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DUTIES AND RESPONSIBILITIES OF THE NUCLEAR POWER
INSPECTORATE AND THE NATIONAL RADIATION PROTECTION
INSTITUTE IN CONNECTION WITH NUCLEAR POWER PLANTS

T Eckered
Nuclear Power Inspectorate
Sweden

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THE FUNCTIONS OF THE SWEDISH NUCLEAR POWER INSPECTORATE AND THE NATIONAL SWEDISH INSTITUTE OF RADIATION PROTECTION AS AUTHORITIES IN THE FIELD OF NUCLEAR POWER

The Swedish Nuclear Power Inspectorate
The National Swedish Institute of Radiation Protection

SUMMARY

This publication is intended to provide a summary of the functions which the Swedish Nuclear Power Inspectorate (SKI) and the National Swedish Institute of Radiation Protection (SSI) perform as authorities in the field of nuclear power. The organization and duties of SKI and SSI as inspection authorities under the Atomic Energy Act and the Radiation Protection Act are described. The legislation which regulates the duties and functions of the authorities as well as other legislation within the field of nuclear power is described briefly.

The procedure followed in the consideration of applications for permits for the construction and operation of nuclear power plants is described from the viewpoint of the functions performed by SKI and SSI in this process.

INTRODUCTION

The construction and operation of nuclear power plants, the production of nuclear fuel, the handling and transport of spent nuclear fuel and plutonium as well as the management of radioactive waste is regulated in Sweden by laws and regulations. The most important laws are the Atomic Energy Act, the Radiation Protection Act, the Workers' Protection Act and the Environmental Protection Act.

The Atomic Energy Act states that permission is required for the construction and operation of nuclear power plants and for the handling of fissionable material. This empowers the authorities to regulate activities in this area by the issuance of safety regulations in order to reduce the risk of accidents and mishaps.

The Radiation Protection Act and the Workers' Protection Act comprise the basis for the safety and protection of employees in nuclear power installations. The Radiation Protection Act covers not only the protection of workers from radiation inside the installation, but also local and global radiation protection for the public.

The central administrative authority under the Atomic Energy Act is the Swedish Nuclear Power Inspectorate (SKI); under the Radiation Protection Act, the National Swedish Institute of Radiation Protection (SSI); under the Workers' Protection Act, the Swedish Board of Occupational Safety and Health (ASS); and under the Environmental Protection Act, the Swedish Environment Protection Board (SNV).

LEGISLATION WITHIN THE FIELD OF NUCLEAR POWER

The following laws regulate the nuclear power field:

Atomic Energy Act	1956:306
Atomic Liability Act	1968:54
Emergency Preparedness Act	1960:331
Mineral Deposits Act	1974:890
Radiation Protection Act	1958:110
Environmental Protection Act	1969:387
Water Act, 2nd Chapter	1964:110
Building Act	1947:385
Workers' Protection Act	1949:1
Act regulating special permission to load nuclear reactors, etc.	1977:140

Atomic Energy Act

The Atomic Energy Act, which is the basic law governing the field of nuclear power, says that:

- the permission of the government or of a government-appointed authority is required by anyone who wishes to acquire, possess, transfer, process or otherwise have anything to do with fuel for the generation of atomic energy
- the permission of the government or of a government-appointed authority is required by anyone who wishes to construct, possess or operate an atomic reactor or installation for the processing of atomic fuel
- the permission of the government or of a government-appointed authority is required by anyone who wishes to take atomic fuel or certain types of equipment for the processing, use or production of atomic fuel out of the country
- the period of validity of these permissions can be restricted and conditions can be established in connection with the granting of the permission, as well as at a later date during the period of validity of the permission
- an inspection authority appointed by the government (SKI) can be authorized by the government to establish such conditions
- the inspection authority shall also ensure that the Act and established conditions are complied with.

Atomic Liability Act

This Act regulates liabilities and compensation for damages resulting from a nuclear accident. The plant owner shall, regardless of fault, indemnify damages resulting from accidents in the atomic energy plant up to a value of SKr 50 million. If this sum does not cover the damages, the state will pay the remainder.

When fissionable material or radioactive waste is transported, this

liability in the event of an accident is assumed by the consignee as of delivery, unless another time is expressly specified by a written agreement.

Owners of atomic installations in Sweden shall be insured to cover their liability for atomic damages.

Emergency Preparedness Act

This Act specifies the safety measures which must be adopted in order to reduce the consequences of an accident in an atomic installation.

It is the responsibility of the local County Administration to set up an organisation plan aimed at protecting the public and adopting measures, such as evacuation of the population, protection of animals and food supplies and restrictions in the utilisation of land, water, natural products and property. The planned measures shall be adopted as soon as there is sufficient cause for suspicion of radioactivity discharge which may entail a public hazard.

A statute (1973-06-06) requires that a special emergency preparedness board (the Atomic Accident Emergency Preparedness Board, BNA) shall be appointed. This board is organisationally attached to the National Swedish Institute of Radiation Protection (SSI) and includes representatives of SKI and SSI as well as a number of experts within other related fields. Accidents in a nuclear power installation shall be reported to SSI so that SSI can assist the County Administration and the installation with its expertise through a so-called "emergency group" from BNA. SSI is also charged by the government to provide the county administrations with advice and instructions on the formulation of emergency preparedness plans. In this capacity, BNA is an advisory body to SSI.

Mineral Deposits Act

This Act states that special permission from the government or an authority appointed by the government is required in order to prospect for uranium and torium-bearing materials and to extract such materials from a deposit.

Radiation Protection Act

The Radiation Protection Act contains provisions regulating operations involving ionizing radiation. Permission for such operations is required from SSI. In granting such permission, SSI shall also issue the conditions and regulations which are to apply. These can be changed if the need arises.

In cases where permission is granted under the Atomic Energy Act, special permission is not required under the Radiation Protection Act. SSI, however, examines and approves the installation from the radiation protection viewpoint and issues any regulations which must be complied with as regards the continuous monitoring of radiation in and around the installation during normal operation.

SSI is responsible for the radiation protection aspects of waste management, including questions concerning environmental protection, and issues directives regulating the handling and disposal of radioactive waste.

SSI performs inspections to ensure that existing regulations are complied with.

Environmental Protection Act

This Act is applicable to situations where

- waste water is discharged
- there is a risk for the pollution of waterways, lakes and oceans
- there is a risk for environmental disturbance through air pollution, noise, vibration, light etc.

Permission under the Environmental Protection Act is granted by the licensing board for environmental protection.

When permission is granted under § 136a of the Building Act (see below), special rules apply.

The inspection authority is the Swedish Environment Protection Board (SNV).

This Act is applicable to nuclear installations in connection with environmental disturbances which are not specifically related to the nuclear aspects of the operation, such as non-radioactive waste discharges, noise and other environmental disturbances.

Water Act

It is especially the 2nd chapter of the Water Act, dealing with construction in water, which is pertinent to watercooled nuclear power plants.

Construction in water which leads to encroachments on or damages to other persons' property or source of livelihood may not be undertaken without the permission of the Riparian Rights Court, which regulates compensation for such damages or encroachments. In some cases, permission must be obtained from the government.

As of 29 May 1969 (SFS 387), matters pertaining to the discharge of radioactive substances into water are not handled by the Riparian Rights Court, but rather by SSI.

Building Act

Sections 81 and 82 of the Building Act empower the County Administration to regulate construction in the vicinity of nuclear power plants. As safety authorities, SKI and SSI provide general guidelines for the planning of zones 2 - 10 km around the nuclear power plant. In zones less than 2 km from the plant, new construction may only be undertaken after special permission has been obtained from the County Administration. SKI has directed the country administrations to exercise extreme restrictiveness in granting such dispensations.

Section 136a of the Building Act governs the localization of a new nuclear power installation. This paragraph states that permission is required for the new establishment of certain industrial operations, including nuclear

power installations, which are of essential importance to energy conservation or for the country's collective land and water resources. Applications for such permission are dealt with by the Ministry of Housing.

The concerned municipality must approve of the industrial establishment before it can be executed. The Licensing Board for Environmental Protection issues the conditions and directives which are to apply.

Workers' Protection Act

The Workers' Protection Act provides a basis for regulations concerning industrial safety. The inspection authority is the Swedish Board of Occupational Safety and Health (ASS), which performs the on-site inspection through labour inspectorates. ASS issues standards and directives governing products and work (such as construction and installation). Especially important for nuclear power plants are the standards and directives concerning pressure vessels and lifting equipment.

Act regulating special permission to load nuclear reactors etc.

During April of 1977, the Swedish Riksdag passed an act regulating special permission to load nuclear reactors. The act states that problems having to do with the handling and disposal of spent nuclear fuel and radioactive waste must be solved before a reactor can be commissioned. The act applies to reactors for which permission has been granted under the Atomic Energy Act and which have not been loaded with nuclear fuel prior to 8 October 1976.

Special permission is granted by the government. Such permission may only be granted if the reactor owner can produce an agreement which adequately provides for the reprocessing of spent nuclear fuel and if the owner has demonstrated how and where a completely safe final storage of the hot waste obtained from reprocessing can be provided. If spent fuel is not to be reprocessed, the reactor owner must demonstrate how and where a completely safe final storage of the spent fuel can be provided in order to obtain permission.

THE FUNCTIONS OF THE SWEDISH NUCLEAR POWER INSPECTORATE

The overriding objective of SKI is to promote technical security in nuclear power installations and facilities for the storage, handling or transport of fissionable material and radioactive waste.

In order to achieve this objective, SKI approves, supervises and inspects technical security, protection and safety precautions both for installations and for the transportation, storage and other handling of fissionable material and active waste. SKI shall also initiate, direct and evaluate research and development within the field of nuclear safety.

Safety inspection of nuclear power plants and other nuclear energy installations.

Before granting permission for the operation of a nuclear power plant, SKI must confirm the safeness of the design and make sure that all systems and components comply with the requirements issued by SKI. SKI examines drawings and designs and orders inspections during production and construction which

it deems necessary from the viewpoint of safety. Particularly rigorous testing is conducted in connection with the commissioning of the plant. After the plant has been commissioned, periodic inspections are conducted as well as extra inspections if any incident occurs which may jeopardize plant safety.

Surveillance of fissionable material

The surveillance of fissionable material (uranium, plutonium and torium) and equipment for the extraction of nuclear energy is aimed at preventing the non-peaceful use of such material or equipment. SKI is responsible for making sure that the commitments assumed by Sweden in agreements with other countries and international organizations are fulfilled. For this purpose, a system of safeguards has been devised which includes a book-keeping system, an inspection system and plant examination.

Active waste

SKI's area of responsibility encompasses those aspects of radioactive waste management which have to do with technical plant security against accidents in the transport, storage and processing of radioactive waste from nuclear energy plants. Matters concerning radiation protection and environmental protection in connection with waste management lie within the area of responsibility of SSI.

Initiation, direction and evaluation of nuclear safety research

SKI is responsible for issuing and directing nuclear safety research which has a bearing on the technology and the types of reactors which are used in the current Swedish nuclear energy program. SKI shall also ascertain the need for research and development work of a more long-range character. SKI shall also initiate, plan, order and administrate research projects in this area.

Organization of the Swedish Nuclear Power Inspectorate

SKI is under the Ministry of Industry and is headed by a board made up of SKI's director and a maximum of six other members appointed by the government.

SKI is divided into six units:

- Inspection unit
- Technical unit
- Materials unit
- Research unit
- Waste unit
- Administrative unit

Inspection unit

The inspection unit is responsible for the work of examination and inspection.

The unit is responsible for handling contacts with the power companies in all matters directly concerning a nuclear power project and for making sure that established regulations for the construction and operation of nuclear power plants are followed. It does this by, for example, reviewing the reports from the power companies and undertaking inspections of the power plants. The unit investigates and follows up matters pertaining to safety and operation and participates in the processing of permit applications.

Technical unit

The technical unit is responsible for the technical review of safety matters and for the establishment of safety standards. The unit reviews safety reports in connection with the granting of permits and establishes safety requirements for the construction of plants.

The unit evaluates the power companies' reports of safety-related incidents and examines and issues regulations for construction and operation. Consultants are engaged in certain matters for specialist investigations.

An advisory board, the Reactor Safety Board, is connected with the inspection and technical units. The function of this board is to supervise SKI's inspection activities and to provide advice regarding reactor safety standards, permit matters and inspection activities.

Material unit

The materials unit is responsible for safeguard matters, export licence matters, material transport matters, criticality matters, safety matters pertaining to research reactors, atomic liability matters and matters pertaining to the physical protection of nuclear power installations and material transports. The unit checks to make sure that quantities of fissionable material are as specified and are stored in the proper manner. It does this by undertaking inspections of nuclear power plants, research stations and fuel element factories. The unit is in charge of the book-keeping of fissionable material and issuing the reports which are required by agreement with the International Atomic Energy Agency (IAEA). The unit is also responsible for examining criticality calculations and for security and permit matters in connection with the transport of fissionable material. In recent years, the unit has intensified its efforts in connection with the physical protection (protection against acts of violence, sabotage and the like) of nuclear power plants installations and transports of fissionable raw material.

The materials unit is served by an advisory board, the Safeguard Board whose duty is to supervise SKI's activities within the area of responsibility of the materials unit and to provide advice regarding the enforcement of existing agreements and proposals for changes in international agreements within the field.

Research unit

SKI is responsible for initiating and ordering safety research which has a bearing on the technology and the types of reactors which are used in the Swedish nuclear energy program. The research unit deals with questions pertaining to such safety research. SKI is responsible for planning, ordering and administering research projects which it initiates itself or which are proposed by grant applicants.

The research unit is served by an advisory board, the Research Board, whose duty is to analyze needs, propose and evaluate research projects, assist SKI in the planning of research activities, in resource assessment, in project follow-up and in the examination of submitted reports.

Waste unit

The function of the waste unit is to evaluate and inspect the management, handling and storage of spent nuclear fuel and radioactive waste from nuclear energy plants. This entails that the unit is responsible for the coordination of the treatment of waste matters within SKI. The unit is also responsible for performing the inspection work which is associated with future installations for the management, handling and storage of spent nuclear fuel and radioactive waste. The unit is responsible for the long-range planning of SKI's activities within the waste field. The unit is responsible for making sure that safety regulations governing processes and plants for the handling and storage of spent nuclear fuel and radioactive waste are issued and enforced. In matters concerning inspection and safety regulations, the unit shall work in collaboration with the inspection unit, the technical unit and the materials unit. The waste unit shall initiate research and development projects within its area of concern. In this work, the unit shall collaborate with SKI's research unit. Furthermore, the unit shall evaluate plans for the future decommissioning of nuclear energy installations.

Administrative unit

The administrative unit is responsible for administrative planning, coordination and service. The unit handles financial and personnel administration as well as records, files, enquiries and office services.

THE FUNCTION OF THE NATIONAL SWEDISH INSTITUTE OF RADIATION PROTECTION

As the national authority for radiation protection under the Radiation Protection Act of 14 March 1958 (No. 110), SSI is the central administrative authority for matters concerning protection against ionizing radiation and executes all other functions which are assigned to SSI by statutes or special stipulations. SSI's functions and duties are regulated by government instruction 1976-06-17 (SFS No. 481).

THE ORGANIZATION OF THE NATIONAL SWEDISH INSTITUTE OF RADIATION PROTECTION

The following is not a detailed description of SSI's organization. The main purpose here is to describe in what part of the organization matters relating to protection against radiation stemming from nuclear power plants are dealt with.

The National Swedish Institute of Radiation Protection (SSI) was formed in 1965 in connection with a reorganization of the Radiation Protection Board.

Since 1 January 1976, SSI has been under the Ministry of Agriculture and is run by a board consisting of the chief director of SSI plus a chairman and ten specially appointed members.

The chief director presides over the inspection unit, the unit for research and development and the administrative unit. The inspection unit is in charge of inspection activities for SSI. This unit is divided into two departments - the x-ray department and the nuclear physics department. The x-ray department deals with matters pertaining to x-ray radiation and non-ionizing radiation. The nuclear physics department deals with matters pertaining to ionizing radiation from radioactive substances. The matters dealt with by the nuclear physics department especially can be of a widely varying nature, where both external and internal radiation hazards must often be taken into account. Thus, this department inspects everything from smoke detectors, ID cards and watches to nuclear power plants with all their radiation protection safeguards.

The inspection departments are organized into sections responsible for different special areas. The handling of nuclear power matters has been divided up among three sections within the nuclear physics department, namely "the section for the internal nuclear power milieu", "the section for the external nuclear power milieu" and "the emergency planning section". These three sections are described in greater detail below.

The section for the internal nuclear power milieu

This section deals with matters pertaining to:

Industrial safety:

The section is responsible for handling radiation protection matters which concern both the utility personnel at nuclear power plants as well as the contractors who are active within the so-called "controlled area". The section's responsibilities include examining plans for major projects from the viewpoint of radiation protection, as regards both technical and organizational safeguards; issuing radiation protection regulations which, among other things, specify the maximum permissible radiation dose for personnel; and establishing rules for determining which personnel are to be medically examined in accordance with the provisions of the Radiation Protection Act. This section is also responsible for checking the personal dosimetry programme at the nuclear power plant and for checking the recorded individual doses, which must be reported to the Institute of Radiation Protection at regular intervals. Inspection and licensing matters pertaining to auxiliary industries, such as workshops which repair or handle radioactive components from nuclear power plants on their own premises, also lie within the area of the responsibility of the section. Finally, the section ensures that radiation protection regulations and directives are being complied with by undertaking inspections at the nuclear power plants.

System design:

The section is responsible for examining the safety reports of the nuclear power plants with regard to the technical design of the plants from the viewpoint of radiation protection, for example potential and actual escape paths for radioactivity, accessibility for repair and service, collection

and treatment systems for radioactive waste and delay devices for radiation discharges via the exhaust system.

Measuring and monitoring equipment:

The section is responsible for examining the safety reports of the nuclear power plants with regard to the measuring and monitoring equipment at the plants for radioactivity surveillance. This equipment shall detect both radiation discharged to the atmosphere and to water as well as radiation from internal systems. Furthermore, the section is responsible for establishing rules for the periodic testing of the function of these systems as well as for following-up and monitoring such testing.

Transports:

The section is responsible for handling matters pertaining to the transport of non-fissionable material. SKI is responsible for transports of fissile material. However, all questions concerning personnel or environment which have to do with ionizing radiation are dealt with SSI, which means that SKI shall consult with SSI in the handling of, for example, fuel transports in these cases.

The section for the external nuclear power milieu

This section deals with matters pertaining to:

Discharge control:

The section is responsible for issuing regulations limiting discharges of radioactive substances to the atmosphere and water from normal operation. The section examines discharge calculations for new plants and checks upon discharges from plants already in operation. This is done through regular written reports and the analysis of monthly samples submitted by the plant. The section must also approve of the plant's waste station for solid and liquid wastes from the viewpoint of radiation protection.

Since the Environment Protection Act (1969:387) went into effect, matters pertaining to ionizing radiation have been taken out of the jurisdiction of both the Riparian Rights Court and the Licensing Board. All radiation protection matters are now decided by SSI with reference to the Radiation Protection Act.

Environmental control:

The section is responsible for ensuring that the necessary preliminary studies and control programs on land and on water are carried out and established. In these matters, SSI works in close consultation with the radioecology section of the National Environment Protection Board (SNV). Another important function of the section is to gather meteorological data for the monitoring of airborne dispersion. The section for the external nuclear power environment also participates in the collection of sample material together with SNV. The section also collects its own samples and makes its own measurements.

The section is responsible for checking the results of control measure-

ments and converting of these results into doses to the people in the vicinity and at greater distances in cooperation with SNV. The results of the environment control work and the radiation doses are presented to fishermen and to the local population around the nuclear power plants through working groups set up by the County Administration.

Radioactive waste:

SSI's area of responsibility encompasses, as was previously mentioned, the radiation protection aspects of the processing, storage and disposal of all radioactive waste, both from the nuclear power industry and from other consumers of radioactive materials. The section for the external nuclear power environment becomes involved in these matters whenever they involve calculations of environmental impact, i.e. the consequences for personnel and the general public of different treatment alternatives, both in the production of the final product and in storage and disposal.

Surveillance of nuclear industry waste is broken down as follows:

For low-activity waste, different methods for handling waste at the waste stations and for final disposal (e.g. deposition as garbage, incineration or controlled storage) are evaluated as to their personnel and environmental impact. For medium-activity waste, the choice of treatment methods and final products is evaluated with regard to environmental and personnel safety (e.g. fire hazard, leakage hazard, shielding, handling, transport and storage). Some of these questions are studied in cooperation with other institutions.

Finally, the handling and storage of spent fuel at stations is studied from the viewpoint of environmental and personnel protection.

Spent fuel containing highly active (hot) waste is currently sent abroad for treatment.

Emergency planning section

One of SSI's functions is to give advice and recommendations to the county administrations who are required by law to establish special emergency preparedness plans for the safety of the population in the event of accidents at nuclear installations. The emergency preparedness section is responsible for the handling of these questions and also serves as a secretariat for the Emergency Preparedness Board against Atomic Accidents (BNA). The activities of this section also include examination of safety reports on the consequences of accidents and other emergency preparedness measures in the field of radiation protection, such as measures in the event of transport accidents.

New construction in the immediate vicinity of nuclear power plants and out to a limit of about 10 km is inspected and regulated by building authorities in consultation with the safety authorities SKI and SSI. General guidelines for community planning in this area are in the process of being worked out. These matters are dealt with in SSI by the emergency preparedness section.

DIVISION OF RESPONSIBILITY BETWEEN SKI AND SSI

SKI and SSI are both inspection authorities, which means that they have been appointed by the government to supervise the enforcement of the Atomic Energy Act and the Radiation Protection Act, respectively.

As far as SKI is concerned, this means surveillance of the construction and the operation of nuclear energy installations, of the production and handling of nuclear fuel and of the handling and storage of active waste from nuclear energy plants. This surveillance includes the inspection of safeguards against various type of accidents which could give rise to human injuries and environmental damage and the inspection of safeguards against the unauthorized use of nuclear material.

SSI's inspection responsibilities embrace all activities which involve ionizing radiation. As far as nuclear energy installations are concerned, this entails inspection of internal radiation protection for personnel in the installation and external radiation protection for the public in the vicinity of the installation and for the general population through supervision of the activity discharges from the installation into the air and water.

This means that nuclear power plants are examined and inspected by both SKI and SSI, but from different aspects. SKI examines their technical safety during normal operation and during various types of operational disruptions and establishes the necessary safety regulations for operation. SSI examines the plant's radiation environment and establishes the necessary regulations governing radiation protection and activity discharges to the environment.

THE PROCESSING OF APPLICATIONS FOR PERMITS FOR NUCLEAR POWER PLANTS BY THE AUTHORITIES

Figure 1 shows how applications for the permits required for the construction and commissioning of a nuclear power plant are processed by SKI and SSI. The figure also applies in general to other nuclear energy installations for which permits are required under the Atomic Energy Act, for example research reactors, fuel factories and reprocessing plants. Most of these application procedures and how they are handled within SKI and SSI are described in chronological order below.

Permit application and preliminary safety analysis report

Under the Atomic Energy Act, permit applications must be made by the owner of the plant to SKI. The application shall include a description of the plant site and of the plant itself and its impact on the environment in various operating situations. The plant owner must also submit a preliminary safety analysis report, normally called a PSAR, to SKI and SSI. The report shall describe in detail the safety philosophy which forms the basis for the design of the plant, conditions on the plant site and the preliminary design and function of the plant itself. Special emphasis is laid on the description of the safety systems in the plant and of the consequences of various possible failures.

SKI sends the permit application to SSI and to other official bodies for review and comment. SSI reviews the matter in the light of the provisions of the Radiation Protection Act and establishes conditions for radiation protection within the plant and for the discharge of radioactivity to the air and water. SKI, after reviewing the permit application and examining the PSAR, then evaluates the plant from the viewpoint of safety and establishes general technical conditions for the design and construction of the plant.

The replies from SSI and the other persons and agencies to whom the application has been sent for review and comment are compiled by SKI, which then turns the matter over to the government along with its own recommendation in the case. If this recommendation includes approval of the application, it also includes proposed conditions for the permission.

If the plant is planned for a new site, the matter must also be reviewed in the light of section 136a of the Building Act by the government (Ministry of Housing), which normally requests recommendations from a large number of sources, including the Licensing Board for Environmental Protection, which reviews the matter in the light of the Environmental Protection Act.

Licence

Licences, i.e. permits to construct, own and operate nuclear power plants and to possess and use the required quantities of fuel for the operation of the plant, are granted by the government. The demands made by SKI and SSI and other recommending bodies are established along with other conditions of a general nature. The government then instructs SKI to specify any other regulations and directives which are required from the viewpoint of safety for the construction and operation of the plant. If the plant is to be constructed on a new site, basic environmental investigations are begun at this stage by SSI, SNV and SMHI.

After the licence has been granted, SKI continues its examination of the safety reports (PSAR). SKI makes a more detailed evaluation of how the plant will fulfil existing safety requirements, after which it can grant its permission for the construction of the plant under the conditions which have been established. At the same time, instructions are issued on the reports which are to be submitted to SKI during the construction of the plant. SSI examines the reports from the viewpoint of radiation protection and makes any necessary comments.

Construction of the plant

The plant owner can then start building the plant. Throughout the construction period, SKI and SSI shall be kept informed regarding matters within their respective areas of concern. SSI must approve the appointment of a radiation protection officer and may replacements for him under the provisions of the Radiation Protection Act. The radiation protection officer bears primary responsibility for ensuring that good radiation protection conditions exist within the plant.

SKI can include a specification in the permit for the construction of the plant calling for a special report on certain components and systems of vital importance to the safety of the plant before these components and systems may be installed.

A safeguard report shall be submitted to SKI at least 8 months before the planned loading of the plant. This safeguard report shall provide a general description of the plant and of the fuel system, the quantity of nuclear material and the book-keeping routines for this material.

Final safety analysis report

During the construction phase, the plant owner makes out the final safety analysis report, normally referred to as the FSAR. This report describes in detail how the plant is designed to comply with the established safety requirements. The report is submitted for examination to SKI and SSI in good time before the planned loading of the reactor. SKI checks the design of the plant against existing safety requirements and carries out the necessary checks of calculations and analyses. If the requirements are met, SKI approves the final design of the plant. SSI examines the final design from the viewpoint of radiation protection, providing a basis for the later issuance of radiation protection directives.

Preoperational testing

As the plant is constructed, the various components and systems are tested. Before the reactor is loaded, comprehensive preoperational testing is carried out both with cold systems and up to full pressure and temperature in order to verify the function of the various systems and the combined function of all the systems. The results of the testing are compiled and submitted to SKI for review.

Before fuel may be brought into the plant, permission is required from SKI and SSI. SKI issues regulations for the systems which are required for the handling of fuel and for routines for the book-keeping of nuclear materials and for guaranteeing physical protection. SSI issues radiation protection regulations which specify requirements on certain systems, including monitoring systems, ventilation systems and waste systems, and on dosimetry and the reporting of discharged radioactivity. When fuel has been brought into the plant, SKI, sometimes together with representatives from IAEA, conducts safeguard inspections in order to check the quantity of nuclear material.

Loading and initial startup testing

When the reactor systems are finished and the reactor is to be loaded with fuel and the initial startup testing is to be carried out, the plant owner applies to SKI for permission. SKI's primary basis for making a decision in this matter is the final safety analysis report and the report on the preoperational testing. SKI also examines the test schedule for the initial startup testing, which is broken down into various stages, and the proposed specifications for the test operation.

SSI grants permission for loading and startup testing and issues radiation protection regulations for the test operation phase specifying both personnel radiation protection and discharge limits.

The plant owner has also to apply to the government for permission to load the reactor under the Special Permission Act. Permission is granted if the requirements under the Act regarding fuel reprocessing and final waste storage is fulfilled by the plant owner.

The reactor can then be loaded, whereby the nuclear operation commences. The first stage of the startup testing includes criticality tests and reactor physics measurements at low power operation. The output of the plant is then gradually increased and the various tests in the test program are performed on the reactor systems and on the reactor and turbine systems together. The results of the tests are compiled at the end of each stage and reported to SKI for review before permission for the succeeding stage can be obtained.

Routine operation

When the specified tests have been carried out with satisfactory results and it has thereby been proved that the plant can be operated safely both under ordinary operating conditions and during various operational disruptions, the authorities can grant permission for routine operation. SKI, after having examined all prescribed reports and after receiving answers to any remaining questions, then issues the directives and regulations which are to govern routine operation. SSI issues the permanent radiation protection regulations.

Reporting during routine operation

Regular reports shall be submitted to SKI and SSI on routine plant operation. Daily reports shall be submitted to SKI on the status and production of the plant. SSI normally receives monthly and quarterly reports on radiation and activity levels in and around the plant. Annual reports on the operation and maintenance of the plant are submitted to SKI and SSI. Accounts of fissionable material and reports on certain events and incidents are submitted in accordance with the general directives to SKI, which reports to IAEA in accordance with prevailing agreements. Furthermore, non-routine reports are submitted to SKI on major incidents and on conditions which have a bearing on safety. Reports are submitted to SSI in the event that maximum discharge levels are exceeded or personnel are exposed to abnormal radiation doses within the plant, or in the event of any other incident of importance from the viewpoint of radiation protection.

SKI and SSI continue to supervise the routine operation of the plant by means of reports and on-site inspections and can, if necessary, make alterations in and additions to established directives and regulations.

THE PROCESSING OF APPLICATIONS FOR PERMITS FOR
NUCLEAR POWER PLANTS BY THE AUTHORITIES

Fig. 1, page 1

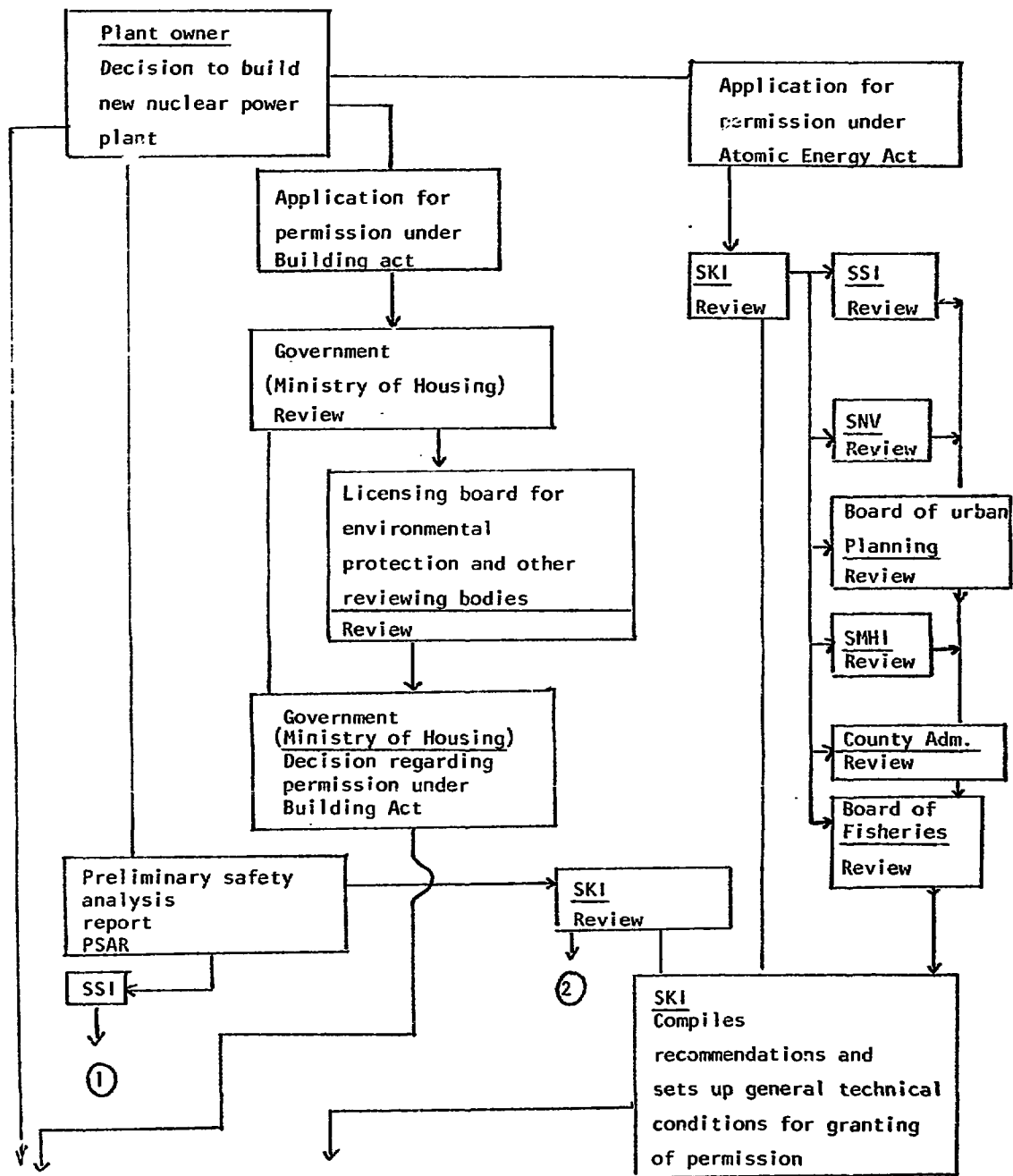


Fig. 1, page 2

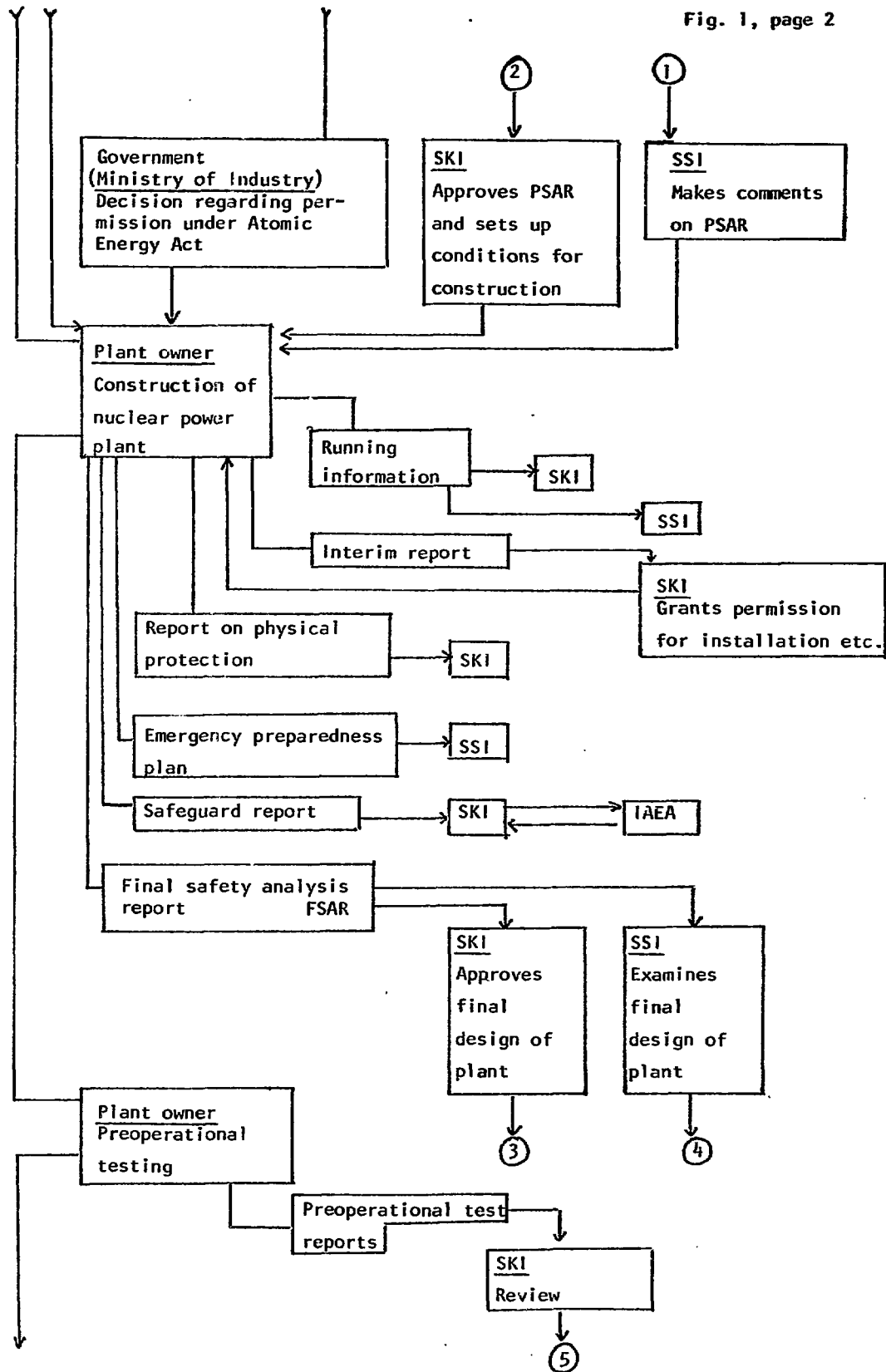


Fig. 1, page 3

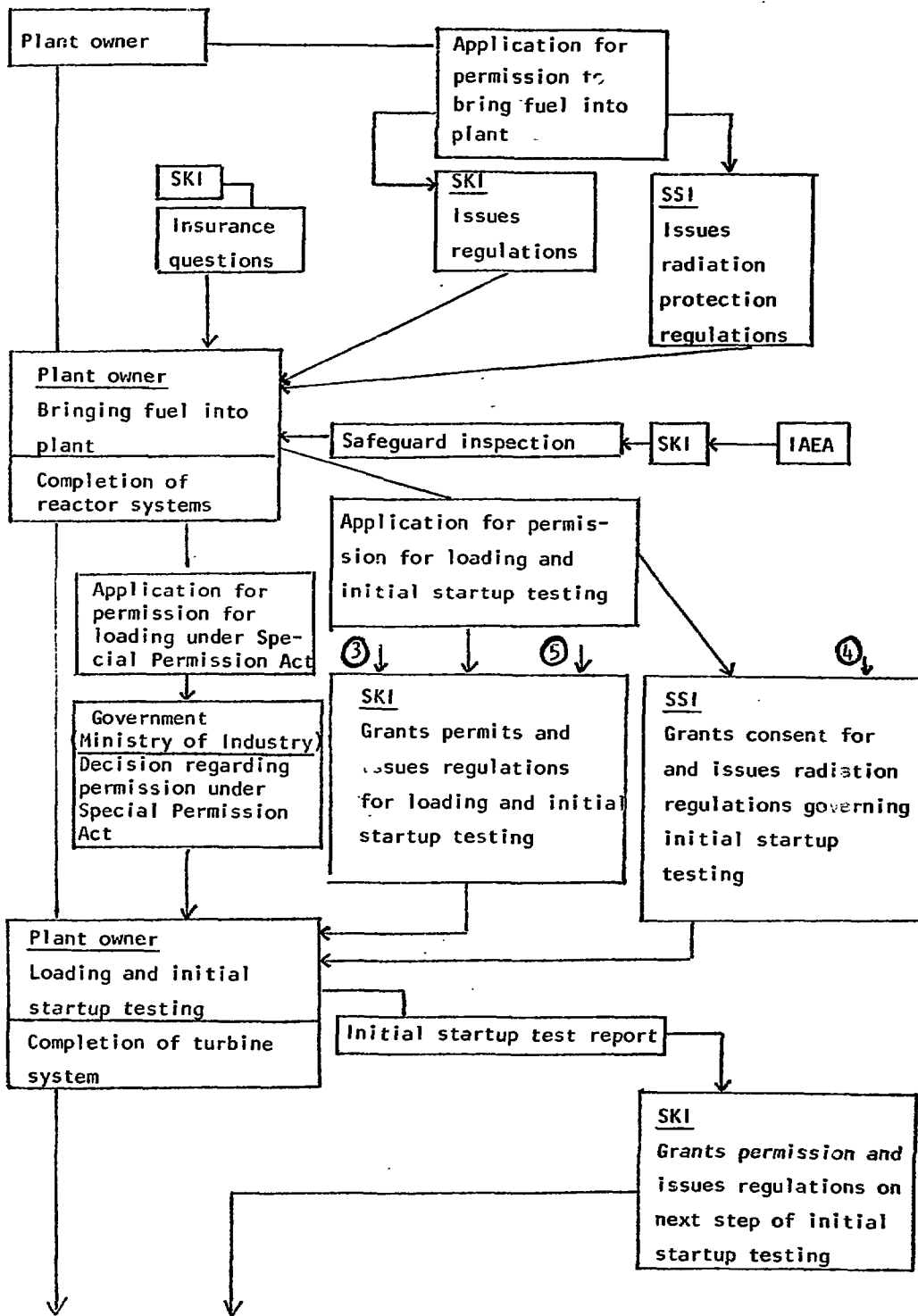


Fig. 1, page 4

