

Australia
Austria
Belgium
Canada
Czech Republic
Denmark
Finland
France
Germany
Greece
Hungary
Iceland
Ireland
Italy
Japan
Korea
Luxembourg
Mexico
Netherlands
New Zealand
Norway
Poland
Portugal
Slovak Republic
Spain
Sweden
Switzerland
Turkey
United Kingdom
United States

NUCLEAR LEGISLATION IN OECD COUNTRIES

Regulatory and Institutional Framework for Nuclear Activities

Sweden

ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

The OECD is a unique forum where the governments of 30 democracies work together to address the economic, social and environmental challenges of globalisation. The OECD is also at the forefront of efforts to understand and to help governments respond to new developments and concerns, such as corporate governance, the information economy and the challenges of an ageing population. The Organisation provides a setting where governments can compare policy experiences, seek answers to common problems, identify good practice and work to co-ordinate domestic and international policies.

The OECD member countries are: Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, the Slovak Republic, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. The Commission of the European Communities takes part in the work of the OECD.

OECD Publishing disseminates widely the results of the Organisation's statistics gathering and research on economic, social and environmental issues, as well as the conventions, guidelines and standards agreed by its members.

* * *

This work is published on the responsibility of the Secretary-General of the OECD. The opinions expressed and arguments employed herein do not necessarily reflect the official views of the Organisation or of the governments of its member countries.

NUCLEAR ENERGY AGENCY

The OECD Nuclear Energy Agency (NEA) was established on 1st February 1958 under the name of the OEEC European Nuclear Energy Agency. It received its present designation on 20th April 1972, when Japan became its first non-European full member. NEA membership today consists of 28 OECD member countries: Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Luxembourg, Mexico, the Netherlands, Norway, Portugal, the Republic of Korea, the Slovak Republic, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. The Commission of the European Communities also takes part in the work of the Agency.

The mission of the NEA is:

- to assist its member countries in maintaining and further developing, through international co-operation, the scientific, technological and legal bases required for a safe, environmentally friendly and economical use of nuclear energy for peaceful purposes, as well as
- to provide authoritative assessments and to forge common understandings on key issues as input to government decisions on nuclear energy policy and to broader OECD policy analyses in areas such as energy and sustainable development.

Specific areas of competence of the NEA include safety and regulation of nuclear activities, radioactive waste management, radiological protection, nuclear science, economic and technical analyses of the nuclear fuel cycle, nuclear law and liability, and public information. The NEA Data Bank provides nuclear data and computer program services for participating countries.

In these and related tasks, the NEA works in close collaboration with the International Atomic Energy Agency in Vienna, with which it has a Co-operation Agreement, as well as with other international organisations in the nuclear field.

© OECD 2003

No reproduction, copy, transmission or translation of this publication may be made without written permission. Applications should be sent to OECD Publishing: rights@oecd.org or by fax (+33-1) 45 24 13 91. Permission to photocopy a portion of this work should be addressed to the Centre Français d'exploitation du droit de Copie, 20 rue des Grands Augustins, 75006 Paris, France (contact@cfcopies.com).

SWEDEN

This chapter was last revised in 2003 and is correct as of that date.

The NEA Secretariat is currently revising this chapter in close consultation with the national authorities and plans to issue a new version in the near future.

SWEDEN

I. GENERAL REGULATORY REGIME	5
1. Introduction	5
2. Mining Regime.....	6
3. Radioactive Substances, Nuclear Fuel and Equipment	6
4. Nuclear Installations.....	7
<i>a) Licensing and inspection, including nuclear safety</i>	7
<i>b) Protection of the environment against radiation effects</i>	9
5. Trade in Nuclear Materials and Equipment.....	11
6. Radiation Protection	11
7. Radioactive Waste Management	13
8. Non-Proliferation and Physical Protection	14
9. Transport	15
10. Nuclear Third Party Liability	16
<i>a) The Nuclear Liability Act</i>	16
<i>b) Chernobyl legislation</i>	17
II. INSTITUTIONAL FRAMEWORK	17
Regulatory and Supervisory Authorities	17
<i>a) Ministry of the Environment</i>	17
<i>b) Ministry of Industry and Trade</i>	18
<i>c) Ministry of Justice</i>	18
<i>d) Ministry of Foreign Affairs</i>	18
<i>e) Swedish Nuclear Power Inspectorate (SKI)</i>	18
<i>f) Swedish Radiation Protection Institute (SSI)</i>	19

I. GENERAL REGULATORY REGIME

1. Introduction

There are 11 operating nuclear power reactors in Sweden; eight are boiling water reactors and three are pressurised water reactors. There are three PWR at Ringhals (with a combined installed capacity of 3 540 MWe), three BWR at Forsmark (3 100 MWe), three BWR at Oskarshamn (2 210 MWe), one BWR at Barsebäck (600 MWe), and one BWR at Ringhals (830 MWe). In 2002 the 11 reactors produced 65.6 billion kWh, accounting for about 45.9% of Sweden's total electricity production in that year.

Several power companies (Skydraft, Mellansvesk Kraftgrupp, Fortum and Vatenfall) own the shares of the various companies licenced to operate nuclear power generating stations in Sweden. These larger companies are themselves owned by private shareholders with the exception of Vatenvall which is partly state owned. Vatenvall has a stake in every operating company except OKG AB, which operates the units at Oskarshamn.

Sweden does not reprocess spent fuel. Since 1988 Sweden's low- and intermediate-level nuclear waste is deposited in the Repository for Radioactive Operational Waste (SFR) located at Forsmark. SFR receives short-lived low- and intermediate-level waste from nuclear power plants, hospitals, industry and research facilities in Sweden. Spent nuclear fuel and other high-level nuclear waste are placed in temporary storage at the Central Interim Storage Facility for Spent Nuclear Fuel (CLAB) located near Oskarshamn.

Studvik Nuclear AB operates two operational research reactors, one tank type (50 000 kW), and one pool type (1 000 kW). The tank type reactor is used primarily for fuel testing, fuel investigations, isotope production and neutron doping of silicon. The pool reactor is used for BNCT-therapy, and supplies neutrons to the Neutron Research Laboratory.

The framework of Sweden's nuclear law is to be found in five acts:¹

- the Nuclear Activities Act [SFS 1984:3], which concerns mainly security and control issues and the overall safety of nuclear operations;
- the Environmental Code [SFS 1998:808], which addresses environmental aspects of nuclear activities, and lists "nuclear activities" among several other "environmentally hazardous activities";
- the Radiation Protection Act [SFS 1988:220], adopted in 1988, aims to protect people, animals and the environment from the harmful effects of radiation;

1. All Swedish acts are published in the Swedish Statute Book, herein referred to as "SFS".

- the Act on the Financing of Future Charges for Spent Nuclear Fuel [SFS 1992:1537], contains provisions for the future costs of spent fuel disposal, decommissioning of reactors and research in the field of nuclear waste; and
- the Nuclear Liability Act [SFS 1968:45], which implements Sweden's obligations as a Party to the 1960 Paris Convention on Third Party Liability in the Field of Nuclear Energy and the 1963 Brussels Convention Supplementary to the Paris Convention.

The provisions of the Nuclear Activities Act, the Environmental Code and the Radiation Protection Act supply the general principles of the regulatory regime. These acts are supplemented by a number of ordinances and other secondary legislation containing more detailed provisions for particular aspects of the regime. Operation of a nuclear facility can only be conducted in accordance with a licence issued under the Nuclear Activities Act and a licence issued under the Environmental Code. Thus, operation of a nuclear facility requires two separate licences.

In 1995, a number of amendments were made to the Swedish legislation on nuclear safety and radiation protection: two amendments stem from Sweden's accession to the European Union, one concerns waste disposal and another concerns exports. To this extent the Nuclear Activities Act and the Radiation Protection Act were amended to conform to European Community legislation.

The export of nuclear material and equipment is governed by the Act on Control of Export of Dual-use Products and Technical Assistance [SFS 2000:1064] and the Act on Inspections according to International Agreements on Non-proliferation of Nuclear Weapons [SFS 2000:140]. Previously, such matters had been regulated by the Strategic Products Act [SFS 1998:397].

On 18 December 1997, the Swedish parliament adopted the Act on the Phasing-Out of Nuclear Power [SFS 1997:13320], which entered into force on 1 January 1998. This act formed part of the inter-party agreement on guidelines for energy policy, which was initiated by the Swedish government in 1995 to create conditions for the efficient use and cost effective supply of energy.

2. Mining Regime

The Mineral Act [SFS 1991:45], which replaced the 1974 Act on certain mineral deposits, provides that the investigation of ore deposits and working of certain minerals are subject to a special licence. This applies to numerous minerals, including those containing uranium and thorium.

3. Radioactive Substances, Nuclear Fuel and Equipment

Both the Nuclear Activities Act [SFS 1984:3] and the Radiation Protection Act [SFS 1988:220] are relevant to this topic. The Nuclear Activities Act applies to all "nuclear activities", and these include the acquisition, possession, transfer, handling, processing, transport and other dealings with nuclear material and waste [Section 1]. Generally speaking, none of these activities may be carried on without a licence issued under the act [Section 5], although there is also provision in the act for exemptions to its requirements [Section 2(a)]. For example, universities and research institutes etc. may acquire, possess and handle small amounts of natural or depleted uranium and thorium and their compounds without a licence. Natural or depleted uranium may also be used as counterweights in aircraft or in the production of radiation-protection screens, ceramic or glass production etc. without a licence. However, the possession of the substances must be reported to the Swedish Nuclear Power Inspectorate (*Statens Kärnkraftinspektion* – SKI).

In addition, the Radiation Protection Act imposes obligations on people engaged in activities involving ionising radiation. Any dealings with radioactive substances or with equipment capable of generating or emitting ionising radiation can be carried on only in accordance with a licence issued under the act [Section 20]. However, if the activity in question is also covered by the Nuclear Activities Act, the requirement for a licence under the Radiation Protection Act is automatically waived unless stated otherwise in the licence issued under the Nuclear Activities Act [Section 23].

The Radiation Protection Act also provides that manufacturers and importers are required to provide radiation protection information about their products (by means of labelling, etc.) and to ensure that the products are fitted with appropriate radiation protection equipment [Sections 9 to 11]. Persons responsible for handling the waste that results from radiation activities must store and dispose of radioactive waste and discarded sources of radiation in a way that is “satisfactory from the viewpoint of radiation protection” [Sections 13 and 14].

In the event of serious breaches of the Radiation Protection Act, criminal sanctions may apply [Sections 35 to 37] and the radioactive substances or equipment used in such a breach may be forfeited [Section 40].

The Pharmaceuticals Act [SFS 1992:859] contains provisions imposing licence obligations for the manufacture, importation and sale of radioactive pharmaceuticals.

4. Nuclear Installations

Most aspects of Sweden’s nuclear facilities are regulated by the Nuclear Activities Act [SFS 1984:3] (containing general provisions) and the Nuclear Activities Ordinance [SFS 1984:14] (containing more detailed rules).

The fundamental provisions of the act provide that nuclear activities are to be conducted in such a manner that all safety measures needed to prevent a radiological accident shall be taken [Section 3]. The act defines nuclear activities to include: the construction, possession and operation of a nuclear installation; the acquisition, possession, transfer, handling, processing, transport or other dealings with nuclear substances and nuclear waste; and the importation of nuclear substances and nuclear waste, and exportation of nuclear waste.

a) Licensing and inspection, including nuclear safety

Licences for nuclear installations are decided upon and issued by the government, with a few exceptions. The government authority with major responsibility for the administration and supervision of the licensing procedure is the Swedish Nuclear Power Inspectorate (SKI). The responsibilities for the SKI are laid down in the Ordinance with Instructions for the Swedish Nuclear Power Inspectorate [SFS 1988:523]. The SKI may attach safety conditions to any licence it issues under the act [Section 8], and has the power to require access to the site where nuclear activities are carried to obtain any information or documentation needed to ensure compliance with the act [Section 17]. The SKI may give directions to a licensee in a particular situation to ensure compliance, and if the licensee fails to take the necessary action, it may proceed to carry out the action at the licensee’s expense [Section 18]. The act also contains criminal sanctions for non-compliance with its requirements [Sections 22, 25-29].

The act places responsibility for the safety of every aspect of a nuclear activity squarely with the person who is the licence-holder in respect of that activity. In addition to a general responsibility to maintain safety, the licence-holder is responsible for ensuring the safe handling and final storage of nuclear waste arising from the activity and the safe shut-down and decommissioning of plants in which nuclear activities are no longer conducted [Section 10]. If the licensee fails to comply with conditions attached to the licence or with safety obligations arising in any other manner under the Nuclear Activity Act, the government or the SKI has the authority to revoke the licence altogether [Section 15]. The decision lies with the authority that has issued the licence.

Although the SKI carries the main responsibility and authority in relation to the operation of nuclear installations, the Swedish Radiation Protection Institute (*Statens Strålskyddsinstitut* – SSI) also participates in inspections of installations in order to ensure compliance with the Radiation Protection Act [SFS 1988: 220].

It is mandatory to submit an Environmental Impact Assessment (EIA) together with an application for a permit to construct, possess or operate a nuclear installation. The EIA aims to facilitate an overall assessment of the planned operation's effects on the environment, health and management of natural resources, thus providing a better basis for deciding whether to issue a licence. Procedures for carrying out the EIA are contained in the Environmental Code. The government or appropriate appointed authority may issue regulations calling for an EIA to be included in an application for permits for nuclear matters other than those mentioned.

The Act on Nuclear Activities was amended in 1987 to prohibit the issue of a licence for the construction of a nuclear power reactor [Section 5(a)]. This 1987 amendment reflected parliament's decision after a referendum held in 1980, following which the Swedish parliament decided that no new nuclear power facilities would be constructed in Sweden, and that existing facilities should gradually cease operations. At the time that this policy was announced, it was envisaged that the last nuclear power reactor in Sweden would cease to operate in 2010. That specific date is no longer topical on the political agenda. The licensing provisions will continue to apply in relation to the operation of those nuclear power facilities that had already been constructed at the time of the 1987 amendments. Thus, the only new installations to be subject to the act's licensing procedure will be those constructed for the handling, storage and final disposal of nuclear waste, including spent nuclear fuel.

In 1995 an inter-party agreement was made between the parties forming the majority in the parliament on guidelines for a new Swedish energy policy. The aim was to create conditions for the efficient use and cost-effective supply of energy, thereby facilitating the creation of an "ecologically sustainable society". As a result of this agreement, the Act on the Phasing-out of Nuclear Power was adopted in 1997 and entered into force on 1 January 1998.

The Phasing-out Act gives the Swedish government the right to revoke a permit to operate a nuclear power reactor. It further provides that the order and timing of closures will depend on the transformation of the energy system. In deciding when a reactor should be taken out of operation, due regard should be taken of its location, age, design, and its importance for the national energy supply system. The act confirms that the licensee is entitled to compensation from the state for losses incurred due to a forced closedown.

On the basis of this act, the Swedish government decided on February 5, 1998 that the nuclear power reactor Barsebäck No. 1 was to be closed down. The state and the reactor owner reached an agreement, approved by the parliament, pursuant to which reactor Barsebäck No. 1 was closed 30 November 1999.

At the international level, Sweden has ratified:

- the 1994 Convention on Nuclear Safety (on 11 September 1995);
- the 1997 Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (on 29 July 1999);
- the 1986 Convention on Early Notification of a Nuclear Accident (on 27 February 1987); and
- the 1986 Convention on Assistance in the Case of Nuclear Accident or Radiological Emergency (on 24 June 1992).

b) Protection of the environment against radiation effects

The Act on Nuclear Activities was amended in 1998 to incorporate references to the Environmental Code [SFS 1998:808]. The amendments, which entered into force on 1 January 1999, state that the General Rules of Consideration and the Environmental Quality Standards of the Environmental Code shall apply when considering matters under the Nuclear Activities Act. In the preparatory work to the Environmental Code the operation of nuclear installation is specified as an example of a hazardous activity.

i) The Environmental Code

The General Rules of Consideration state that operations must be conducted and measures taken so that harm to human health and to the environment is avoided, and provide the following fundamental principles:

- the burden of proof principle;
- the knowledge requirement;
- the precautionary principle;
- the best possible technology principle;
- the appropriate location principle;
- the resource management and eco-cycle principles;
- the product choice principle;
- the principle of reasonableness.

The Environmental Quality Standards specify the maximum levels of pollution or disturbance to land, water, air or the environment in general, that humans may be exposed to without any significant risk. Permits, approvals or exemptions may not be issued for a new operation that would contravene an Environmental Quality Standard, unless precautionary measures to alleviate the negative effects are taken.

ii) Environmental impact statement

The Nuclear Activities Act requires an environmental impact statement (EIS) as part of the application for a licence to construct, possess or operate a nuclear power plant. The purpose of the EIS

is to assess the effects of the planned operation on human health and the environment and on the management of natural resources. The procedure to be followed when making the assessment is described in the Environmental Code [Chapter 6]. In addition, the Ordinance on Environmental Impact Assessments [SFS 1998:905] provides that nuclear reactors and installations for the storage of nuclear waste and spent nuclear fuel shall always be considered to have a significant impact on the environment [Section 3]. Prior to the drafting of an EIS, the operator must obtain and compile available data and consult the other parties, authorities and organisations concerned, including the general public.

iii) Permit under the Environmental Code

According to the Ordinance on Environmentally Hazardous Activities and Health Protection [SFS 1998:899], a nuclear activity may not be carried out without a permit issued under the Environmental Code [Section 5]. This means that such operations are required to have two permits, one issued in pursuance to the Code and the other in pursuance to the Nuclear Activities Act.

Applications for a permit to conduct nuclear activities are submitted to the Swedish Nuclear Power Inspectorate (SKI). The Inspectorate is required to assess whether the following provisions in both the Nuclear Activities Act and the Environmental Code have been satisfactorily complied with:

- the safety regulations according to the Nuclear Activities Act;
- the general rules of consideration in Chapter 2 of the Code and the measures proposed by the applicant to avoid any environmental hazards;
- the environmental quality standard in Chapter 5 of the Code; and
- the environmental impact assessment, i.e. its contents as well as the extent of the consultations with concerned parties.

The Inspectorate will, as part of its preparation of the matter, obtain the necessary opinions and statements from concerned parties, such as the Swedish Radiation Protection Institute (SSI) and local authorities. Other parties affected by the operation will also be given the opportunity to express their opinions at local hearings. Before handing over the matter to the government, SKI includes in its expert opinion any special conditions that it deems necessary to be part of a future permit, such as precautionary measures to minimise the hazards involved, and the conditions concerning radiation protection considered by SSI.

An application to conduct nuclear activities and an environmental impact statement, similar to those submitted to SKI, must also be submitted to an appropriate environmental court for consideration under the Environmental Code. During its deliberation, the court will assess whether the provisions in the Code regarding emissions and disturbances, including those caused by radioactive substances and ionising radiation, have been satisfactorily complied with.

Once the environmental court has considered the matter, it hands the application over to the government, which assesses its permissibility under Chapter 17 of the Environmental Code, and whether the proposed location for the operation is suitable. It is of great importance that the expert opinions prepared by SKI, SSI and the environmental court are available to the government before deciding the matter of permissibility.

Finally, the appropriate municipal council must have approved the operation before the government issues a permit. This is known as the municipal veto. However, regarding facilities for

intermediate storage or final disposal of nuclear material or waste, the Code provides that the municipal veto may be overturned if the operation is of the utmost importance to the national interest. This exception does not apply, however, where another site is considered more appropriate for the activity or if an appropriate site has been designated for the activity in another municipality which is likely to approve the site [Chapter 17, Section 6].

5. Trade in Nuclear Materials and Equipment

The export of nuclear material and equipment is governed by the Act on Control of Export of Dual-use Products and Technical Assistance, as well as by EC Council Regulation No. 1334/2000 of 22 June 2000 setting up a Community Regime for the Control of Exports of Dual-Use Items and Technology. The procedure to grant permission for export requires an application to be made to the Swedish Inspection for Strategic Products (ISP), which makes the decision whether or not to grant the necessary permission. SKI has jurisdiction to decide certain cases on the export of dual-use products, which are connected to nuclear activities, such as nuclear fuel.

In special cases, however, the government grants permission for export of such products. The ministry in charge of such cases is the Ministry for Foreign Affairs. In the event of trade in nuclear materials or equipment in breach of the regime established under the Act on Control of Export of Dual-use Products and Technical Assistance or under the Nuclear Activities Act, the sanctions contained in each respective act apply, including criminal prosecution.

The Ordinance on Nuclear Activities [SFS 1984:14] deals with the import of nuclear substances and nuclear waste as well as the exportation of nuclear waste at a more detailed level. The ordinance provides for a hierarchy of licensing and notification, depending on the category of material or equipment to be imported. The Swedish Radiation Protection Institute (SSI) issues licences for the import and export of nuclear waste.

An application to import nuclear substances or nuclear waste from a foreign nuclear installation shall contain information on how long the material will stay in Sweden. The application will be granted only if it is clear that the material will either be conveyed out of Sweden within a certain time, or that a licence for terminal storage within Sweden has been granted. An application to export nuclear waste from nuclear activities in Sweden shall contain information as to how it will finally be disposed of. The application shall further contain an assurance from the exporter that the waste will be taken back if it is not disposed of as described in the application.

Sweden ratified the 1968 Treaty on the Non-Proliferation of Nuclear Weapons on 9 January 1970. It has also concluded bilateral agreements with its major suppliers, agreeing not to re-export material or equipment except with the approval of the original supplier. Thus, these international commitments will be taken into account in decisions about the issue of export licences.

6. Radiation Protection

On 1 July 1988, a Radiation Protection Act [SFS 1988:220] came into force, replacing the previous act of the same name which dated from 1958. The 1988 Act states that its purpose is, “to protect people, animals and the environment against the harmful effects of radiation” [Section 1]. The act establishes a system of licences that applies to both ionising radiation (radiation from gamma rays, X-rays and the like) and non-ionising radiation (optical radiation, radio-frequency radiation, ultrasound radiation, etc.) [Section 2].

The act's main obligations are imposed on the people who conduct activities involving ionising radiation. These activities include the manufacture, importation, transport, sale, acquisition, possession, use or dealing with a radioactive substance, and the use of any technical device capable of generating ionising radiation [Section 5]. Generally speaking, a licence must be obtained from the Swedish Radiation Protection Institute (*Statens Strålskyddsinstitut* – SSI) before any of these activities can be commenced [Section 20]. The licence may be issued for a limited period, may be subject to conditions and may be revoked if the licensee fails to comply with the act, regulations or conditions in any significant respect [Sections 24, 26 and 28].

The act places broad obligations on people conducting activities involving ionising radiation, including: taking measures that are necessary to prevent or counteract injury to people and animals and damage to the environment; supervising and maintaining radiation protection at the site where radiation occurs; and properly maintaining all the equipment used in radiation related activities [Section 6].

In addition, the act provides specific duties owed to employees: employers must ensure that people working in places where radiation activities occur are fully informed of the risks associated with their work, and of the regulations and conditions to be observed in carrying out their work. The employer is also responsible for adequately training employees in relation to the functioning of radiation protection systems [Section 7]. A complementary duty is placed on employees to use the safety systems provided by the employer [Section 8]. The act provides certain conditions for the radiation protection of employees. No person under the age of 16 may perform work involving ionising radiation [Section 16]. Medical examinations are compulsory for persons engaged in ionising radiation work [Section 18]. SSI may intervene to impose additional procedures for a particular kind of work, or to prohibit it altogether [Section 17].

Criminal sanctions apply in the case of serious breaches of the act [Sections 35-37], and radioactive substances or equipment used in such a breach may be confiscated [Section 40].

While the Radiation Protection Act imposes duties and responsibilities on various groups of people in general terms, most of the details of specific aspects of the radiation protection regime are set out in two ordinances, the Radiation Protection Ordinance [SFS 1988:293], and the Ordinance with Instructions for the Swedish Radiation Protection Institute [SFS 1988:295]. The Radiation Protection Ordinance designates the SSI as the government's central agency for the purposes of the act, lists certain substances and equipment that are exempt from the requirements of the act, and sets out topics on which the Institute may issue regulations. The Ordinance with Instructions for the Swedish Radiation Protection Institute deals with some other functions of the Institute, such as granting it responsibility for research and development in the field of radiation protection, dissemination of information on the subject, establishment of international radiation protection standards in the national context, and provision of advice to public authorities in the event of a nuclear accident affecting Sweden.

Although the main supervisory responsibility in relation to radiation protection lies with the SSI, this body may delegate partial responsibility to local authorities engaged in public health and environment protection [Sections 29 and 30]. In such a case, the local authorities are endowed with certain information-gathering powers, the right of access to facilities and authority to give directions, in order to enforce effectively the act and its regulations [Sections 31-33].

In accordance with the Radiation Protection Ordinance, the SSI has issued nine regulations implementing Council Directive 96/29/Euratom of 13 May 1996. This Directive lays down basic safety standards for the protection of the health of workers and the general public against the dangers

arising from ionising radiation. It is based on the recommendations of the International Commission on Radiological Protection (ICRP). The nine regulations are entitled SSI's Regulations on: Monitoring and Reporting of Individual Radiation Doses [SSI FS 1998:5]; Categorisation of Workers and Workplaces at Work with Ionising Radiation [SSI FS 1998:3]; Dose Limits at Work with Ionising Radiation [SSI FS 1998:4]; Medical Surveillance of Exposed Workers [SSI FS 1998:6]; Radiation Protection of Workers Exposed to Ionising Radiation at Nuclear Plants [SSI FS 2000:10]; Radiation Protection Managers at Nuclear Plants [SSI FS 2000:11]; Radiation Protection of Human Health and the Environment from the releases of Radioactive Substances from Certain Nuclear Facilities [SSI FS 2000:12]; Handling of Radioactive Waste and Nuclear Waste at Nuclear Facilities [SSI FS 2001:1]; and Planning for and during Decommissioning of Nuclear Facilities [SSI FS 2002:4].

7. Radioactive waste management

Management and disposal of radioactive waste is regulated principally by provisions of the Nuclear Activities Act [SFS 1984:3] and Ordinance [SFS 1984:14] and the Radiation Protection Act [SFS 1988:220] and Ordinance [SFS 1988:293].

Nuclear waste is defined in the Nuclear Activities Act as:

- radioactive substance formed in a nuclear plant and which has not been produced or removed from the plant to be used in education or research, or from medical, agricultural or commercial purposes;
- material or other items which have belonged to a nuclear plant and become contaminated with radioactivity, and are no longer to be used in such a plant;
- radioactive parts of a nuclear plant which is being decommissioned.

Responsibility for the management of nuclear waste lies with the licensee carrying out the activities that produce the waste. The Nuclear Activities Act states that the licensee must ensure the safe handling and final storage of nuclear waste and the safe decommissioning and dismantling of nuclear plants which are no longer in use [Section 10]. In practice this means that the producer of nuclear waste is responsible for its collection, transport, treatment and interim storage. A licensee of a nuclear power reactor is, according to the act, specifically required to conduct research and development into the safe handling and final storage of spent nuclear fuels and long-lived nuclear waste, in consultation with other reactor operators. The research and development program, which must cover a period of six years, is subject to government approval. The program is reviewed every three years by the Swedish Nuclear Power Inspectorate (*Statens Kärnkraftinspektion* – SKI) and the Swedish Radiation Protection Institute (*Statens Strålskyddsinstitut* – SSI) and reported to the government through SKI. The government may require changes to the program and may impose certain specified conditions [Sections 11 and 12]. If the operator of the nuclear facility does not comply with these obligations relating to research and development, and this non-compliance has serious implications as far as the safety of the facility is concerned, the operator's licence may be revoked [Section 15].

A final repository for low and intermediate level reactor waste (the SFR facility) has been constructed at the nuclear power plants in Forsmark. The repository operates under the terms and conditions of an operating licence that is issued by the government, but it is supervised by both the SKI and the SSI. Since 1985, the Central Interim Storage Facility for Spent Nuclear Fuel (the CLAB facility constructed by the power plants in Oskarshamn) has been in use, serving as an intermediate storage facility prior to final disposal of the fuel. The implementation of the research and development

programme is performed in stages over a period of many years and involves SKI, SSI, numerous other government agencies and consultations with the general public. Currently discussions are being held on plans for a final repository for spent nuclear fuel and it is expected that a decision on this project will be made within the next few years.

A separate act deals with the question of financing the final disposal of nuclear spent fuel and waste as well as the decommissioning of nuclear reactors. The Act on the Financing of Future Costs of Nuclear Waste Management [SFS 1992: 1537] requires the producers of nuclear power to pay an annual fee to the state. The amount of the fee is calculated according to the energy output of each nuclear facility and according to information provided by the producers as to the estimated costs of carrying out their legal obligations in relation to nuclear waste (i.e. its safe handling, storage, and research and development).

The fees are paid into a fund the assets of which are earmarked to cover the future costs of spent fuel disposal, decommissioning of reactors and research in the field of nuclear waste. The fund also covers the ongoing costs of the safe handling and storage of nuclear waste, and of the research and development programs carried out by the producers in fulfilment of their obligations under the Nuclear Activities Act. The SKI is responsible for reviewing the calculations of the annual fees and for proposing the amount to be paid by operators of nuclear reactors.

The handling and disposal of waste generated by activities other than nuclear power production, defined as radioactive waste, is dealt with in the Radiation Protection Act [SFS 1988:220] and is under the supervision of the SSI. The act states that people who have conducted activities involving either radiation or devices capable of emitting radiation are responsible for ensuring that any radioactive waste (or discarded radioactive source) is handled and, if necessary, stored “in a manner that is satisfactory from the viewpoint of radiation protection” [Sections 13 and 14]. The SSI also issues regulations applicable to radioactive emissions from nuclear power plants. The Regulations provide that releases of radioactive substances from nuclear power plants into the water or the air should be monitored, analysed and reported to the Institute. The provisions are based on the ALARA (as low as reasonably achievable) principle.

Through the Environmental Code [SFS 1998:808], the dumping at sea of any kind of waste, including radioactive waste, is prohibited. The rules in the Code replace the Marine Dumping Prohibition Act of 1971 [SFS 1971:1154]. It is also of note that, at the international level, Sweden ratified the 1972 London Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter on 21 February 1974. It furthermore ratified the 1997 Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management on 29 July 1999.

8. Non-Proliferation and Physical Protection

Sweden has ratified both the 1968 Treaty on the Non-Proliferation of Nuclear Weapons (on 9 January 1970) and the 1979 Convention on the Physical Protection of Nuclear Material (on 1 August 1980). Sweden also ratified the 1996 Comprehensive Test Ban Treaty on 2 December 1998. Sweden's obligations under these treaties are given effect by means of several general provisions in the Nuclear Activities Act [SFS 1984:3] and wide regulation-making powers conferred on the Swedish Nuclear Power Inspectorate under the Nuclear Activities Ordinance [SFS 1984:14]. The fundamental provisions of the Nuclear Activities Act state that nuclear activities are to be carried out in a manner that honours Sweden's obligations with the aim to: prevent nuclear explosions; non-proliferation of nuclear weapons and unauthorised dealings with nuclear material [Section 3]. The act expressly states

that one of the main methods of achieving safety in nuclear activities is to prevent unlawful dealings with nuclear material [Section 4].

At a more specific level, the act places obligations on people who have been licensed to conduct nuclear activities to ensure that international inspectors have access to the nuclear installations and have sufficient information at their disposal in order to facilitate their task of supervising Sweden's non-proliferation obligations [Section 17].

The Nuclear Activities Ordinance entrusts the Swedish Nuclear Power Inspectorate with the responsibility for issuing regulations dealing with the following matters:

- measures to maintain safety in nuclear activities, as required by Section 4 of the Nuclear Activities Act;
- measures to ensure fulfilment of Sweden's obligations regarding non-proliferation of nuclear weapons and unauthorised dealings with nuclear material;
- the powers to be exercised by the international observers referred to in Section 17 of the Nuclear Activities Act [Section 20(a)].

The ordinance also gives the Swedish Nuclear Power Inspectorate the task of drafting regulations relating to the supervision and inspection of all aspects of nuclear activities (for example, handling, processing, transport) so as to ensure that the safety requirements referred to in Sections 3 and 4 of the act are met [Section 21].

The Act on Inspections according to International Agreements on Non-proliferation of Nuclear Weapons provides the legal basis for international inspectors to conduct inspections in accordance with the additional protocol to the Agreement between Sweden, EU and the IAEA.

9. Transport

The transport of nuclear substances and nuclear waste is included within the scope of "nuclear activities" and is therefore subject to the licensing system of the Nuclear Activities Act. A licence must be obtained, and it may be subject to time limits and other conditions. The Ordinance [SFS 1984:14] on Nuclear Activities specifies that in the case of transport of nuclear material or highly radioactive waste, the Swedish Nuclear Power Inspectorate determines the question of licences after consultation with the Swedish Radiation Protection Institute about conditions that will need to be imposed in the interests of radiation protection [Section 18].

The transport of radioactive substances comes within the scope of the Radiation Protection Act [SFS 1988:220] since it is included in the list of "activities involving radiation" [Section 5]. People involved in the transport of radioactive substances are therefore subject to the general obligations of the act (to take measures necessary to protect people, animals and the environment from radiation damage and to provide proper safety systems, training and information to the employees). They are also required to obtain a licence for transport activities [Section 20], unless the activity is subject to the licensing requirements of the Nuclear Activities Act [Section 23]. The Swedish Radiation Protection Institute is empowered to impose conditions on the licence [Section 27] and to issue regulations relating to transport licences [Section 21]. Licensees are subject to the provisions of the act that require information and access to be given to the supervisory authority (the Institute) [Section 31], and they are of course also subject to the penalty provisions of the act [Sections 35 to 40].

The Transport of Dangerous Goods Act [SFS 1982:821] applies to the transport of radioactive substances including their loading, unloading, storage and other handling. The Act and the Ordinance [SFS 1982:923] on the Transport of Dangerous Goods transpose the Conventions and other international agreements on the subject – International Regulations concerning the Carriage of Dangerous Goods by Rail (RID), International Convention concerning the Carriage of Goods by Rail (CIM), European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR), International Convention for the Safety of Life at Sea (SOLAS), the International Maritime Dangerous Goods Code (IMDG), International Civil Aviation Organisation ICAO agreements etc. – into Swedish national law.

The Ordinance on the Transport of Dangerous Goods designates the Swedish Nuclear Power Inspectorate as the competent authority for nuclear materials and the Swedish Radiation Protection Institute for other radioactive materials as concerns the issuing of certain certificates etc. The regulatory authority for transport by road is the National Rescue Services Agency, for transport by sea, the Swedish Administration of Shipping and Navigation and for transport by air, the Swedish Civil Aviation Administration.

10. Nuclear Third Party Liability

Sweden is a Party to the following instruments on nuclear third party liability:

- the 1960 Paris Convention on Third Party Liability in the Field of Nuclear Energy, and the 1963 Brussels Convention Supplementary to the Paris Convention as amended by the 1982 Protocols; Sweden ratified these two Conventions on 1 April 1968 and 3 April 1968 respectively;
- the 1971 Brussels Convention on Civil Liability in the Field of Maritime Carriage of Nuclear Material, which it ratified on 22 November 1974;
- the 1988 Joint Protocol relating to the Application of the Paris Convention and the Vienna Convention, which it ratified on 27 January 1992.

a) *The Nuclear Liability Act*

The Nuclear Liability Act [SFS 1968:45] implements Sweden's obligations under the above mentioned treaties. The act has been amended several times in order to keep it in line with developments at the international level, and to make increases from time to time in the amounts of the operator's liability. The act provides that the operator of a nuclear installation, which is the source of a nuclear incident, is strictly and exclusively liable to provide compensation to those who have suffered personal injury, damage to property or loss as a result of the incident. The amount of the operator's liability has been raised progressively since the act was first passed in 1968. Originally the limit was 50 million Swedish kronor (SEK) per incident [Section 17]. This sum has progressively increased; the current limit of Special Drawing Rights (SDR), which came into effect on 1 April 2001, is now SDR 300 million, corresponding to approximately SEK 3 300 million.

The liability limit for incidents occurring at installations that produce, treat or store only unirradiated uranium and for incidents occurring in the course of transport of such uranium has remained at the amount of SEK 100 million per incident. Except in the case where a nuclear installation is operated by the state, every Swedish nuclear operator must have insurance, approved by the government, to cover his liability as set out by the legislation.

The act provides for compensation over and above that available under the terms of the Paris Convention and the Brussels Supplementary Convention. Should a nuclear incident occur, for which the operator of a nuclear installation located in Sweden is liable, and the amounts available under the two Conventions are insufficient to allow compensation in full, the state will compensate the victims from a maximum sum of SEK 6 000 million per incident. This extra tier of compensation is available only in relation to nuclear damage suffered in Sweden, Denmark, Finland, and Norway or on the territory of any other Party to the Brussels Supplementary Convention, only to the extent that the Party concerned provides similar additional compensation for damage suffered in Sweden.

A person wishing to claim compensation under the Nuclear Liability Act must do so within three years of becoming aware of his or her entitlement to compensation, or, in any case, within ten years of the nuclear incident which caused the damage in question [Section 21]. The act also contains provisions establishing which Swedish courts have jurisdiction over a particular claim for compensation [Sections 36 and 37].

b) *Chernobyl Legislation*

Following the Chernobyl accident in 1986, Sweden passed legislation dealing specifically with compensation for those who had suffered economic loss in Sweden as a result of the accident. This legislation established various measures regarding emergency systems and allocated the sum of SEK 250 million as compensation to claimants who had been obliged to discard animal carcasses, vegetable products and milk, rehabilitate horticultural areas, abandon commercial hunting activities, etc. In addition, a number of ordinances were made dealing with specific economic activities which were adversely affected by the accident [for example, the Ordinance on compensation to agricultural, garden and reindeer-raising enterprises for costs and losses resulting from radioactive fallout, SFS 1986:621]; the latest Ordinance on this matter was passed in 1994 [SFS 1994:246].

II. INSTITUTIONAL FRAMEWORK

Under the Swedish Constitution, ministers are responsible for making proposals on matters within their portfolios. However, decisions are made collectively by the whole government rather than by one minister.

Various national bodies exist with regulatory or supervisory responsibilities in the nuclear field. As a general rule these bodies enjoy considerable independence within the broad policy framework laid down by the government.

1. Regulatory and Supervisory Authorities

a) *Ministry of the Environment*

The Ministry of the Environment is responsible for drawing up and implementing legislation and state financing for nuclear safety and radiation protection as well as legislation on nuclear liability.

b) Ministry of Industry and Trade

The Ministry of Industry and Trade is responsible for energy policy in general, including nuclear energy policy.

c) Ministry of Justice

The Ministry of Justice is responsible for drawing up and implementing civil and criminal law.

d) Ministry of Foreign Affairs

The Ministry of Foreign Affairs is responsible for drawing up and implementing legislation concerning dual-use products.

e) Swedish Nuclear Power Inspectorate (SKI)

i) Legal Status

On 1 July 1974, the Swedish Atomic Energy Board was renamed the Swedish Nuclear Power Inspectorate (*Statens Kärnkraftinspektion* – SKI). Its functions are set out in the Ordinance on Instructions for the Swedish Nuclear Power Inspectorate [SFS 1988:523]. SKI comes under the authority of the Ministry of the Environment and is the “authority appointed by the government” under the Nuclear Activities Act to be the main regulatory body for the Swedish nuclear power industry.

ii) Responsibilities

SKI’s principal duties, conferred by the Nuclear Activities Act and secondary legislation enacted pursuant to it, are as follows:

- to follow developments in the field of nuclear energy, in particular regarding safety issues;
- to investigate issues and initiate measures to increase the level of safety of nuclear facilities;
- to follow developments with regard to methods for handling and final disposal of spent nuclear fuel and radioactive waste, and to the shutdown and decommissioning of nuclear facilities;
- to initiate research and development work on the safety of nuclear power plants and other nuclear installations, the safe transport of nuclear material and waste, and, finally, safe methods for handling and storage of spent nuclear fuel and nuclear waste. Also to initiate research and development on methods for the shutdown and decommissioning of reactor facilities, to the extent that no other authority has jurisdiction over such tasks, and otherwise to initiate any other research necessary for the Inspectorate to carry out its assignments;
- to actively contribute towards providing members of the general public with information about work carried out in the fields of nuclear safety and radioactive waste;

- to ensure control of nuclear materials pursuant to Sweden's international obligations or as otherwise required;
- to provide technical advice to authorities responsible for the protection of the public in the event of a nuclear accident in Sweden or elsewhere;
- to account for funds that SKI administers in accordance with the Act on the Financing of Future Expenditure on Spent Nuclear Fuel and the Ordinance of 1981 on the Financing of Future Expenditures on Spent Nuclear Fuel, etc;
- to recommend to the government on a yearly basis the amount of the fee which is to be paid by producers of nuclear power to the Inspectorate, and accumulated in a fund managed by SKI; and
- to issue regulations concerning safety aspects of nuclear activities, and these constitute SKI's own Code of Statutes (identified by the reference SKI FS).

iii) Structure

A board appointed by the government governs SKI, and the chairperson of the board is the Director-General of SKI. Among the members of the board are representatives from bodies such as the Swedish Radiation Protection Institute, Universities, the Supreme Court and representatives from the *Riksdag* (the Swedish parliament). The SKI is divided into several departments: Reactor Safety, Nuclear Materials Control, Nuclear Waste Safety, Research, Information Technology, Information, Administration and Personnel. In addition, SKI is supported by three Advisory Committees (Reactor Safety, Safeguards and Research).

iv) Financing

Funding for SKI's activities comes from statutory licensing fees under a special ordinance on fees, revised annually.

f) Swedish Radiation Protection Institute (SSI)

i) Legal Status

The Swedish Radiation Protection Institute (*Statens Strålskyddsinstitut* – SSI) is the central national authority under the responsibility of the Ministry of the Environment, appointed for the purposes of the Radiation Protection Act of 1988.

ii) Responsibilities

SSI is the principal authority responsible for protection against ionising and non-ionising radiation. Its functions are set out in the Ordinance on Instructions to the Swedish Radiation Protection Institute [SFS 1988:295]. SSI is involved in regulating and supervising aspects of both the inner and outer environments of nuclear power plants, the use of radioactive substances in industry, medicine and research, dental and veterinary X-ray diagnostics, and the use of non-ionising radiation (for example, in sun lamps and lasers).

SSI's functions also include:

- acting as the central co-ordinating body for radiation protection research, as well as conducting research in this field;
- taking account of international standards in the formulation of national radiation protection requirements; and
- disseminating information to the public on radiation hazards and radiation protection.

The Radiation Protection Act empowers the Institute to issue regulations on numerous aspects of radiation protection, and these constitute the Institute's own Code of Statutes (identified by the reference SSI FS).

iii) Structure

A board appointed by the government governs SSI, the chairperson of which is the Director-General of the Institute. The members of the board represent bodies such as the National Board of Health and Welfare, the National Environment Protection Board, the National Board of Occupational Health and Safety, the Swedish Nuclear Power Inspectorate and the *Riksdag* (the Swedish parliament).

The following three departments carry out most of the Institute's operations:

- Occupational and Medical Exposures;
- Waste Management and Environmental Protection;
- Emergency Preparedness and Environmental Assessment.

The Institute is supported by an Advisory Scientific Board. Its task is to decide upon grants for basic radiation protection research and to give advice on other scientific matters.

iv) Financing

A proportion of SSI's activities is funded by licence fees. The remainder of its funding is provided by the government.