accident. Furthermore, standards for permissible iodine-131 levels in meat, poultry, eggs, berries, and medicinal plants were introduced. In the second half of May 1986, data was obtained indicating the increasing role of cesium-137 and cesium-134 in the contamination of meat and a number of other foods, after the decay of iodine-131. Furthermore, information on the presence of cesium-137 and cesium-134 in food products was also reported. Large-scale food testing and culling efforts necessitated standards regulating the total beta activity content.

Implementation of a comprehensive set of measures to control milk contamination with iodine-131 has significantly reduced the significance of this factor in determining human radiation doses. Assessments have shown that, compared to regions of the country where these measures were not implemented, due to the low absolute levels of iodine-131 contamination in milk, individual radiation doses to the population in the most contaminated regions have been reduced by 5-20 times.

Overall, the contribution of oral iodine-131 intake to the total radiation dose of the country's population was 2.5% (in the Byelorussian SSR - 1.1%), and the maximum values of individual thyroid doses were observed in the Kiev, Chernigov, and Zhytomyr regions, for which these doses averaged 26 mSv for 1-year-old children, 8.2 mSv for 10-year-old children, and 2.6 mSv for adults.

More than 300,000 measurements of caesium isotope levels in human bodies conducted in 1986 and 1987 showed that in almost 80% of cases, the activity of cesium-137 in the human body did not exceed 1 kBq, compared to the expected value of 10-15 kBq, according to model estimates. Nationally, the contribution of oral cesium-134 and cesium-137 to the dose over the year following the accident was 13% and 20%, respectively.

Predicting the radiation impact of caesium isotopes on the human body in the near and distant future is more challenging.
It was decided to use the cesium-137 transfer factors for the main types of agricultural products obtained between 1964 and 1986 based on an analysis of data from monitoring the country's contamination with nuclear tests' products. Analysis of these data revealed that the biological half-life of cesium-137 in milk for the USSR is 8.4 years.

In 1986 and 1987, a comprehensive set of agrotechnical and agrochemical measures was implemented in contaminated areas of the Ukrainian SSR, the Byelorussian SSR, and the RSFSR, enabling the production of agricultural products fit for consumption.
Hundreds of thousands of hectares of contaminated land in these republics have undergone deep ploughing with the application of increased quantities of mineral fertilisers. Work is underway to reclaim land and improve meadows and pastures. Measures are being implemented to reduce the transfer of radioactive substances from the soil to plants by applying lime, phosphorus, and potassium fertilisers, as well as certain sorbents (zeolite). These measures have reduced the radioactive content of agricultural produce by 1.5 to 3 times within the first year of their application.

Full implementation of all planned measures will likely lead to a significant reduction in radiation doses to the country's population due to the "dietary" factor.

Systematic surveys of the health status of the population and the radiation situation in settlements within the radioactive contamination zone confirmed the high effectiveness of the preventive and protective measures implemented in these areas. Among these, special mention should be made of the decontamination (use of new technologies and substances) of settlements, the evacuation of children and pregnant women for health-improving recreation during the summer period, which was carried out everywhere in 1986 and 1987, regular monitoring of the contamination of locally produced food products, the transfer of dairy cattle to uncontaminated pastures or feed, and the ban on the consumption of contaminated food products.

All these measures have significantly reduced the population's radiation doses, bringing them, on average, in the most contaminated areas of the Gomel, Kiev, Bryansk, and Mogilev regions to 10–15 mSv, of which less than 50% is due to internal exposure to cesium-134 and cesium-137 isotopes. Only 0.5–1% of those examined had internal doses exceeding 50 mSv.
As additional studies have shown, the high levels of caesium isotopes in the bodies of this latter group of people are explained by their disregard for restrictions on consuming contaminated food from their own households.

Specialised scientific institutions have been established and comprehensive scientific programs are being implemented to conduct long-term medical and biological monitoring of the population and personnel. One of the key stages of all this work is the compilation of an All-Union Register of all persons exposed to radiation. This register will include all persons residing, temporarily arriving, and organised contingents brought in to eliminate the accident and its aftermath, as well as their children and grandchildren, as well as persons evacuated from contaminated areas.

Surveys in 1986 and 1987 showed that among children exposed to radiation, there was no increase in overall morbidity or in diseases such as pneumonia, allergic and autoimmune processes, congenital heart and vascular anomalies, or other diseases. Analysis of infectious diseases in the population living in contaminated areas indicates that their level and structure reflect general patterns characteristic of both these regions and the country as a whole. A comparison of cancer incidence rates in the analysed areas and in the control group revealed no significant changes.

The incidence of malignant neoplasms of hematopoietic and lymphatic tissue was not elevated. Not a single case of leukemia was registered among the irradiated children in 1987–1988.

Estimates show that the implementation of a comprehensive set of preventive and protective measures has reduced individual external radiation doses by half compared to the predicted levels, and internal radiation doses by ten times or more. Implementation of the planned agricultural and sanitary measures in subsequent years will likely also reduce the expected radiation doses to the population of individual regions and the USSR as a whole.

A total of 237 people involved in the clean-up efforts following the Chernobyl accident were affected by acute radiation sickness (ARS).

28 people died from ARS. One person died in the rubble and two died during the accident, on 26th of April 1986. The total number of fatalities is 31.

Approximately 90 firefighters participated in extinguishing the fire at the Chernobyl Nuclear Power Plant during the accident, six of whom died, and 46 were diagnosed with acute radiation sickness.