MINISTRY OF INDUSTRY

Transcript
GOVERNMENT RESOLUTION

Appendix 4 B 5

1981-10-15

1183/81 (partially)

Sydsvenska Värmekraftaktiebolaget
Fack
S-200 70 MALMÖ
Sweden

Stipulations for continued permission pursuant to article 2 of the Nuclear Energy Act (1956:306) to operate a nuclear reactor

Permission pursuant to article 2 of the Nuclear Energy Act (1956:306) to erect, own and operate a nuclear reactor has been granted by the Government to Sydsvenska Värmekraft AB on 6 February 1970 with respect to the Barsebäck 1 nuclear power unit and on 16 June 1972 with respect to the Barsebäck 2 nuclear power unit.

In the Bill concerning guidelines for national energy policy (Bill 1980/81:90 App. 1), the Government put forth a proposal concerning, among other things guidelines for the nuclear safety work within the framework of the Swedish nuclear power program. Certain consequence-mitigating and release-limiting measures intended to be adopted at the Swedish nuclear power stations were thereby described. It was stated in the Bill that even though the risks of uncontrolled releases of large quantities of radioactive material are already extremely small in the existing reactor plants, all available means should be exploited to further reduce the risks of such releases. This applies in particular to the reactors located close to areas of high population density, for example those at the Barsebäck station. According to a parliamentary communication dated 27 May 1981, the Swedish Parliament has approved the guidelines laid down in the Bill (NU 1980/81:60, rskr 1980/81:381).

One method to reduce the risks of large releases of radioactive material in connection with severe accidents in a nuclear power reactor is to introduce "filtered venting" of the reactor containment.

The Swedish Nuclear Power Inspectorate, AB ASEA-ATOM and Studsvik Energiteknik AB, in collaboration with the nuclear power plant owners, have recently concluded the first stage of a project designated FILTRA that aims at a safety evaluation of filtered venting of a reactor containment. It is clear from the first progress report from the project that filtered venting of a reactor containment contributes towards reducing the risks of large releases of radioactive material.

The Government finds that plants for filtered venting should be installed in order to reduce the risks of large releases of radioactive material. The nuclear power station of primary interest in this respect is Barsebäck, in view of the location of the Barsebäck station in proximity to major population centres.

On the authority of article 4 of the Nuclear Energy Act (1956:306), the Government prescribes that, in addition to what has been prescribed in previous resolutions, the licences pursuant to article 2 of the Nuclear Energy Act to operate the Barsebäck 1 and 2 nuclear power units shall be contingent on the following conditions.

Measures for filtered venting of the reactor containments shall be adopted at the nuclear power station at Barsebäck.

The equipment should be designed so that it is activated when the pressure in the reactor containment exceeds the design pressure, 0.5 MPa, given in the current safety analysis report. The pressure at which the equipment is designed to be activated may not, however, be so high that leakage is expected from the reactor containment. The equipment shall be built in such a manner that at least 99.9% of the reactor core inventory of every radioactive isotope, not including noble gases, is retained in the reactor containment and the filter plant when venting occurs via the filter plant in connection with a severe reactor accident.

Before any measures are adopted at the reactor facility, a technical description of the plant equipment, as well as an account of its function, shall be submitted to the Swedish Nuclear Power Inspectorate. The extent to which the proposed measures may have a negative effect on reactor safety in other respects shall thereby be particularly elaborated upon. It is then up to the Inspectorate to grant permission for these measures after reviewing the submitted documents.

The measures shall be adopted and the equipment put into service by the end of 1985 or by a later deadline determined by the Nuclear Power Inspectorate, but no later than by 1 September 1986.

The Government authorizes the Swedish Nuclear Power Inspectorate to prescribe any additional stipulations for continued operating permission that are warranted by safety reasons or otherwise in the public interest.

On behalf of the Government

Ingemar Eliasson

Gösta Lindh

Attested ex officio
(Signature)

Copy to
Swedish National Institute of Radiation Protection
Swedish Nuclear Power Inspectorate

Bill 1980/81:90 Appendix 1 Ministry of Industry

As far as consequence-mitigating systems and release-limiting measures are concerned the Reactor Safety Committee's point of departure in formulating its recommendations was the possibility that an accident can lead to such a pressure buildup in the reactor containment that the containment fails, leading to large, uncontrolled releases of radioactivity. As a possible countermeasure, the Committee suggested controlled depressurization ("venting") through a safety relief valve connected to a filter system that retains the radioactive substances. A number of alternative systems were sketched. The Committee found, however, that the available information did not permit any final decisions to be made as to which detailed measures should be adopted. The Committee found that further studies were required for this.

Since the Committee's finding, SKI (the Swedish Nuclear Power Inspectorate) - in collaboration with the nuclear power utilities, AB ASEA-ATOM and Studsvik Energiteknik AB - has started a project, FILTRA, aimed at a safety evaluation of filtered venting of the reactor containments. To my knowledge, nothing has yet emerged from this study to indicate that the risks of large releases would not be reduced by the proposed modification of the reactor containment.

Even though the risks of uncontrolled releases of large quantities of radioactive material, giving rise to radioactive land contamination, are already extremely small in the existing reactor plants, I believe that every means should be exploited to further reduce the risks of such releases. This applies in particular to the reactors located close to areas of high population density, such as those at the Barsebäck station. Such measures should be adopted even if they entail a considerable cost for the plant owner in relation to the reduction of release risks they accomplish. Filtered venting of the reactor containments at the Barsebäck station should be ready to be put into service by no later than 1985 or after the immediately following refuelling periods. It is up to the Government to issue further directives to this end.

Filtered venting may also be of interest for the reactor containments at Ringhals, Oskarshamn and Forsmark. It is important, however, that experiences from Barsebäck, as well as the results of current technical development within the field, can be applied. The guidelines currently under preparation by other countries that utilize nuclear power, including the United States, as regards measures to reduce the risks of radioactive land contamination should also, if possible, be taken into consideration in formulating the requirements on the latter reactors. If the continued investigation work shows that methods other than filtered venting of the reactor containments provide a comparable reduction of the risks of large releases of radioactive material or if the risk picture as regards accidents that lead to large releases of radioactive material differs significantly from the current one, the safety stipulations for the nuclear power stations at Ringhals, Oskarshamn and Forsmark should be accordingly modified. A decision should be made on these matters in time to permit measures to be implemented before 1989.

IBJ

Sydsvenska Värmekraft AB
Fack

A.1.1/1456/81

Guidelines for safety account regarding devices for filtered venting of the reactor containment at the Barsebäck nuclear power station

In a communication dated 1981-10-15, the Government, acting on the authority of 4 of the Nuclear Energy Act, has prescribed that measures for filtered venting of the reactor containments be adopted at the nuclear power station at Barsebäck as a condition for continued operation of the Barsebäck 1 and 2 nuclear power units. In the aforesaid communication, the Government further authorizes the Swedish Nuclear Power Inspectorate (SKI) to grant permission for these measures after review of a technical description of the plant equipment and an account of its function, and to prescibe any additional conditions for the continued operating permission that are warranted by safety reasons or otherwise in the public interest. The Government letter further defines certain premises for the Inspectorate's review, such as requirements on retention efficiencies etc.

SKI finds that, in addition to the conditions laid down by the Government, the Inspectorate should, acting on the authority thus granted it, stipulate certain more detailed technical directives that define more closely the principles according to which the Inspectorate intends to judge the plant owner's (Sydkraft's) safety analysis report for the plant. In this context, it should be borne in mind that the equipment for filtered venting of the reactor containments at Barsebäck will be the first of its kind. It is therefore not possible to refer to previous installations and review principles. Hence, such more detailed technical directives from SKI are to be based primarily on the preliminary documents mentioned in the Government letter, namely Bill 1980/81:90 App. 1 and the progress report from the FILTRA research project published in March 1981. The Bill and the progress report refer in turn primarily to the Reactor Safety Committee's report SOU 1979:86. For the sake of completeness, some statements from these preliminary documents that SKI feels should be taken into consideration in formulating technical directives concerning devices for filtered venting of the reactor containments at Barsebäck are cited in the following.

The Government Committee on Reactor Safety made the following statement in the matter (SOU 1979:86, page 47):

"Particularly with respect to consequence-mitigating or release-limiting measures, the Committee finds that existing reactor containments provide considerable protection against even major accidents. The risk of extensive environmental consequences can nevertheless be further reduced. It is therefore proposed

- that a decision in principle be taken to adopt further release-limiting measures.

- that these measures be primarily oriented towards further reducing the risks of releases that can lead to high radiation doses through e.g. extensive radioactive land contamination,

- that the measures be adopted in the first instance for those reactors that are situated in the proximity of large population centres".

This statement became one of the points of departure for the FILTRA research project. In a progress report from this project dated March 1981, the project steering group stated the following with respect to fundamental guidelines for the design of devices for filtered venting in the event that such devices should be required by the Government authorities:

"The work during phase 1 has shown that the following principles should guide the technical design of filtered venting systems:

- The goal is a considerable reduction of the risk for the release of radioactive substances which can cause long-term ground contamination assuming that a severe reactor accident has occurred.

- There should be a minimum of interaction with existing safety systems and their functions during accident sequences covered by current design basis accidents.

- The system should function passively during the first 24 hours or more of the accident sequence - then more credit can successively be taken for preplanned active measures.

- The required removal efficiency should not be set higher than corresponding to the risk for leakage of radioactive substances in less severe accident sequences which do not necessarily trigger venting of the containment.

- Diversified solutions to the condenser and filtration functions should be studied, partly in order to be able to take advantage of different types of removal processes."

The progress report goes on to note that several different types of event sequences have been identified with assumed multiple faults in different safety systems, in the event of which sequences a filtered venting of the reactor containment could reduce the risk of large releases resulting from overpressure failure of the containment.

In Bill 1980/81:90 Appendix 1, Minister Petri stated the following:

> As far as consequence-mitigating systems and release-limiting measures are concerned the Reactor Safety Committee's point of departure in formulating its recommendations was the possibility that an accident can lead to such a pressure buildup in the reactor containment that the containment fails, leading to large, uncontrolled releases of radioactivity. As a possible countermeasure, the Committee suggested controlled depressurization ("venting") through a safety relief valve connected to a filter system that retains the radioactive substances. A number of alternative systems were sketched. The Committee found, however, that the available information did not permit any final decisions to be made as to which detailed measures should be adopted. The Committee found that further studies were required for this.
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> Since the Committee's finding, SKI (the Swedish Nuclear Power Inspectorate) - in collaboration with the nuclear power utilities, AB ASEA- ATOM and Studsvik Energiteknik AB - has started a project, FILTRA, aimed at a safety evaluation of filtered venting of the reactor containments. To my knowledge, nothing has yet emerged from this study to indicate that the risks of large releases would not be reduced by the proposed modification of the reactor containment.
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> Filtered venting may also be of interest for the reactor containments at Ringhals, Oskarshamn and Forsmark. It is important, however, that experiences from Barsebäck, as well as the results of current technical development with the field, can be applied. The guidelines currently under preparation by other countries that utilize nuclear power, including the United States, as regards

measures to reduce the risks of radioactive land contamination should also, if possible, be taken into consideration in formulating the requirements on the latter reactors. If the continued investigation work shows that methods other than filtered venting of the reactor containments provide a comparable reduction of the risks of large releases of radioactive material, or if the risk picture as regards accidents that lead to large releases of radioactive material differs significantly from the current one, the safety stipulations for the nuclear power stations at Ringhals, Oskarshamn and Forsmark should be accordingly modified. A decision should be made on these matters in time to permit measures to be implemented before 1989.

In reference to the above and by virtue of the authority vested in it by the Government, SKI has found it suitable to set forth the following guidelines for the initial work on a safety analysis report describing devices for filtered venting of the reactor containments at Barsebäck:

1. Choice of design basis parameters for venting and filtration capacity etc.

A point of departure for the choice of design basis parameters for venting and filtration capacity, as well as for sizing of the plant as a whole, should be an analysis of a number of typical cases chosen in such a way that they can be judged to cover the sequences that, based on a safety analysis of the reactor plant, represent the dominant contributors to the risks of overpressure failure of the containment in connection with very severe reactor accidents. The devices for filtered venting should further be designed so that they are activated passively in the event of a severe accident and can then function passively for about 24 hours. After this, credit can be taken for preplanned active measures.

2. Account of retention efficiency for different isotopes

The following premises should apply for the safety analysis report as regards the retention of radioactive isotopes in the filter plant:

- Special emphasis shall be accorded in the analysis to the isotopes and their chemical compounds that can cause land contamination of importance from a radiological viewpoint. The analysis shall otherwise deal with those isotopes in the core inventory, noble gases excepted, that are considered important from a radiological viewpoint in the reference literature (see Appendix 1).

- In determining the retention efficiency of the chosen design solution, the point of departure should be a "best estimate" - e.g. an estimate based on the best available technical and scientific information, with allowance for a reasonable margin of safety, owing to, among other things, the uncertainty in the technical data. In determining what can be considered to be a reasonable margin of safety, account shall be taken of the

degree to which the substance contributes to land contamination of radiological importance and otherwise to the risk picture in connection with accidents where the venting system is triggered so that noble gas releases can be expected.

SKI foresees that a progressive detailing and supplementing of the above guidelines may be necessary, for example in connection with the reporting and review of preliminary safety analyses submitted by Sydkraft for different parts of the plant.

Per Bystedt has been appointed project leader for SKI's review work in this matter.

The above directives have been discussed in the liaison group established for the purpose between SKI and SSI (the Swedish National Institute of Radiation Protection).

In the final preparation of this case, in which the undersigned Director General has arrived at a decision, Mr. Larsson, Mr. Håkansson and Mr. Bystedt have been present and Mr. Högberg has read the case.

SWEDISH NUCLEAR POWER INSPECTORATE

(Signatures)

Copies to:

Ministry of Industry
Swedish National Institute of Radiation Protection