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In the event of any differences in interpretation of this guide the Finnish version shall take precedence over this translation.

# THE INSTITUTE OF RADIATION PROTECTION AS THE SUPERVISING AUTHORITY OF NUCLEAR POWER PLANTS

## 1 GENERAL

General guidelines for the supervising of the construction and operation of nuclear power plants in Finland are given in the Atomic Energy Act (356/57) and Atomic Energy Decree (75/58) and in later amendments to them.

In the articles 2 and 3 of the Atomic Energy Act the permits necessary for a nuclear power plant are mentioned. These permits are issued by the Ministry of Trade and Industry. In practice the following three permits are needed which shall be applied for and which are issued apart from each other, but which form the necessary wholeness of permits for a nuclear power plant.

Construction Permit

This is, as mentioned in the Act, the permit necessary for "the construction of any facilities intended for the production or processing of materials suitable for the generation of atomic energy, as well as of atomic reactors".

Operating Permit

This is, as mentioned in the Act, the permit necessary for "the holding and operation of any facilities intended for the production or processing of materials suitable for the generation of atomic energy, as well as of atomic reactors".

Fuel Permit

This is, as mentioned in the Act, the permit necessary for "the production, trade and other transfer, holding, transport, and use of materials suitable for the generation of atomic energy" and for "the import and export of materials suitable for generation of atomic energy as well as ores and concentrates containing such materials". One or more fuel permits are needed for a nuclear power plant depending on the manner of procuring of the fuel.

When applying for operating and fuel permits the safety permits referred in the Article 2 of the Act on Protection Against Radiation (174/57) may also be applied on the basis of the same documents.

Before the issuance of each permit the Ministry of Trade and Industry asks the Institute of Radiation Protection (IRP) for a statement. In its statement for the permit the IRP presents conditions and instructions necessary for assurance of the safety. In addition, before the issuance of the operating permit the IRP carries out a summary inspection to confirm that the nuclear power station is ready to receive nuclear fuel and come into service (compilation of inspection record to be delivered to the Ministry of Trade and Industry).

Besides the Atomic Energy Decree, there are orders concerning the position and duties of the IRP in the Act (536/74) and Decree (103/75) on the Institute of Radiation Protection as well as in the Decree on Protection Against Radiation (328/57).

In accordance with the Decree on Pressure Vessels the IRP is the supervising authority of pressure vessels in the nuclear power plants.

## 2 TIMING OF SUPERVISING MEASURES

The supervising measures directed at a nuclear power plant project can be divided temporally into three sequences, of which the first one is ending with the issuance of the construction permit, the second one with the issuance of the operating permit and the third one begins with the issuance of the operating permit.

The construction permit is issued for a nuclear power plant unit to be placed on a definite site. Before the issuance of the construction permit the suitability of the land area for the intended purpose from the regional planning point of view should also be examined. This means i.a. that the site plan or the building plan should be confirmed in accordance with the legislation concerning building activities. The IRP shall possibly be requested to make a statemen on regional plans in question.

For the handling of the application for the construction permit described in item 3 of this guide the IRP normally needs a time of about one year. In the event of a plant unit, which is nearly similar with a unit, which has gone through a previous permit process, the handling time may be shorter.

The construction of the nuclear power plant must not be started before the construction permit has been issued.

The supervision of the construction described in item 4 and the handling of the operating permit described in item 5 of this guide take place at least partly simultaneously. The supervision of the construction begins at the issuing of the construction permit and

goes on until the issuance of the operating permit. Systems which do not directly affect nuclear safety may, however, when agreed upon separately, be constructed and supervised still after the issuance of the operating permit. Documents needed for the operating permit may be provided for handling immediately after the issuance of the construction permit. The application for the operating permit and the fin safety analysis report shall be provided not later than one year before the planned loading of the fuel into the reactor.

Before the issuance of the operating permit the IRP will check that all measures included in supervision of construction have been properly carried out and defects found in the course of supervision corrected (compilation of an inspection record).

The reactor of the nuclear power plant must not be loaded with fuel before the operating permit has been issued.

The inspection work connected with the first fuel permit of the nuclear power plant will be carried out simultaneously with the construction supervision, and the handling of the application for the operating permit. The supervising measures concerning nuclear materials will be described in Guide YVL 6.1.

Fuel or enriched uranium needed in its production must not be brought under pertaining Finnish jurisdiction before the fuel permit has been issued. International agreements made by Finland may presuppose a fuel permit already at an earlier stage.

Supervision, which begins at the issuance of the operating permit will be described in item 6 of this guide.

## 3 PREREQUISITES FOR THE CONSTRUCTION PERMIT

The construction permit application is made to the Ministry of Trade and Industry in accordance with article 11 of the Atomic Energy Decree. The annexes 1...9 especially mentioned in the text of the Decree will be handed over in connection with the application, written in domestic language.

In order to get additional information, which is regarded as necessary for being able to make a statement concerning the application for the permit, the IRP requires, based on item 10 of the Decree, "any other evidence considered necessary by the authorities", a preliminary safety analysis report, topical reports referred to in PSAR, a classification document, industrial security plans, and quality assurance programmes. The IRP approval of these documents is separately asked for, and they may also be written in foreign languages as agreed upon with the IRP. The IRP gives a positive statement about the permit application only after having approved these documents.

As a general condition for a positive statement about the application is, that the applicant has in the aforementioned documents convincingly demonstrated that

- the objectives concerning safety are in concordance with the principles stated in the reference /1/,
- the objectives set in design can be carried out by using proved techniques, and,
- the organization in question is capable to fulfil the project in a acceptable manner.

3.1
Preliminary safety analysis report

The preliminary safety analysis report shall contain information about general principles of design and fulfilment, a description of the plant to the systems level, accident analyses, and a description about environmental effects. Its purpose is to demonstrate that factors affecting safety and rules concerning safety have properly been taken into account.

In handling the safety analysis report the IRP works on the basis of reference /2/. Therefore, it is recommended that the safety analysis report is written by using the numbering and captioning of the table of contents given in the aforementioned reference. Another manner of presentation is also approved, but in that case it must be taken into account that it may slow down the handling. The scope of the contents shall with applicable parts correspond to reference /2/, whatever is the manner of presentation.

The IRP will consider the acceptability of the references used in the safety analysis report separately for each reference. In order to accelerate the handling only those references shall be used, which have an essential relevance in the verification of the presentation. The most recommendable manner is to refer to topical reports, which can be handed over to the IRP already before the preliminary safety analysis report. A list of these reports is presented in item 1.6 of the safety analysis report, where it is also indicated when the reports have been delivered to the IRP.

The safety analysis report according to reference /2/ may exclude item 3.2 concerning classification,

item 13.6 concerning industrial security, and item 17 concerning quality assurance, which the IRP handles as separate documents.

The preliminary safety analysis report shall be handed over to the IRP so that it can be handled before making the statement concerning the construction permit. Normally one has to be prepared for a handling time of one year.

3.2
Topical reports

The purpose of topical reports is to indicate in detail, what kinds of experimental research and theoretical analyses the design of the plant is based on. The reports may be associated with the plant in question or with another equivalent plant designed by the same plant supplier.

Topical reports shall be provided among other things on fuel, reactor, reactor pressure vessel, engineered safety features and containment. The reports shall present all test results which are relevant to the design, and describe in detail calculation models and computer programmes used in the design.

Topical reports shall be delivered to the IRP so that they can be handled not later than in connection with the handling of the equivalent item of the preliminary safety analysis report.

3.3
Classification document

The classification document indicates safety classes for the nuclear power plant systems, structures and components. The requirements for the design, manufacture, installation, testing, and inspections are determined by these classes. The supervision measures

by the IRP for each item are determined by the safety class.

The classification document is compiled according to Guide YVL 2.1.

The classification document shall be delivered to the IRP so that it can be handled before the statement concerning the construction permit is made. Normally one shall be prepared for a handling time of two months.

3.4
Industrial security plans

The purpose of the industrial security plans is the physical protection of the plant, including its use, and the fuel against deleterious actions. Requirements to be set for the industrial security plans will be described in Guide YVL 6.20.

The industrial security plans shall be delivered to the IRP so that they can be handled before the statement to be made for the construction permit. Normally one must be prepared for a handling time of at least two months.

3.5
Quality assurance programmes

In the quality assurance programmes are presented those systematic procedures that will be followed by the organizations participating in the implementation of the plant project in their actions affecting quality. These actions are e.g. design, purchases, manufacture, handling, transport, storing, cleaning,

construction, installation, inspections, tests, operation, maintenance, repairs and changes.

At least the quality assurance programmes of the applicant and the main supplier shall be delivered for the approval by the IRP. If there are other organizations participating in the implementation of the plant project with remarcable portions, the IRP may after consideration require also their quality assurance programmes for inspection.

Requirements set for quality assurance programmes are presented in Guide YVL 1.4.

Quality assurance programmes shall be delivered to the IRP so that they can be handled and that there will be a good comprehension of their applicability to practice before the statement concerning the construction permit is made.

## 4
## SUPERVISION OF CONSTRUCTION

After the issuance of the construction permit the IRP supervises in detail the realization of the plant project. The supervision assures that the conditions of the construction permit and the requirements of the pressure vessel legislation will be fulfilled, and that the nuclear power plant will in detail be made to proper quality standards.

The supervision of an individual structure or component will depend on the type (pressure vessel, concrete structure, electrical motor etc.) and the safety class. For the structures and components most important to safety a preinspection, a constructi inspection, and a start-up inspection are made. Not

all of the inspections are made for less important structures and components, or they will be made restricted in the scope.

After required start-up inspections for structures and components belonging to a definite system, a start-up inspection is made concerning the whole system, and thereafter systems tests included in the commissioning of the nuclear power plant are supervised.

Pressure vessel supervision includes also measures, which are not separately mentioned in YVL-guides. Rules concerning these measures and requirements are given in the pressure vessel decree (549/73), in the State Council decisions 232/71, 619/71 and 837/71, and in the decisions 69/75, 70/75 and 71/75 of the Ministry of Trade and Industry. Aforementioned rules shall be followed unless special rules like the YVL-guides set stricter demands replacing them.

Special measures associated with the supervision of structural works are described in guide group YVL 4.

Separate inspection bodies performing inspections and quality control during plant construction shall be approved by the IRP. The approval procedure is clarified in Guide YVL 1.3.

The IRP will after consideration made audits to the manufacturing factories and the nuclear power plant works during the whole construction phase.

4.1
Preinspections

It is verified in the preinspection before the beginning of the manufacture that the plans are

acceptable and possible to accomplish. In that connection attention in drawn among other things upon manufacturer´s organization, standards, design bases, material choice, strength calculations, manufacturing methods, and quality control programme.

There is a summary in Guide YVL 2.2 concerning preinspections for structure and component types in various safety classes. The contents of the inspectior are clarified in guides belonging to guide groups YVL 3, YVL 4 and YVL 5.

If the type and safety class of the structure or component presuppose a preinspection, the manufacture is allowed to begin only after the IRP has made an approving preinspection decision.

4.2
Construction inspections

In the construction inspection the design correspondence of the item is verified. The inspection in based on quality control records, physical inspectio and possible tightness, pressure and function tests.

There is a summary in Guide YVL 2.2 concerning construction inspections for structure and component types in various safety classes.

Construction inspections are made, depending on the type and safety class of the structure and component, during the manufacture, after the factory manufacture, and during installation, or in part of aforementioned cases. When constuction inspections are made prior to installation, their acceptance is a prerequisite for the beginning of the installation.

4.3
Start-up inspections

At a start-up inspection it is verified that a proper preinspection and construction inspection have been made for each structure and component, and that the conditions set in the connection of these inspections have been fulfilled. Functional tests of the equipment belonging to the start-up inspection in accordance with the pressure vessel decree are usually made separately as a part of the start-up test.

When start-up inspections have been made for all structures and components belonging to a certain system, a further start-up inspection concerning the whole system is made. This means verifying that the system is in accordance with the final safety analysis report (item 5.1 of this guide). It is additionally inspected that matters affecting the inservice maintenance possibilities, and safety at work aspects have adequately been taken into account.

Start-up inspections are described in Guide YVL 2.4, and for the part of pressure vessels also in Guide YVL 3.7.

Approved start-up inspections of the systems is one prerequisite for the delivery of the inspection record to the Ministry of Trade and Industry.

4.4
System tests included in start-up

The control measures of system tests depend on the safety classes. For the most important systems from the safety point of view the approval of start-up

test programs and test results are presupposed. In addition the IRP will audit the tests according to its consideration.

The supervision of the start-up is described in Guide YVL 2.5.

The approval of the system tests for those parts that can be done without the reactor, is one prerequisite for the delivery of the inspection record to the Ministry of Trade and Industry.

## 5 CONDITIONS OF THE OPERATING PERMIT

The rules concerning the application for the operating permit are given in article 11 of the Atomic Energy Decree. In addition the application shall have as attachments

- a proposition of the approval of the plant manager and his substitute presumed in the articles 14 and 16 of the Atomic Energy Decree, as well as an explanation that these fulfil the requirements meant in the latter part of the Decree,
- the ordinance for the plant administration presumed in article 17 of the Atomic Energy Decree,
- a clarification that the applicant has the construction permit for the plant, and that he owns or that he has appropriately applied for a fuel permit.

A prerequisite for a positive IRP statement about the permit application is

- the approval of the final safety analysis report,
- the approval of the topical reports referred to in FSAR,

- the approval of emergency plans,
- the approval of industrial security plan,
- the approval of the summary programmes of inservice incpections,
- the approval of the quality assurance programme for the operation,
- the providing for approval of preliminary technical specifications.

The Ministry of Trade and Industry prepares the operation permit and conditions to be attached thereto on the basis of received statements. The inspection record compiled by the IRP is still needed before the issuance of the permit. The inspection record verifies that the nuclear power plant is ready for the fuel loading and the operation to be started thereafter. Prerequisites for providing the Ministry of Trade and Industry with the inspection record are

- approved start-up inspections,
- the approval of the system test results for those parts of the start-up which are possible to perform without the reactor,
- the approval of preliminary technical specification
- an adequate number of licenced plant operators,
- the accomplishment of the preservice inspection of the structures and components.

5.1
Final safety analysis report

The same general instructions as for the contents grouping and scope of the preliminary safety analysis report are likewise valid for the final safety analysis report.

Design features and plans meant to be final and analyses concerning them shall be presented in the safety analysis report. In the event that there later will be changes, the report shall for this part be revised and the changes shall without delay be delivered to the IRP for approval.

From a safety analysis report according to reference /2/ may be left out item 13.3 concerning emergency planning, item 13.6 concerning industrial security, item 16 concerning technical specifications, and item 17 concerning quality assurance for the operation, which are handled by the IRP as separate documents.

The final safety analysis report shall be delivered for the approval of the IRP not later than one year before the scheduled loading of the fuel.

5.2
Topical reports

If during the construction phase some design principles have been approved on the basis that the design will later on be justified by the help of more accurate analyses and tests, the detailed justifications will be presented in the topical reports.

The topical reports shall be delivered for the approval by the IRP so that they can be handled not later than in connection of the handling of the equivalent part of the final safety analysis report.

5.3
Emergency plans

The emergency plans concern measures, the aim of which is to restrict the scope of possible accidents and to prevent and alleviate the consequences of

the accidents. The emergency plans shall include the alarming and communicating manners, the surveillance of the functioning of the engineered safety features, the surveillance of the spreading of radioactive substances, the corrective measures, the personal protection measures, and the arrangement of first aid services.

The applicant is responsible for the compiling of the emergency plans for the plant personnel and the plant area. The applicant shall in addition arrange necessary connections to the local authorities, who will take care of the emergency outside the plant area

The emergency plans shall be delivered to the IRP so that they can be handled before making the statement concerning the operating permit.

5.4
Industrial security plans

For the operating permit the IRP requires much wider and more detailed industrial security plans than for the construction permit. These requirements will be described in Guide YVL 6.20.

The information concerning industrial security shall be delivered to the IRP so that it can be approved before the fuel delivery to the plant.

5.5
Inservice inspections

For the most important structures and component inspections are carried out periodically after the start-up. A summary programme shall be compiled for the inspections covering all planned objects with

their inspection scopes, methods and terms. A so called preservice inspection is made before the start-up, with the results of which later inspection results may be compared. Detailed programmes shall be compiled for the preservice inspections, and they shall be presented for the approval by the IRP not later than one month before each inspection. Actions associated with the inservice inspections are described for the part of pressure vessels in Guide YVL 3.8 and for the part of other structures and components in guides to be published later.

The summary programme of the inservice inspections shall be delivered to the IRP so that it can be handled before making the statement concerning the operation permit.

The accomplishment of the preservice inspections is a prerequisite for the delivery of the inspection record to the Ministry of Trade and Industry. The summary report of the preservice inspections shall be delivered to the IRP within three months after finished inspections

5.6
Quality assurance programme for the operation

In the quality assurance programme are presented those systematic procedures, which are followed during the operation of the nuclear power plant in actions affecting quality. Those actions are among other things plant operation, service, repairs, periodical inspections, fuel exchange, amendments and tests. Requirements set for the quality assurance programme are clarified in Guide YVL 1.4.

The quality assurance programme shall be delivered to the IRP so that it can be handled before making the statement concerning the operating permit.

5.7
Technical specifications

In the technical specifications relations between controllable process quantities and allowable operational states, and restrictions caused by the failure of different devices for facility operation are quantitatively defined. In addition they present requirements for tests, by which the functional capability of different devices is periodically ascertained.

The technical specifications are put into final form in the connection of the plant start-up, but, they shall be compiled to be as complete as practical already before the start-up.

In accordance with the decision 594/68 of the Ministry of Social Affairs and Health, the authorities determine on the amount of radionuclides that may be released into the air and water. A proposal for the release limits has to be included in the technical specifications. The determination of the release limits shall take place in accordance with Guides YVL 7.1 and YVL 7.2.

A preliminary proposal for the technical specification shall be presented for the approval by the IRP before the IRP will make the statement concerning the operation permit.

5.8
The verification of the qualification of operational personnel

The Institute of Radiation Protection sets requirement on the qualifications of the operational personnel of the nuclear power plant in Guide YVL 1.7.

These requirements concern the responsibility areas, experience, basic education and specific education of the personnel. The needed information is delivered to the IRP as a part of the final safety analysis report.

Only those persons separately accepted by the IRP may independently conduct the plant operation from the main control room of the nuclear power plant. Prerequisites for the acceptance are medical certificate about the state of health, performance of a written and oral examination, and ability proved in practice to independently conduct the operation of the plant. The acceptance procedure of the operator is described in Guide YVL 1.6.

The acceptance of the operators is one prerequisite for the delivery of the inspection record to the Ministry of Trade and Industry.

## 6
## SUPERVISION OF THE OPERATION

After the Ministry of Trade and Industry has issued the operating permit for the plant the IRP will supervise the start-up and operation.

For the first criticality of the reactor and for raising the power to higher levels permits of the IRP are needed, which are always based on the results of the preceding start-up test period.

When the plant has reached full power and the start-up test programme has been fulfilled, the technical specifications are revised on the basis of start-up test results.

The IRP supervises the operation of the nuclear power plant by the help of procedures and documents enumerated in the following and by making audits.

The inservice surveillance concerning nuclear materials will be described in guide group YVL 6.

The inservice surveillance associated with matters of internal radiation safety of the nuclear power plant and the radiation safety of the environment are described in guide group YVL 7.

During the operation phase the IRP may, if needed, demand the lowering of the plant power or stopping of the plant. As an extreme measure it may suggest the Ministry of Trade and Industry to cancel the operating permit.

6.1
Operation reporting

Periodical reports concerning the normal operation of the plant are delivered to the IRP as well as special reports about all those occurrences associated with

- a deviation from the technical specifications
- a failure of a structure or component important to safety.

The scope and delivery manner of the reports are described in Guides YVL 1.5, YVL 7.8 and YVL 7.10.

6.2
Reports associated with reloadings

For each regular reloading of the fuel a report is delivered to the IRP describing the reactor properties during the coming operating period.

The description shall in scope and accuracy correspond to the equivalent items 4.2 and 4.3 of reference /2/.

The report shall be delivered to the IRP not later than two months before the beginning of the planned reloading.

If in the midst of the reloading period individual fuel assemblies or rods shall be exchanged, the scope of the needed analyses is agreed upon separately in each case.

6.3
Inservice inspections

Detailed programmes concerning individual inspection occasions of the inservice inspections shall be presented to the IRP not later than one month before the scheduled inspection.

For the part of pressure vessels the inspections are described more comprehensively in Guide YVL 3.8, and for the part of other structures and components in guides to be published later.

The prerequisite for the beginning of the inspection is that the IRP has approved the inspection programme.

The aforementioned inservice inspections are made as the assignment of the nuclear power plant owner. In addition the IRP will make the inservice inspection meant in the article 16 of the Pressure Vessel Decree (549/73).

6.4
Inspection of the emergency plans

The information included in the emergency plans shall be checked and renewed as needed annually. The revised plans shall be delivered to the IRP.

6.5
Supervision of wastes

A description of the onsite handling and storing of the radioactive wastes has been delivered to the IRP as a part of final safety analysis report. The normal annual reports inform of the accumulated amounts of wastes and activities. If it is intended to transport wastes away from the plant area and to store them elsewhere, the IRP shall be informed of these intentions at as early a stage as possible. It shall then also be considered, which permits are possibly required at the ministry level. The IRP supervises the design and construction of separate waste stores in the same manner as the design and construction of those of nuclear power plants.

6.6
Structural changes

If structural changes affecting safety are performed at the plant, the IRP shall be notified of these in good time. Regarding the changes a separately agreed supervision process will be followed, corresponding in applicable parts to the supervision during construction.

6.7
Decommissioning

When decommissioning of the nuclear power plant is planned, the plant owner shall present to the IRP data about the radiation emitted by the activated

structures, components, and wastes. It shall be additionally presented , how the radiation will decrease as a function of time, and how the radiation sources will be separated from the environment for as long a time as isolation is necessary.

## 7 REFERENCES

1. General design criteria for nuclear power plants, the Institute of Radiation Protection, 1976-01-27.

2. Standard Format and Content of Safety Analysis Reports for Nuclear Power Plants, Revision 2, U.S. Nuclear Regulatory Commission, September 1975