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NUCLEAR ENERGY AGENCY
COMMITTEE ON NUCLEAR REGULATORY ACTIVITIES

NEA/CNRA/R(2001)8
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Working Group on Inspection Practices (WGIP)

STATUS REPORT ON REGULATORY INSPECTION PHILOSOPHY, INSPECTION ORGANISATION AND INSPECTION PRACTICES

November 2001

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ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

Pursuant to Article 1 of the Convention signed in Paris on 14th December 1960, and which came into force on 30th September 1961, the Organisation for Economic Co-operation and Development (OECD) shall promote policies designed:

- to achieve the highest sustainable economic growth and employment and a rising standard of living in Member countries, while maintaining financial stability, and thus to contribute to the development of the world economy;
- to contribute to sound economic expansion in Member as well as non-member countries in the process of economic development; and
- to contribute to the expansion of world trade on a multilateral, non-discriminatory basis in accordance with international obligations.

The original Member countries of the OECD are Austria, Belgium, Canada, Denmark, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, the United Kingdom and the United States. The following countries became Members subsequently through accession at the dates indicated hereafter: Japan (28th April 1964), Finland (28th January 1969), Australia (7th June 1971), New Zealand (29th May 1973), Mexico (18th May 1994), the Czech Republic (21st December 1995), Hungary (7th May 1996), Poland (22nd November 1996), Korea (12th December 1996) and the Slovak Republic (14 December 2000). The Commission of the European Communities takes part in the work of the OECD (Article 13 of the OECD Convention).

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 27 OECD Member countries: Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Luxembourg, Mexico, the Netherlands, Norway, Portugal, Republic of Korea, 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.

COMMITTEE ON NUCLEAR REGULATORY ACTIVITIES

The Committee on Nuclear Regulatory Activities (CNRA) of the OECD Nuclear Energy Agency (NEA) is an international committee made up primarily of senior nuclear regulators. It was set up in 1989 as a forum for the exchange of information and experience among regulatory organisations and for the review of developments which could affect regulatory requirements.

The Committee is responsible for the programme of the NEA, concerning the regulation, licensing and inspection of nuclear installations. The Committee reviews developments which could affect regulatory requirements with the objective of providing members with an understanding of the motivation for new regulatory requirements under consideration and an opportunity to offer suggestions that might improve them or avoid disparities among Member Countries. In particular, the Committee reviews current practices and operating experience.

The Committee focuses primarily on power reactors and other nuclear installations currently being built and operated. It also may consider the regulatory implications of new designs of power reactors and other types of nuclear installations.

In implementing its programme, CNRA establishes co-operative mechanisms with NEA's Committee on the Safety of Nuclear Installations (CSNI), responsible for co-ordinating the activities of the Agency concerning the technical aspects of design, construction and operation of nuclear installations insofar as they affect the safety of such installations. It also co-operates with NEA's Committee on Radiation Protection and Public Health (CRPPH) and NEA's Radioactive Waste Management Committee (RWMC) on matters of common interest.

CNRA WORKING GROUP ON INSPECTION PRACTICES

The CNRA believes that safety inspections are a major element in the regulatory authority's efforts to ensure the safe operation of nuclear facilities. Considering the importance of these issues, the Committee has established a special Working Group on Inspection Practices (WGIP). The purpose of WGIP, is to facilitate the exchange of information and experience related to regulatory safety inspections between CNRA Member countries

ABSTRACT

In 1995 the WGIP issued Status Report on Inspection Philosophy, Inspection Organisation and Inspection Practices, NEA/CNRA/R(94)3, OCDE/GD(95)3. Included was information on the regulatory bodies in 14 Member countries. Following publication of this report, WGIP members proposed that this work should be updated and extended at appropriate intervals to include information on both OECD Member countries and non-member countries regulatory inspection practices. The CNRA endorsed this approach and an updated version was issued in 1997. This new edition includes information on 29 countries (19 Member countries and 10 non-Member countries).

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INTRODUCTION

This report provides descriptions of the different regulatory inspection practices in OECD Member countries and non-Member countries. While the compilation is not complete, it provides insights into the framework of inspection philosophies, organisational aspects and practices utilised within these countries.

It is important to note that the information contained in this report represents current practices in these countries as of ***31st October 2001***. Since this information is subject to changes, due to re-organisations, advancements, etc., the reader should take these types of occurrences into account.

The overall concept of this document is to describe regulatory inspection practices in the various countries in a brief yet descriptive narrative, which could be compiled in a concise reference booklet for use by the international community.

Countries contributing to this document are as follows (OECD Members countries are identified by asterisk):

Argentina	Armenia	Australia *
Belarus	Belgium *	Canada *
China	Chinese Taipei	Czech Republic *
Finland *	France *	Germany *
Hungary *	Italy *	Japan *
Kazakhstan	Republic of Korea *	Mexico *
The Netherlands *	Pakistan	Russia
Slovak Republic	Slovenia	South Africa
Spain *	Sweden *	Switzerland *
United Kingdom *	United States *	

The authors would like to extend their appreciation to all those who contributed information and helped in producing this report.

CHAPTER 1 - REGULATORY AUTHORITY

This chapter defines the basic role of the regulatory body, its organisational set-up, and depicts how it relates to other governmental departments or ministries (Charts[1] attached in Annexes I and II). Additionally, a brief description is provided on the bases and statutory authority of the organisation, the extent of its jurisdiction over power and non-power installations and the relationships between itself and the licensees.

1.1 ARGENTINA

By means of its Decree # 1540/94, the Argentine Executive Power created the National Board of Nuclear Regulation (*ENREN)* as an autonomous agency and assigned it all the surveillance and regulation functions in the nuclear field that were previously in charge of the National Atomic Energy Commission *(CNEA).* In April 1997, the Congress approved the Nuclear Law where the National Regulations became the Nuclear Regulatory Authority (further on: ARN). It remains an independent organisation, entrusted with all regulatory functions previously assigned to the Board and maintaining a similar organisation structure. The work to be performed by the *ENREN* involves the establishment and application of a regulatory framework for any nuclear activities performed in Argentina, with the following objectives:

- Attaining and maintaining an appropriate level of protection to people against the harmful effects of ionising radiation (except in the surveillance of X-ray generating units, used in medicine, which are under the surveillance of the Ministry of Health and Social Welfare).
- Attaining and maintaining a reasonable degree of radiological and nuclear safety.
- Ensuring that nuclear activities are not performed for non-authorised goals and that they are developed in agreement with the non-proliferation agreements undersigned by Argentina.
- Preventing intentional actions that may lead to severe radiological consequences or to the withdrawal of non-authorised nuclear material or of other material or equipment of nuclear interest.

The *ARN* is led by a Board of Directors constituted by its President and 5 members who are appointed by the Executive Power. Their appointment is for a four-year period, although they may be re-elected indefinitely.

As a regulatory authority, the *ARN* is entrusted to issue authorisations, licenses or permits, accordingly, concerning practices involving the use of radiation sources. Additionally, it applies control and surveillance with regard to compliance with the standards and regulatory documents in force by those in charge of such practices[2]. Since the very beginning of regulatory activities in Argentina, consideration was given to the fact that efficiency in the performance of these tasks required the availability of sufficient scientific and technological knowledge and support, so as to judge —independently— the design, construction, operation and decommissioning of the installations under control

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1. Due to various circumstances (e.g., complexity, unavailability, etc.), it was not possible to obtain charts in Annex II for all contributing countries. Therefore, the reader is advised that information on missing charts should be requested from the referenced organisation

2. "Practice" is understood as any task involving radiation sources that may produce an actual or potential increase in the exposure of individuals to ionizing radiation, or in the number of people exposed.

Within this framework, the overall strategy of the Argentine regulatory system has been focused on the following basic issues:

- Formulation of standards with regard to radiological and nuclear safety, safeguards and physical protection.
- Scientific and technological development in topics associated with radiological and nuclear safety, safeguards and physical protection.
- Independent performance of studies and assessments concerning radiological and nuclear safety, safeguards and physical protection for the licensing process.
- Regulatory inspections and audits aimed at verifying compliance with the licenses, permits and authorisations issued.
- Personnel training in topics related to radiological and nuclear safety, safeguards and physical protection, addressed to those responsible for safety in practices submitted to control and to those performing regulatory activities.

The compliance with regulatory standards and requirements is the minimal condition and does not exempt those responsible from taking all the necessary actions in order to guarantee radiological and nuclear safety of the installation.

1.2 ARMENIA

The Armenian Nuclear Regulatory Authority (***ANRA***) was established as an independent governmental department on 16 November 1993 by decree of the Government of Armenia. The Decree # 573 covers the legal basis for conducting inspection and regulation activities. The ***ANRA*** provides regulation and supervision of all activities related to the use of nuclear energy.

The ***ANRA*** interfaces with the Ministry of Energy, Ministry of Health, Ministry of the Environment, Emergency Management Administration, Meteorological Administration and other State organisations, but their jurisdictions are separate and independent.

1.3 AUSTRALIA

Australia is a Federation of States and Territories. *Constitutional* responsibility for radiation protection and nuclear safety in each State and Territory rests with the respective State/Territory Government. The Federal or Commonwealth Government (as it is also known) has responsibility for radiation protection and nuclear safety matters falling within its Constitutional jurisdiction (which is administered by the Australian Radiation Protection and Nuclear Safety Agency).

The Australian Radiation Protection and Nuclear Safety Agency (*ARPANSA*) is a Commonwealth Government executive agency established on 5 February 1999 (under the *Australian Radiation Protection and Nuclear Safety Act* 1998 (the Act)). *ARPANSA* is part of the Commonwealth Government's Health and Aged Care Portfolio. The Chief Executive Officer of *ARPANSA* (CEO) reports to the Parliamentary Secretary to the Minister for Health and Aged Care, Senator Tambling.

ARPANSA was formed from the merger of the Nuclear Safety Bureau (responsible for monitoring and reviewing the safety of nuclear plant operated by the Australian Nuclear Science and Technology Organisation) and the Australian Radiation Laboratory (a Commonwealth agency undertaking research and providing advice/services in the fields of radiation protection, nuclear safety and medical exposure).

The object of the Act, is to protect the health and safety of people and the environment from the harmful effects of radiation (ionising and non-ionising). The Act provides a framework for regulating *Commonwealth entities* and *Commonwealth contractors dealing with controlled apparatus* and *controlled*

material and conduct in relation to *controlled facilities* (including nuclear plant previously monitored and reviewed by the Nuclear Safety Bureau). A copy of the Act can be found on the World Wide Web at the following address: **http://www.arpansa.gov.au/legframe.htm.** Aside from the title to the Act, each of the italicised phrases appearing above is a defined term in the Act.

One of the functions of the CEO under the Act is to administer this framework. The Act authorises the CEO to issue either a Commonwealth entity or a Commonwealth contractor a facility licence (for controlled facilities) or a source licence (for controlled apparatus or controlled material). The licence is issued subject to conditions set out in the Act and Regulations made under the Act as well as conditions set by the CEO. The Act authorises the CEO to appoint inspectors and provides those inspectors with powers to conduct inspection for compliance with licence conditions. A breach of the Act or a condition of licence may be referred by the CEO to the Director of Public Prosecutions for prosecution.

ARPANSA has 6 Branches: Regulatory Branch, Medical Radiation Branch, Non-Ionising Radiation Branch, Environmental and Radiation Health Branch, Standards and Policy Branch and Corporate Support Branch.

ARPANSA's Regulatory Branch consists of 3 Sections: Nuclear Installations Section, Facilities and Sources Section, and Policy and Coordination Section. The Branch:

- assesses applications for licences against accepted standards for radiation protection and nuclear safety (details of *ARPANSA*'s assessment process is available at: www.arpansa.gov.au/ass_info.htm);
- makes recommendations to the CEO on the issuing of licences;
- undertakes reviews, audits and inspections of licensed activities to confirm compliance with legislative requirements;
- investigates incidents; and
- takes any enforcement actions necessary to ensure compliance, safety of people and protection of the environment in accordance with the Act and directions from the CEO.

Where necessary and appropriate, the Regulatory Branch obtains advice on technical matters from other Branches within *ARPANSA* and external consultants.

A diagram of the organisational structure for *ARPANSA* and its Regulatory Branch is available at www.arpansa.gov.au/org.htm#es.

1.4 BELARUS

Before 1991 the USSR Gosatomnadzor exercised state supervision of nuclear safety in BSSR as well as in other soviet republics. In 1991 by the decision of the Cabinet of Ministers Belarus' Gostechnadzor was transformed into Gospromatomnadzor, i.e. State Committee on Supervision of Industrial and Nuclear Safety. An Interregional Inspectorate on Nuclear and Radiation Safety was established.

In 1995 through the decision of the Government Gospromatomnadzor was incorporated into the Ministry of Emergencies as Promatomnadzor. The same year Department of Nuclear and Radiation Safety Regulation was set up in Promatomnadzor.

In 1997 Promatomnadzor was transformed into the Committee for Supervision of Industrial and Nuclear Safety under the Ministry of Emergencies of the Republic of Belarus (Promatomnadzor).

Promatomnadzor exercises its functions in the field of nuclear and radiation safety in accordance with 2 major regulations:

- On State Control over Industrial and Nuclear Safety in the Republic of Belarus (approved by the Decree of the Cabinet of Ministers of 13 October 1995 No. 572 which was revised in 1999 and 2000) and
- On the Committee for Supervision of Industrial and Nuclear Safety under the Ministry for Emergencies of the Republic of Belarus (Promatomnadzor) (approved by the Decree of the Council of Ministers of 10 June 1997 No. 675 which was revised in 1999 and 2000).

For the organisational set-up and relations with other governmental bodies see Charts attached in Annexes I and II.

1.5 BELGIUM

1.5.1 National Organisation

The Belgium Authority responsible for the safety of nuclear installations is the Minister for Internal Affairs. He licenses non-profit organisations, the so-called "Licensed Inspection Organisations" (LIO), to inspect and assess the nuclear installations.

A "Federal Agency for Nuclear Control" (*FANC*) has been created to take over all the control activities. The *FANC* may licence LIOs and delegate some of its mission to them. To date, the *FANC* is operational from 11th September 2001.

Association Vinçotte Nuclear ***(AVN)*** is the only Licensed Inspection Organisation (LIO) responsible for inspection and safety assessment of the nuclear power plants: it is also in charge of most of the fuel cycle facilities, research institutes, universities, medical and industrial facilities as well as other smaller installations.

Other smaller LIO's are presently responsible for inspection of other nuclear facilities.

1.5.2 Basic Principles

Responsibility for safety according to the license is the responsibility of the Utilities, which must prove safety of any modification.

1.5.3 AVN *Organisation*

AVN is organised vertically in four Divisions (see appendix I) reporting to the GMT (General Management Team) composed of a Director General and one Director. Each Division is placed under the responsibility of a Division Head, who is seconded in his tasks by an assistant (with a temporary mandate) and by co-ordinators covering each a specific domain. These four Divisions are:

- The NII (Nuclear Installations Inspections) Division covers (1) the inspections in all installations for which ***AVN*** is Authorised Agency, (2) the Health Physics in some class 2 and 3 installations, (3) the emergency planning.

- The PEM (Projects & Experience Management) Division covers (1) the co-ordination of the national and international operational projects, (2) the operational support, (3) the national and international operating experience feedback, (4) the definition of basic safety rules and referential.
- The SRD (Studies, Research & Development) Division covers (1) the special safety analysis projects (generic studies, PSA, severe accidents, future reactors, waste repositories, …), (2) the management of the R&D programme.
- The HRS (Human Resources & Support) Division covers (1) the human resources management, (2) the communication, (3) the information technology, (4) the accounting and finance, (5) the logistic support.

The GMT and the four Division Heads constitute the SC (Steering Committee), with a function to co-ordinate the different activities.

AVN also has a horizontal structure with several Technical Responsibility Centres (TRC), which are teams of specialists working together in a given competence domain.

Missions of ***AVN*** in connection with Nuclear installations include:

- Assessment of new nuclear installations or of modifications in operating ones, issue an evaluation report to the special commission for ionising radiation's, propose a project of license decree.
- Conformity checks for new nuclear installations or modifications in operating nuclear installations.
- Inspections during operation of existing nuclear installations.
- Periodic safety re-assessments of nuclear installations (10-year basis).
- Advisory role in the evaluation cell in the National Crisis Centre, in case of Emergency Plan.
- Assessment of operating experience and feedback in nuclear installations.
- Evaluation and applicability in Belgium of nuclear safety rules and regulations.
- INES, IRS, IRSRR, FINAS contact for Belgium.
- Establishment of Research and Development activities.
- Contact with similar foreign organisations.

1.6 CANADA

Operators of NPPs and those who use or possess nuclear materials must comply with the new Nuclear Safety and Control Act (NSC Act) and all regulations made pursuant to it. The mission of the Canadian Nuclear Safety Commission (*CNSC*), the regulatory body established under the Act, is to ensure that the use of nuclear energy in Canada does not pose undue risk to health, safety, security and the environment. The *CNSC's* licensing system is administered with the co-operation of federal and provincial departments in such areas as health, environment, transport and labour. The concerns and responsibilities of these departments are taken into account before licenses are issued by the *CNSC*, providing there is no conflict with Nuclear Safety and Control Act and its regulations.

The new Nuclear Safety and Control Act, which became effective on 1 June 2000, establishes a seven-member Board that functions as a quasi-judicial decision-making body. It makes licensing decisions for major nuclear facilities and sets policy direction on matters relating to health, safety, security and environmental issues affecting the Canadian nuclear industry.

The *CNSC* staff organisation comprises the President's Office, the Secretariat, the Directorate of Reactor Regulation, the Directorate of Fuel Cycle and Materials Regulation, the Directorate of Environmental and Human Performance Assessment, and the Directorate of Corporate Services. The staff implements the policies of the Board and makes recommendations to the Board concerning the issuing of licenses, and other regulatory matters.

There is a *CNSC* office at every NPP, where staff monitor the plants on a day-to-day basis. Specialists from corporate headquarters work with the on-site staff in assessing every plant's performance against legal requirements, including the conditions of operating licenses. To do this, staff review all aspects of a plant's operation and management, and inspect each plant.

1.7 PEOPLES REPUBLIC OF CHINA

The National Nuclear Safety Administration *(NNSA)* was established in 1984 authorised by the State Council. It is an independent Regulatory Authority. The nuclear installations are regulated on the bases of Regulations on the Safety Supervision and Control for Civilian Nuclear Installations of the People's Republic of China (1986) as well as other regulations and codes in the fields of nuclear safety.

Detailed functions and duties of *NNSA* are:

- To establish principles and policies of nuclear safety; to prepare and promulgate nuclear safety regulations and their detailed rules of implementation; to issue nuclear safety codes and guides; to review and endorse national technical standards related to nuclear safety.
- To organise, review and assess safety performance of nuclear installations and the capabilities of operating organisations in ensuring safety; to issue or revoke nuclear safety licenses; to carry out nuclear safety surveillance; to review and supervise on-site emergency plan and preparedness; to investigate and deal with nuclear accidents; to conduct mediation and settlement of disputes relating to nuclear safety.
- To be responsible for the supervision and control as well as the granting and issuing of licenses on nuclear pressure-retaining component activities.
- To review the possession, utilisation, production, storage, transportation, treatment and disposal of nuclear materials, to approve issuance of nuclear material licenses; to inspect and enforce nuclear material control.
- To organise review and assessment, issue and manage licenses of civilian nuclear material transportation and its containers.
- To provide technical assistance in nuclear emergency management, to assess nuclear incidents or accidents and their radiological consequences, and to compile and evaluate the monitoring data of radiation, hygiene, environment, etc.
- To organise nuclear safety research and development programmes necessary for its regulatory functions and for nuclear safety in general.
- To carry out international co-operation in the area of nuclear safety, and to promote and implement nuclear safety agreements with foreign countries and international organisations.
- To deal with information dissemination, public education and training in the area of nuclear safety.
- To perform other tasks assigned by the State Council.

1.8 CHINESE TAIPEI

The Atomic Energy Council (*AEC*) was founded in 1955 at the ministerial level under the Executive Yuan. Principal mission in the past has been in the management of international affairs concerning atomic energy and the promotion on the peaceful applications of the atomic energy. In recent years, the *AEC*'s most important task has been shifted to safety regulation, radiation protection, radwaste administration, and R&D for technical developments and civilian nuclear applications.

The *AEC* consists of commissioners, mostly representatives of relevant agencies or ministries within the Executive Yuan. Both the *AEC* and the EPA monitor the soundness of the nuclear facility environment to prevent any sort of pollution. The Chairman presides over the Council with the assistance of two Vice

Chairmen and one Secretary General to overview the Council affairs. Directly under their supervision include five departments, three offices, three affiliated agencies and six advisory committees. The five departments, and three offices directly under the Council's administration include technical units of Department of Planning, Department of Nuclear Regulation, Department of Radiation Protection and Department of Nuclear Technology and administrative units of Department of General Administration, Office of Accounting, Office of Security and Office of Personnel.

The three affiliated agencies are the Institute of Nuclear Energy Research, the Radiation Monitoring Centre and the Fuel Cycle and Materials Administration.

The six advisory committees are Advisory Committee on Nuclear Safety, the Committee on Ionising Radiation Safety, the Committee on Environmental Protection of the Fourth Nuclear Power Station, the Committee on Nuclear Accident Investigation and Evaluation, the Committee on Qualification of Medical Radiological Personnel, and the Committee on Nuclear Legislation.

Aiming at developing more diversified civilian nuclear applications and securing nuclear safety., the *AEC* establishes the following objectives:

- Strengthening overall planning to promote integrated developments.
- Strengthening nuclear safety to protect public health.
- Co-ordinating with national energy policy to achieve a proper ratio of nuclear power supply.
- Supporting the nuclear industry to enhance its capabilities.
- Securely managing radwastes in accordance with the delineated areas of responsibilities.
- Implementing emergency preparedness planning and stamping out nuclear accidents.
- Stimulating research and development efforts in supporting regulatory function.
- Promoting research and development activities and honouring international responsibilities.
- Planning for the development of human resources and appropriating manpower effectively.
- Promoting atomic energy education and establishing public consensus.

1.9 CZECH REPUBLIC

The Czech Republic's National Regulatory Authority in nuclear safety and radiation protection field is the State Office for Nuclear Safety *(SÚJB).* It was established as of 1 January 1993 by Act No. 21/1992 Coll. *SÚJB* is a central body of the Czech Republic's state administration with an independent budget. It is headed by its Chairman appointed by the Czech Government. The Chairman acts simultaneously as the Nuclear Safety Inspector General.

SÚJB performs the state administration and supervision of the utilisation of nuclear energy and ionising radiation and supervision of radiation protection. Competencies of SÚJB are defined by Act No. 18/1997 Coll., on peaceful utilisation of nuclear energy and ionising radiation (the Atomic Act), and include particularly:

- execution of state supervision of nuclear safety, nuclear items, physical protection of nuclear installations, radiation protection and emergency preparedness in nuclear installation premises or at workplaces using ionising radiation sources;
- licensing of activities under the Act No. 18/1997 Coll., e.g. siting and operation of nuclear installations and workplaces with very significant sources of ionising radiation and radioactive wastes, transport of nuclear materials and radionuclide sources;
- approving of documents relating to the assurance of nuclear safety and radiation protection, as established by the Atomic Act, limits and conditions for operation of nuclear installations, methods of physical protection, emergency codes for transport of nuclear materials and selected

radionuclide sources, internal emergency plans for nuclear installations and workplaces with ionising radiation sources;
- establishing of conditions and requirements for radiation protection of population and exposed workers (e.g. establishing of exposure limits, definition of controlled zones), establishing of emergency planning zones and requirements for emergency preparedness of licensees under the Atomic Act;
- monitoring of population and occupational exposure levels;
- co-ordination of activities performed by the National Radiation Monitoring Network on the Czech Republic's territory and provision of international exchange of radiation protection data;
- keeping a national system of registration and control of nuclear materials, national registration system of licensees, imported and exported selected items, ionising radiation sources, records on population exposure and occupational exposure;
- professional co-operation with the International Atomic Energy Agency;
- provision of data to municipalities and district offices about radioactive waste management on their respective territories and provision of adequate information to general public and CR Government about activities performed by the Office;
- provision of data from measurements and evaluation of the impact of nuclear, chemical and biological substances on human health and on the environment, including evaluation of the level of protection with individual and collective protective means against such substances;
- co-ordination and provision of activities to fulfil tasks resulting from the treaty about the ban on development, production, accumulation of supplies and use of chemical weapons and about their destruction under Act No. 19/1997 Coll.

To reflect its focus and performed activities the organisational structure of SÚJB was changed in 2000.

- **Section of Nuclear Safety** includes a department of nuclear installations assessment, a department of nuclear installation inspections and a department of nuclear materials.
- **Section of Radiation Protection** includes a department of sources and nuclear power engineering, a department of exposure regulation, a department for the environment and radioactive wastes and a separate licensing department.
- **Section of Management and Technical Support** includes a department of international co-operation, an economic department and the Office bureau. The division also includes the office monitoring the ban of chemical weapons.
- Directly to the Office Chairwoman report a **department of emergency preparedness**, which also provides for the function of Emergency Response Center and coordinates the Radiation Monitoring Network, a **QA department** and a **department of defence and auditing.**
- SÚJB includes **Regional Centers** (RC) situated in Praha, Plzen, •eské Bud•jovice, Ústí nad Labem, Hradec Králové, Brno and Ostrava, plus two local workplaces at NPP Dukovany and NPP Temelín.
- SÚJB controls one budgetary organisation - **State Institute for Radiation Protection (SÚRO)** based in Prague and one allowance organisation – **State Institute for Nuclear, Chemical and Biological Protection** (**SÚJCHBO)** based in P•íbram – Kamenná.

1.10 FINLAND

The overall authority in the field of nuclear energy in Finland is the responsibility of the Ministry of Trade and Industry according to the Nuclear Energy Act. The Ministry prepares matters concerning nuclear energy to the Council of State for decision-making and, to some extent, grants import and export licenses for nuclear equipment and materials. Among other duties, the Ministry of Trade and Industry is responsible for the formulation of a national energy policy. License applications for nuclear facilities are handled by the Ministry of Trade and Industry.

STUK - Radiation and Nuclear Safety Authority is a governmental organisation working administratively under the Ministry of Social Affairs and Health. However, *STUK* has also many connections with other ministries, such as the Ministry of Trade and Industry, Ministry of the Interior and Ministry for Foreign Affairs. Connections to ministries and governmental organisations are described in Chart 1 in Annex II. The establishment of *STUK* is based on the legislation (Act 1069/1983 and Decree 618/1997). *STUK* acts as the regulatory body for nuclear power plants in Finland.

According to the Decree *STUK* has the following duties:

- regulatory control of safety of the use of nuclear energy, emergency preparedness, physical security and nuclear materials
- regulatory control of the use of radiation and other radiation practices
- monitoring of the radiation situation in Finland, and maintaining of preparedness for abnormal radiation situations
- maintaining of national meteorological standards in the field
- research and development work for enhancing radiation and nuclear safety
- informing on radiation and nuclear safety issues, and participating in training activities in the field
- producing expert services in the field
- making proposals for developing the legislation in the field, and issuing general guides concerning radiation and nuclear safety
- participating in international co-operation in the field, and taking care of international control, contact or reporting activities as enacted or defined.

The role, authority and responsibilities of *STUK* are defined in the Nuclear Energy and Radiation Protection Acts. Based on the legislation, *STUK* is independent in its decision-making process. In practice, *STUK*'s decisions on safety issues have never been challenged by any Ministry or other authority.

The responsibilities and rights of *STUK*, as regards the regulation of the use of nuclear energy, are provided in the Nuclear Energy Act. They cover the safety review and assessment of license applications, and the regulatory control of the construction and operation of a nuclear facility. Based on the Nuclear Energy Act, *STUK* has comprehensive regulatory control rights (e.g. access to documents and plants, right to make measurements and to take samples). *STUK* has the authority to enforce regulations, if necessary, with conditional imposition of a fine. Nuclear crimes are dealt with by the public prosecutor. Sanctions include fines and imprisonment up to 10 years. A legal mechanism exists in Finland for appeal of decisions made by public authorities. In practise, fines are not used and no appeals have been made against *STUK* in the field of nuclear energy.

STUK maintains jurisdiction over nuclear safety, radiation protection, pressure vessel, and nuclear material and safeguards. Nuclear Energy and Radiation Protection Acts and Decrees define the regulatory framework in Finland. General safety requirements are given by Decisions by the State Council (i.e., Cabinet of Ministers).

STUK gives detailed technical and administrative instructions relative to the design, construction, commissioning and operation of nuclear power plants in "YVL" Guides. These include; general guides, systems, pressure vessels, buildings, other structures and components, nuclear materials radiation protection and radioactive waste. In addition to the YVL Guides, *STUK* has internal guides (YTV Guides) which define inspection related practices. Organisational chart is presented in Charts 2 and 3 in Annex I.

1.11 FRANCE

Up to now, nuclear installations are regulated by the Decree of December 11, 1963, amended by three more recent decrees. In particular, its Article 11 defines the role of inspectors.

The regulatory agency, called "Nuclear Safety Authority" in France, comprises the "Nuclear Safety Directorate" (*DSIN*) together with regional offices, which are Nuclear Departments located in the "Regional Directorates of Industry, Research and the Environment" (*DRIRE*s).

It should be added that, within the *DSIN*, there is a specific department, the NSSS control office (BCCN), responsible for matters concerning the safety of PWR main primary and secondary systems, in relation with pressure vessel regulation.

Within the Ministry of Industry, the Nuclear Installation Safety Directorate (*DSIN*) main assignments are as follows:

- drafting the general technical regulations and monitoring their application,
- implementing licensing procedures for nuclear installations (authorisation decree, start-up commissioning license, effluent release license),
- organising and implementing supervision of these plants by inspectors,
- supervising the transportation of radioactive and fissile materials for civil use (since 1997),
- preparing the setting up of an emergency response plan, to be implemented in the event of an incident or accident having occurred in a nuclear installation,
- providing the general public and the media with information on nuclear safety problems,
- contributing to the activities of international organisations and promoting bilateral relations with Safety Authorities in other countries.

The *DSIN* also regulates nuclear safety research and development work undertaken by organisations depending on the Ministry of Industry, mainly the IPSN, the CEA and EdF.

At the regional level, the Nuclear Departments of the *DRIRE*s supervise all nuclear activities related to safety, as well as other regulations:

- inspections,
- supervision of PWR shutdowns,
- processing of waiver requests,
- processing of events reported by the licensees on the INES scale,
- regulations of registered installations on environmental protection grounds,
- pressure vessel supervision,
- environmental monitoring (effluent release, waste management),
- relations with local authorities,
- emergency preparedness.

Most of this regional work is carried out by commissioned non resident inspectors, who, like the *DSIN*, get a strong technical support and expertise from the IPSN.

Besides, the *DRIRE* inspectors get specific assistance from consultant agencies like the APAVE, for pressure vessel regulation.

Finally, it should be added that the Office for Protection Against Ionising Radiation (OPRI), reporting to both the Ministry of Health and the Ministry of Labour, supervises radiological releases in the environment, and can bring expertise in the field of radioprotection in general.

1.12 GERMANY

As indicated by its name, the Federal Republic of Germany has a federal structure. The Federal Constitution therefore contains detailed provisions on the legislative and administrative competencies of the Federation (*Bund*) and the individual States (*Länder*).

Pursuant to the *Federal Act of 1959 on the Peaceful Uses of Atomic Energy and Protection Against its Hazards* (Atomic Energy Act), supreme authorities of the *Länder*, designated by their governments, are competent for the granting, withdrawal and revocation of licences for nuclear installations as well as for their regulatory control (supervision).

According to the Atomic Energy Act, any construction, operation and possession of a nuclear installation requires a license and is subject to continuous regulatory supervision. In general, independent experts or expert organisations, namely the Technical Inspection Agencies (TÜV) are contracted to support the *Länder* authorities by technical expertise. Inspection and control functions may be delegated to subordinate *Länder* agencies in certain cases.

The *Länder* authorities are supervised by and subject to the directives of the Federation (*Bund*), who issues ordinances and general administrative regulations. The federal control and supervision relate to the legality and expediency of the actions of the *Länder*. The competent supreme federal authority is the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU).

In addition, import, export, other professional handling and transportation of radioactive material, as well as construction and operation of final repositories for radioactive waste are subject to governmental licensing and supervision.

The Government of the Federal Republic of Germany wants to terminate the use of nuclear energy for electricity production and has created a framework for a gradual phase-out of in consensus with the industry. In June 2000, the Government and the leading producers of electricity agreed on the cornerstones of the phase-out program.

Basically, the operation time of NPPs is limited to 32 years. However, not the time of operation time per se will be limited, but the remaining amount of electricity to be produced. The total amount permitted after January 1, 2000 is 2623 Tera Watt hours. In case of early closure of older NPPs, their share may be credited to more modern ones. The Government assures during the remaining lifetime of the NPPs that operation and waste management will be free of governmental interference under the provisions that a high level of safety is maintained and the regulatory requirements are fulfilled. The operation of the disputed NPP Mülheim-Kärlich will not be resumed. In order to avoid transports of spent fuel, the utilities will establish as soon as possible interim storage facilities at the NPP sites or in their vicinity. Starting from July 2005, the removal of spent fuel from the NPPs will be restricted to direct disposal . Until then, transports to reprocessing facilities are permitted. The Government will amend the Atomic Energy Act corresponding to the agreement. Government and utilities understand that there will be no compensation claims.

1.13 HUNGARY

The first legal regulations on radioactive materials and radiotherapy were issued in 1964, followed by legal standards arising from international contracts and regulating the definition of other record keeping duties in the early 70's. State level legal control over nuclear equipment was established in 1978. This decree of the council of ministers *(CM)* listed the tasks related to the establishment of the Paks Nuclear Power Station as well as the scopes of authorities of portfolios resulting from the above tasks. Then, based on the CM decree (No. 10/1978.MT), a ministerial decree was issued (No 5/1979.) regarding safety issues of the nuclear

power plants, regulating licensing processes, supervision, safety engineering requirements and last, but not least named the state regulatory body in these issues. At that time this role was performed by a section and later a division of the State Energetic and Energy Safety Technology Supervisory Board *(SEESTSB).* Detailed technical requirements have to date been listed in regulations comprising the appendices of this decree.

At nearly the same time, safety regulations and authority process regulations were issued for other nuclear installations (training and research reactor, critical system), however, these appeared only as at the level of ministerial instructions. A more and more urgent need had developed for a comprehensive law regarding the peaceful use of nuclear energy, and this void still prevailing in the late 70's was to be filled by the law No. I in 1980 regarding nuclear energy. This law as well as the CM decree No. 12/1980 on its implementation did not change the established scopes of authorities, but defined several new authorities and responsibilities to be regulated at the ministerial level, and these formed the basis for numerous ministerial decrees issued later.

It is a justified, evident requirement that regulatory control must be performed by an administrative body endowed with appropriate professional skills and authority, independent of those possessing owner's rights. This principle was only partly applied in the case of the nuclear establishment, since the SEESTSB was subjected to the same member of the cabinet responsible for the industry (minister of heavy industry, then minister of industry and later minister of industry and trade) as the superior body of the Paks Nuclear Power Plant Company, the Hungarian Electricity Board. Theoretically, the situation was the same in the case of all the other nuclear institutions.

Significant changes were only introduced with the gradual development of the framework of constitutionality, having come into force on 1 January 1991. Based on government decree No. 104/1990., the Hungarian Atomic Energy Commission's *(HAEC)* scope of tasks and authority were redefined and a new national administrative body, the Hungarian Nuclear Energy Authority *(HAEA)* was established to operate under the leadership of the President of *HAE*C.

After the years of experience, and in the context of the negotiations Hungary started negotiations with the EU about the membership, significant changes had been decided in a renewed legislation system in 1996. New act on Atomic Energy was proclaimed in December (No. CXVI/1996), coming to force in January 1997. New features appeared in the new Act:

- increased role and responsibility of *HAEA*,
- H*AEC*'s regulatory role (licensing of nuclear facility) was transferred to Hungarian Atomic Energy Authority (*HAEA*).
- financial penalty/fine for violation of safety rules and requirements was introduced
- Central Nuclear Fund was established to cover costs of interim and final disposal of radwastes and of decommissioning nuclear facilities
- New declaration came to force about necessity for regulatory independence, openness, human recourses and education, R&D activities
- New directives were included for emergency planning and preparedness

In accordance with the new Act on Atomic Energy, new government decrees were issued in 1997 (No. 87/1997 and 108/1997) ordering statute, rights and responsibilities of *HAEA.*

The governmental decrees defined regulatory tasks of all governmental bodies, including *HAEC*'s president. This position is designated to one of the members of the cabinet, presently to (the Minister of Economy), who the Minister of Economy, who is the supervisor of *HAEA.* That means his personal leadership, and not the leadership of the ministry. The president reports annually to Parliament on safety matters.

In the new regulatory system the regulatory role of *HAEA* could be described as follows. The regulatory responsibilities rest on the Nuclear Safety Directorate (NSD) of *HAEA*. NSD is the regulatory body in the first instance, while *HAEA* Director General is judging on appeals, as second instance level of authority.

Nuclear Safety Regulations were issued as appendixes of governmental decree 108/1997:

- Vol. 1. Regulatory Procedures of NPPs
- Vol. 2. Quality Assurance
- Vol. 3. Design Requirements of NPPs
- Vol. 4. Operation Requirements of NPPs
- Vol. 5. Regulation of Training & Research Reactors.

Up to now (November 2000) nearly 60 guidelines were issued by Director General of *HAEA* to support the licensees and their contracted companies, and the regulatory body staff to meet the safety requirements.

In the new system *HAEA* NSD has the duties and rights in licensing and inspection of nuclear facilities, and civil structures related to nuclear facilities, licensing and inspection of equipment and structures (nuclear safety and technical radiation protection aspects), and inspection of operational QA.

In the procedures of another state authorities NSD is co-authority in physical protection, emergency preparedness, and fire protection.

1.14 ITALY

1.14.1 Acts

In Italy the regulatory regime for nuclear activities is largely based on two acts:

The first is the Act no. 1860 of 31 December 1962 on the Peaceful Uses of Nuclear Energy;

The Act introduced a general regime based on a series of administrative and procedural requirements including notifications and licences. Amendments were subsequently made to the law under which small quantities of special fissile materials, raw materials and other radioactive materials laid down by Ministerial Decree were no longer subject to such formalities (Act no. 1008 of 19/12/1969 and Ministerial Decree of 15/12/1970).

The second basic text is Legislative Decree no. 230 of 17/12/1995, replacing the Decree of the President of the Republic no. 185 of 1964. The new Decree, which came into force on 1 January 1996, provides for the transportation of six Euratom Directives concerned with radiation protection. Moreover, it enacts supplementary provisions due to the experience made in the application of the safety of nuclear installations, such as decommissioning and the protection of the workers and the general public against the hazards of ionising radiation.

1.14.2 Regulatory Authority

A substantial change came in 1994 when Act no.61 set up *ANPA* , the Italian National Agency for the Protection of the Environment that inherited the duties, responsibilities and personnel of the former Central

Directorate for Nuclear Safety and Radiation Protection. This Directorate was responsible of licensing and inspections as regards nuclear and radiation protection aspects.

The *ANPA* represents now the major part of the regulatory body system governing, besides the environment, the field of nuclear safety and radiation protection.

The main tasks of *ANPA* to fulfil the obligations of the Legislative Decree no. 230/1995 are:

- controls and surveillance on existing nuclear installations,
- licensing of new nuclear installations,
- radioprotection of workers, public, environment.

1.15 JAPAN

Administrative organisation in Japan was largely reformed by the major overhaul of the government in January 6, 2001. Under the new organisation, the Minister of Economy, Trade and Industry (*METI*) is, as a competent minister, in charge of the regulation for the utilisation of nuclear power as an energy, including nuclear power generation, milling and manufacturing of nuclear materials, reprocessing of spent fuels and waste management, and the Agency for Nuclear and Industrial Safety (ANIS) was established as an implementation organisation.

On the other hand, the Minister of Education, Culture, Sports, Science and Technology (*MEXT*) is, as a competent minister, in charge of the regulation for the research and development of nuclear energy, including research reactors, use of nuclear fuel, radiation hazard protection, and environmental monitoring, and the regulation is done by the Science and Technology Policy Bureau (STPB) of *MEXT*, as an implementation organisation.

Meantime, the effective separation between the regulatory body and the promotive body had been legally guaranteed by distinguishing sections with missions of utilisation of nuclear power or its promotion and with missions of safety regulation, which were independent each other. Under the new system, the effective separation is guaranteed more clearly in practical and legal means; the mission of promotion is assigned to the Agency for Natural Resources and Energy and the Research and Development Bureau of *MEXT*, while the mission of safety regulation to the ANIS of *METI* and the STPB of *MEXT*.

A double check system is employ in the safety regulation in Japan, where the ANIS of *METI* or the STPB of *MEXT* undertakes primary examination for the licensing of nuclear facilities or changes of the license, and then Atomic Energy Commission (*AEC*) and Nuclear Safety Commission (NSC) secondarily reviews the examination results.

The *AEC* and the NSC, which had been set up within the Prime minister's Office, was set up in the Cabinet Office in the reform and the number of their staffs was increased. The *AEC* plans, examines and determines the matters concerning utilisation of nuclear power, while the NSC plans, examines and determines the matters concerning securing safety.

1.16 KAZAKHSTAN

The Kazakhstan Atomic Energy Agency (*KAEA*) has been established by Presidential Decree in 1992 as a separate legal entity with responsibility for implementing national policy and regulating all activities in the nuclear field. Since 1996 year Agency had been renamed to Atomic Energy Committee of the Republic of Kazakhstan (*KAEC*) and since 1999 it is working under the aegis of Ministry of Energy and Mineral Resources with the same function power and responsibility.

According to the last provision adopted by Governmental Degree of 23 September 2000, K*AEC* is responsible for:

- Realisation of State Policy in the field of safe use of atomic energy.
- State control of nuclear, radioactive and special non-nuclear materials, dual-use materials and goods. Providing regime of Non Proliferation Nuclear Weapons, nuclear and radiation Safety during the use of atomic energy.
- Export and import control of nuclear materials, technologies, equipment, special non-nuclear materials, dual-use materials and goods, radioactive sources and isotope goods.
- Preparation of annual reports connected with safety status of entities using atomic energy to the Government.
- Development of acts, regulations, standards, rules in the field of atomic energy use.
- Licensing of all types of activities in the field of atomic energy use.
- Consideration and approval of safety related documents of nuclear installation during all stages of their life cycle.
- State account and control of nuclear materials and supervision for providing the physical protection during their storage, transport and use.
- Providing and Co-ordination of co-operation of KAZAKHSTAN Institutions with IAEA and other International organisations in the field of atomic energy use.
- Emergency preparedness.
- Co-ordination and organisation of research and scientific activity in the country and participation in the international co-operation in the field of atomic energy use.
- Preparation of proposals for upgrading and improvement of legislation of the Republic of KAZAKHSTAN in the field of atomic energy use.

Other functions:

KAEC shares responsibility with several ministries for activities in the field of nuclear energy use.

The Agency on Health Affairs of the Republic of Kazakhstan which is responsible for providing of medical services necessary for the radiation protection of the public and employees. Agency also is providing control works the radioactive sources and gives the sanction to work with any radioactive sources, renders the medical help to personal, which works with nuclear materials.

The Ministry of Natural Resources and Environmental Protection is responsible for protection of the environment against radioactive contamination. It co-ordinates the work on study of a radiation situation in Kazakhstan and executes the State ecological examination of the projects (EIA – Environmental Impact Assessment).

The Ministry of Internal Affairs verifies the fire safety and physical protection standards of all facilities which use nuclear energy or in which radioactive waste is managed, and ensures compliance with regulations on transport of nuclear materials and radioactive substances.

The Agency on Emergency Situations is responsible for monitoring compliance with measures on prevention of emergency situations and provides measures to protect the public against radiation exposure in the event of such situation.

All those State Bodies are the first level of the system of regulation.

1.17 REPUBLIC OF KOREA

The main legislation governing the safety of nuclear installation is the Atomic Energy Act which provides the legal foundation for nuclear activities. Regulation and licensing of nuclear facilities in Korea are based on the provisions of the Atomic Energy Act, Enforcement Decree and Enforcement Regulation, Notice of the Minister of Science & Technology and Technical Specifications which are part of safety analysis reports.

The Korea Institute of Nuclear Safety *(KINS)* was established in February 1990 through special legislation by the National Assembly. The *KINS* is a technical expert group established to support the Ministry of Science and Technology *(MOST)* with technical expertise in effectively performing nuclear regulatory functions. Entrusted by the government, *MOST*, in accordance with the Atomic Energy Act, *KINS* is responsible for:

- Safety review and evaluation to assure the safety of nuclear installations.
- Safety inspection for nuclear installations.
- Technical standards development.
- Radiation protection, RIs and radiation generators regulation.
- Development of regulatory policy and enforcement of nuclear safety laws and regulations.
- Research & development in the area of unresolved safety issues identified through safety review and inspection of nuclear facilities in various stages.

1.18 MEXICO

The National Commission of Nuclear Safety and Safeguards, Comisión Nacional de Seguridad Nuclear y Salvaguardias, *CNSNS*, was created under the Nuclear Reglamentary Law of Article 27 of the Republic's constitution, on 26 January 1979. This law gives the broad authority to regulate all nuclear installations and all users of radioactive material. The regulatory body authority derives from the Secretary of Energy, and directly from the Undersecretariat for Energy. The *CNSNS* is also authority in matters like safeguards and physical security for the nuclear installations.

The *CNSNS* has the authority given by law, to declare the closure of for safety reasons of nuclear and radioactive installations if necessary, and to grant licenses to the operational staff facilities

1.19 THE NETHERLANDS

The legal basis for supervision of nuclear installations is the Nuclear Energy Act of 1963, including its later added decrees. All nuclear installations are subject to supervision of competent authorities. Inspectors, designated by these authorities, have free access to the installation and can require, if necessary, all information.

The following competent authorities are involved in the implementation of this act:

- Ministry of Housing, Spatial Planning and the Environment (*VROM*) regarding nuclear safety in general, environmental protection and emergency preparedness and planning.
- Ministry of Social Affairs and Employment regarding to the policy of radiation protection of workers.
- Ministry of Economic Affairs (EZ) regarding physical security,

The tasks of the Nuclear Safety Department (*KFD*) within the Ministry of *VROM* is:

- preparation of technical nuclear safety rulemaking,
- to assess and to inspect nuclear safety (including integrity of pressure vessels and piping),

- assessment and inspection of on-site radiation protection and
- to give technical advise to several authorities at emergency situations.

1.20 PAKISTAN

In Pakistan, the day-to-day regulatory matters pertaining to nuclear aspects are looked after by the Pakistan Nuclear Regulatory Authority (*PNRA*) which was established by Ordinance III of 2001. The former Directorate of Nuclear Safety and Radiation Protection *(DNSRP)* was created under Pakistan Nuclear Safety and Radiation Protection Ordinance which was repealed by the new ordinance.

The main national laws and regulations are as follows :

- Pakistan Nuclear Safety and Radiation Protection Ordinance 1984
- Pakistan Nuclear Safety and Radiation Protection Regulations 1990.

1.21 RUSSIA

The Federal Nuclear and Radiation Safety Authority of Russia (Gosatomnadzor of Russia) was established since 1992 by Decree of the President of Russia # 283-rp (1992), as amended. The Gosatomnadzor of Russia was based on the reorganised Regulatory Authority of USSR (Gospromatomnadzor of USSR) formed in 1984.

Pursuant to the Federal Act on Use of Atomic Energy by the Decree of the President of the Russian Federation from January 21, 1997, # 26 the Gosatomnadzor of Russia is designated as the body for state regulation of safety at usage of an atomic energy.

The Gosatomnadzor of Russia acts as an independent Regulatory Authority. The legal bases for its activity is:

- The Federal Law on the Use of Atomic Energy (1995).
- The Federal Law on Radiation Safety of Public (1996) and others.

Basic principle established by The Federal Law on Use of Atomic Energy is full responsibility of operational organisations for NPP safety.

The Gosatomnadzor of Russia implements the state regulation of safety at usage of an atomic energy, nuclear materials, radioactive materials and items on their basis in the peaceful and defence purposes (except of regulation of activity related to developing, manufacturing, testing and use of nuclear weapon and nuclear power plants of military assignment).

The main tasks of Gosatomnadzor are the following:

- to provide of state regulation and supervision of safety at usage of nuclear energy and of nuclear materials;
- to draft and to implement applicable federal safety requirements and regulations with regard to radiological and nuclear safety, safeguards and physical protection;
- to perform licensing with regard to nuclear installations and the prohibition of the operation of a nuclear installation without a licence:
- to enforce of applicable regulations and of the terms of licences, including suspension, modification or revocation;
- to organise and to perform of regulatory inspections and assessments of nuclear installations to ascertain compliance with applicable regulations and the terms of licences;
- to provide the public with information on nuclear safety problems.

1.22 SLOVAK REPUBLIC

Nuclear Regulatory Authority of Slovak Republic *(ÚJD SR, hereinafter referred as to "UJD")* is the central state authority responsible for the nuclear regulatory activities, at the level of other ministries with direct access to the Government and to the Parliament. The *UJD* was established on 1 January 1993 by Act No. 2/1993.

Main responsibilities of the *UJD* are:

- state supervision of nuclear safety of nuclear facilities, radioactive waste treatment, spent fuel treatment and other phases of the fuel cycle.
- Control and accounting of nuclear materials
- quality assessment of selected equipment and techniques
- assessment of the programmes for utilisation of nuclear energy
- fulfilling of commitments of the Slovak Republic arising from International agreements in the area of nuclear safety and use of nuclear materials

General bases for the use of nuclear energy and for regulatory control are enacted in the Act No.130/1998 on the peaceful use of nuclear energy (hereinafter referred as to "Atomic Act") and in the corresponding set of regulations. Other regulations based on the "Atomic Act" are being prepared.

UJD performs three (3) basis activities: inspection, assessment and rule making.

1.23 SLOVENIA

Slovenian Nuclear Safety Administration *(SNSA)* was established at the end of 1987, as an independent autonomous regulatory body responsible directly to the government. Re-organisation of the Administration in 1991 put *SNSA* in the frame of the Ministry of Environment and Spatial Planning.

Main competencies of the *SNSA* were defined in the Act of Organisation and Field of Activities of the Ministries of Nov. 94 (Off. Gaz. RS No. 71/94, 47/97, 60/99):

- nuclear and radiation safety of nuclear facilities
- trade, transport and handling of nuclear and radioactive materials
- accounting for and control of all nuclear facilities and materials (safeguards)
- physical protection of nuclear facilities and materials
- liability for nuclear damage
- training of NPP personnel
- quality assurance
- radiation monitoring
- early exchange of information in case of nuclear or radiological emergencies
- international co-operation in the field of nuclear safety
- inspection

There are several other laws which regulate the administration as a whole and must be followed by all regulatory bodies. Some of these laws are: Act on Government, Act on Administrative Procedures, and the Act on Administration. These acts define interfaces between different ministries, between Government and ministries, responsibilities and scope of activities of different governmental bodies, etc. In administrative process when *SNSA* decides to accept or not the request of nuclear installations for substantial modifications or changes in technical specifications, the Act on Administrative Procedures must be followed.

1.24 SOUTH AFRICA

The National Nuclear Regulator (*NNR*) is established under the National Nuclear Regulator Act (NNRA), 1999. The objects of the Regulator are to:

- provide for the protection of persons, property and the environment against nuclear damage through the establishment of safety standards and regulatory practices;
- exercise regulatory control related to safety over –
  - the siting, design, construction, operation, manufacture of component parts, and decontamination, decommissioning and closure of nuclear installations; and
  - vessels propelled by nuclear power of having radioactive material on board which is capable of causing nuclear damage;

  through the granting of nuclear authorisations;
- exercise regulatory control over other actions to which the NNRA applies, through the granting of nuclear authorisations;
- provide assurance of compliance with the conditions of nuclear authorisations through the implementation of a system of compliance inspections;
- fulfil national obligations in respect of international legal instruments concerning nuclear safety; and
- ensure that provisions for nuclear emergency planning are in place.

The prevailing legislation mandates the *NNR* to regulate over the total nuclear fuel cycle and all other activities involving radioactive material, but not over fabricated radioactive sources outside of nuclear installations.

Presently, nuclear authorisations have been issued to Eskom for the Koeberg Nuclear Power Station (KNPS), to the Nuclear Energy Corporation of South Africa (NECSA) for it facilities at Pelindaba and for its low- and intermediate-level radwaste repository at Vaalputs, to over seventy mines and minerals processing and ancillary operations and to twenty four users of small quantities of radioactive materials.

The *NNR* is currently assessing a nuclear installations licence application for a Pebble Bed Modular Reactor (PBMR) plant at Koeberg and for the PBMR fuel manufacturing plant at the NECSA site at Pelindaba.

The Board comprises of up to 12 Directors, appointed by the Minister of Minerals and Energy and the staff complement of the *NNR* comprises eighty-one persons distributed over the areas shown in Annex 1.

The regulatory approach of the *NNR* is to require its holders of nuclear authorisations to conduct quantitative risk assessments/hazards analyses of their plants and activities in order to demonstrate compliance with *NNR* safety criteria, following which the *NNR* verifies adherence to nuclear authorisation conditions through compliance inspection programmes.

1.25 SPAIN

The Nuclear Safety Council *(CSN)* was created through a Law in 1980 as a Regulatory Body independent of Central Administration of the State. *CSN* is the unique body with competence in nuclear safety and radiation protection matters. The *CSN* grants directly operating staff licenses, radiation protection and dosimetry services authorisations, and its reports are requested and are binding for construction, operation, decommissioning of nuclear power plants, fuel facilities, medical & industrial facilities and research reactors, transportation, and medical services authorisations.

The *CSN* is directed by a board or council composed of 5 members (one of them is the President of the *CSN*). The names of the members are proposed to the Parliament by the Ministry of Economy (before it was the Ministry of Industry and Energy), and their mandate is for 6 years.

The main functions of the *CSN* are as follows:

- Propose to the government regulations related to nuclear safety and radiation protection. The *CSN* can itself state instructions and safety guides to be followed by licensees.
- Elaborate safety analysis reports to the Ministry of Economy to grant construction, operation, decommissioning and closure authorisations for nuclear and radioactive facilities.
- Inspect and control of nuclear and radioactive facilities and other activities related to them.
- Advise to the government about radiological criteria for developing emergency preparedness plans and collaborate in the emergency responses.
- Control the environmental radiological surveillance inside and outside nuclear facilities and the whole national territory.
- Inform to the public and media about nuclear safety and radiation protection matters on nuclear and radioactive facilities.
- Promote research and developments plans and programmes on nuclear safety and radiation protection issues.

The *CSN* reports to the Parliament about its activities. A written report is issued yearly containing a summary of the safety conditions of nuclear and radioactive facilities, events reported during the year, evaluations and inspections carried out by the *CSN*, and a large number of activities in different areas as regulations, research and development, public information activities and others.

A new organisation of the *CSN* has been approved in 2000. Two Manager Directors has been stated instead of only one Direction. The Direction of Nuclear Safety is in charge of nuclear installations under operation (nuclear power plants and nuclear fuel facilities and transports). Project Managers of each plant and resident inspectors are included in this Direction. Also, experts in different specialities related to nuclear safety are organised in three deputy directions. This Direction has 102 people.

The Direction of Radiation Protection is in charge of nuclear facilities under decommissioning, waste disposal facilities, radioactive installations (medical and industrial) and in all aspects related to radiation protection of people and environment. The emergency preparedness is included in this Direction. The total number is 89 people.

Apart from the Directions, three Offices have been created depending on General Secretary. Their names are the Office of Inspection, Rules and Regulations and Research and Development. Their role is related to both Technical Directions, so they are independent of them. Furthermore, Internal Quality, Computer Services, and Administrative Department depend on the General Secretary.

The *CSN* has a matrical organisation for nuclear facilities, in which a project manager for each nuclear installation co-ordinates analysis, inspections of technical specialists and other services. Each specialist carries out evaluations and inspections in their own area of speciality. There are also two resident inspectors located at each nuclear power plant site.

1.26 SWEDEN

Three main laws regulate the nuclear safety programme in Sweden. The Law on Nuclear Activities, the Law on Financing of Future Costs for Spent Fuel and Nuclear Waste, and the Radiation Protection Law. In addition, special laws cover nuclear liability and emergency planning.

The Law on Nuclear Activities, defines nuclear materials, nuclear waste, nuclear installations, and nuclear activities which require licensing. The law assigns full responsibility to the licensee for the safety of nuclear activities and establishes the legal authority of the Swedish Nuclear Power Inspectorate *(SKI)*. The Radiation Protection Law, specifies general radiation protection requirements with regard to occupational exposure and exposure to the general public and establishes the legal authority of the Swedish Radiation Protection Institute *(SSI)*.

SKI and *SSI*, both independent authorities, jointly carry responsibility for ensuring that licensees assume their responsibility in providing safety and radiation protection.

1.27 SWITZERLAND

The legal basis for the regulation and supervision of nuclear activities are:

- The Nuclear Law of December 23, 1959 (Federal law concerning peaceful use of nuclear energy and radiation protection).
- The Federal Amendment to the Nuclear Law of October 6, 1978.
- The Federal Ordinance about the Supervision of Nuclear installations of March 14, 1983.

According to the ordinance the Federal Nuclear Safety Inspectorate *(HSK)* exercises supervision over nuclear installations in Switzerland. Its main tasks are the establishment of the safety review to be delivered to the federal government with regard to the granting of a general license or of permits for construction, operating, etc., of nuclear installations, and the surveillance and inspection of these installations.

The licensee has full responsibility for the safety of his plant. The regulatory body defines the safety requirements and checks for fulfilment of these requirements. Persons entrusted with the surveillance may at any time require information and have access to all documents; they have unhindered access to all installations, offices, and stores.

1.28 UNITED KINGDOM

The main legislation governing the safety, and enforcement of safety, of nuclear installations is the Nuclear Installations Act as amended, together with the Health and Safety at Work, etc., Act 1974 and the Ionising Radiations Regulations 1999. Under the Nuclear Installations Act no site may be used for the purpose of constructing, commissioning or operating any nuclear installation unless a license has been granted by the Health and Safety Executive *(HSE)*. A nuclear installation is broadly defined as being an installation where nuclear fuel is manufactured, enriched or reprocessed, where products from irradiated nuclear fuel are manufactured, or an installation which is a power or research reactor. Most nuclear defence related installations are now regulated by Her Majesty's Nuclear Installations Inspectorate (NII) either directly under the Nuclear Installations Act (for sites that are licensed) or under the Ionising Radiations Regulations.

Her Majesties Nuclear Installations Inspectorate *(NII)* as part of the *HSE* is responsible for enforcing safety and health legislation at any licensed site. A statutory body called the Health and Safety Commission *(HSC)* sits between Government and *HSE*. The aims of HSC and *HSE* together are to protect the health, safety and welfare of employees, and to safeguard others, principally the public, who may be exposed to risks from industrial activity.

In addition to the provisions of the above mentioned laws and regulations, each nuclear site license has conditions attached which have the force of law and which place either absolute requirements or require the making of adequate arrangements and compliance with those arrangements. A fundamental feature of one condition, is the requirement for the licensee to demonstrate the safety of the proposed operation in a document known as the "safety case", prior to the start of that operation.

Breach of any law, regulation or license condition is a criminal offence and the offender may be prosecuted in the United Kingdom courts of law. Inspectors appointed by the *HSE* also have the power to stop unsafe acts or require improvements to be made within given time scales. Some of the conditions attached to the license also give the *HSE* the power to direct the licensee to undertake a specified task (e.g., shutdown reactors) and the power to consent or approve to certain activities (e.g., items of high safety significance). These powers are carefully set out so as to not take away the absolute responsibility of the licensee for safety on the licensed site.

Neither *HSE* or *NII* are involved in licensing of individuals at the nuclear installation, but powers in the license conditions exist to enable the *HSE* to stop any appointment by the licensee of persons to key safety related posts such as control room operators. Actions of *NII* are subject to internal review processes and in extreme cases can be subject to review by the United Kingdom courts of law.

The Government sets the policy on siting of nuclear installations, dealing with radioactive waste and decommissioning which *NII* implements through the granting of site licenses and its powers under the site license conditions. *HSE* sets policy in respect of work radiation exposure which is enforced by *NII* on licensed nuclear installations and by other parts of *HSE* for other industrial and medical uses of radioactive material. *NII* also enforces other safety and health regulations in relation to non-nuclear hazards at licensed nuclear sites.

1.29 UNITED STATES

In the Atomic Energy Act of 1954, the Atomic Energy Commission *(AEC)*, was vested with developmental and regulatory functions related to peaceful uses of atomic energy. In 1974, the Energy Reorganisation Act, split the *AEC* into the Energy Research and Development Administration *(ERDA)* and the Nuclear Regulatory Commission *(NRC)*. The *NRC* has jurisdiction over all non-governmental uses of special nuclear materials and man-made isotopes. This includes power and non-power reactors, fuel facilities and users of nuclear materials. The *NRC* does not have jurisdiction over natural sources, such as radon nor accelerator-produced radiation.

The *NRC* has broad authority under the Atomic Energy Act of 1954, including the authority to perform inspections. This authority is implemented through a regulation, 10 CFR 50.70, which requires licensees and construction permit holders to permit *NRC* inspections of records, premises, activities, and licensed materials.

The *NRC's* mission is to protect the health and safety of the public and the environment in the use of nuclear facilities and materials. The inspection programme is one of the principal methods used to accomplish this mission. *NRC* regulations and inspection activities are based on the understanding that the nuclear industry is ultimately responsible for the proper construction and safe operation of its facilities. The inspection programme is designed and carried out to independently verify that the licensee is building and operating its nuclear facility in accordance with its permit, license, and the regulatory requirements and that its work activities are being performed in a high-quality, proper manner to assure operation with adequate protection.

CHAPTER 2 - FINANCIAL / BUDGETARY SCHEMES

This chapter provides information on how budgets for the regulatory are financed. A brief description of how and where funds are obtained and dispersed throughout the regulatory organisation (Charts attached as Appendix III). Also, where appropriate, information is provided on punitive actions taken such as fines or penalties which are levelled by the authority.

2.1 ARGENTINA

The budget is primarily supported from the State fundings (75%) and a small percentage from regulatory taxes (25%) applied to the Utility and the Atomic Energy Commission. There is a project based on financial penalties according with the non-compliance with the license conditions. The resources distribution are conformed by the following costs: inspections (32%), technical and scientific support (28%), administration (29%) and other (11%).

2.2 ARMENIA

To implement its tasks, the ***ANRA*** gets financial resources form the state budget. These resources cover the regulators, inspectors, as well as technical administration staff salaries and various work expenses. The ***ANRA*** receives no fees from fines or other punitive actions.

In 1995-2000 the ***ANRA*** received international assistance from the IAEA through the national and European regional programmes, from European Commission, as well as from US NRC and UK WS Atkins firm through bilateral programmes.

2.3 AUSTRALIA

ARPANSA obtains its operating budget from Commonwealth Government appropriations, licence application fees and annual charges and provision of commercial services (such as personal radiation monitoring and consultancy contracts). The licence application fees and annual charges are calculated on a cost recovery basis with no profit loading. The operating budget for the 2001-2002 is approximately AUD$18M, of which approximately $3M is for regulatory branch functions.

2.4 BELARUS

In general Promatomnadzor gets its financing from the state budget. Staff gets salaries and business trips are financed from budgetary sources. All technical expenses are financed through paid services (expertise). It should be noted that Promatomnadzor does not get any resources from licenses and fines.

2.5 BELGIUM

The Ministerial services or the *FANC* are financed on the basis of nuclear taxes paid by the licensees. The LIO are paid by the licensee on the basis of the time spent on inspections and assessments. The finances

and activities of the LIO are controlled by a special committee chaired by a high level public servant who is a member of *FANC*.

2.6 CANADA

The *CNSC* regulates the various nuclear industries through comprehensive licensing procedures. Among the *CNSC's* licensees are facilities that mine and refine uranium or fabricate uranium fuel, nuclear reactors, research and waste management facilities, industrial radiographers, manufacturers and suppliers of radioisotopes, hospitals, universities and clinics. Also included in the list are the petroleum industry, transportation packaging companies, and the agriculture, food beverage, communications construction, pulp, paper and printing industries.

In 1990, the *CNSC* began implementing fees to recover the costs of its regulatory activities from most licensees. Educational institutions and publicly funded, non-profit health care institutions are exempt from these fees.

Revenues from the fees accrue to the government of Canada and are not at the disposal of the *CNSC*. The *CNSC* does not, and in fact cannot, spend these revenues. The resources for regulating the nuclear industry are approved by Parliament, and fees recover the costs for these resources.

Regulatory costs for non-exempt licensees make up approximately 85% of the total *CNSC* cost. The remaining 15% is comprised of costs for non-regulatory activities and costs for regulating licensees who are exempt from the fees. To date, the *CNSC* has not achieved its target of full recovery of the 85% portion. For example, in fiscal year 1995-96, the *CNSC* recovered 75% of its 37.6M$ recoverable licensing costs.

2.7 PEOPLES REPUBLIC OF CHINA

To implement its functions and duties, the *NNSA* gets financial resources from the government budget. Some of the licensing procedures have to paid by the applicants.

2.8 CHINESE TAIPEI

A total of 86.9 million USD was budgeted for fiscal year 2001, this data includes the budget of *AEC* headquarters and his subsidiaries bodies.

2.9 CZECH REPUBLIC

The annual budget of the *SÚJB* is an integral part of the State budget. It covers both the *SÚJB* and its technical support organisation the National Institute for Radiation Protection (NRPL). The budget is structured as follows: salaries (25%), research and development (8%), technical support programme (10%), investments (20%) and others (37%). The budget of *SÚJB* is part of the State budget and is approved annually by the Parliament. These financial resources are used to cover all expenses of the *SÚJB* and *NRPL*.

SÚJB receives no income from fines or other punitive actions. Income from financial penalties is a part of the State budget which is not available for direct *SÚJB* use.

2.10 FINLAND

The principle in Finland is that customers should pay the costs of inspection activities. This has been organised in such a way that *STUK* charges the power companies on the basis of actual regulatory work carried out. The costs of regulatory work have been charged earlier from the licensees to the state treasure. Since the beginning of 2000 *STUK* has covered directly the costs of regulatory control work with fees it has invoiced from the licensees. In this way *STUK* can easier respond to regulatory control needs arising from licensee's new activities.

The main part of *STUK*'s income comes from the governmental annual budget approved by the parliament. Because international co-operation has been increased a lot during recent years e.g. with the European Commission *STUK* also takes part in this co-operation. The income from these international sources can be paid directly to *STUK*.

Total finance in 2000 was 129 million FIM The sources of funding of *STUK* were as follows (2000): budgetary allocations (70 %), income from services (23 %), external funding of joint ventures (5 %) and other sources e.g. Employment authorities (2 %). Expenditures by sector were as follows (2000): nuclear safety (30 %), radiation safety (8 %), preparedness (5 %), research (29 %) and external services (28 %).

2.11 FRANCE

The financial resources of the Nuclear Safety Authority now come from the annual state budget, which amounted to 597 millions of Francs in 2000 [there is no more direct transfer from the annual taxes paid by the licensees, these taxes are now paid to the state].

These resources cover staff salaries and operating expenses (nearly 20 %), and mostly safety assessments and expertise from the IPSN (close to 80 %).

2.12 GERMANY

2.12.1 Budgeting and Costs

To implement their respective tasks, the staff of the Federal Ministries and agencies and of the Länder authorities as well as their material expenses are budgeted within the Federal and the Länder governmental annual budgets. There are also budgets for research on nuclear safety and radiation protection.

According to the basic principles of the Administration Cost Act, fees are levied for all administrative actions in favour of individual persons or private companies. In the case of licensing and supervision of nuclear installations, the Atomic Energy Act provides the regulation for the charging of costs, including fees and expenses, to the applicant or the licensee. Details on the respective fees are laid down in the Atomic Energy Act Cost Ordinance.

For example, the fee for granting a construction licence for a nuclear power plant is set to 2/1000 of the construction costs of the nuclear licensed part of the plant. For other licensing decisions, fees may range from 1000 to 1 Million DM. In addition, fees for conducting inspections and measurements are fixed. These fees shall be based on the actual expenses and will be invoiced to the licensee.

The licensing as well as the inspection authorities may contract experts and expert organisations (TÜV´s) for expertises and conduct of inspections, provided these expenses are justified according to the technical needs and difficulties. The expenses for the experts are reimbursed to the regulatory body by the licensee.

2.12.2 Punitive Actions

Criminal acts such as handling of fissile nuclear material or operation of a nuclear reactor without a valid licence will be punished according to the laws. Infringement of laws or rules like violations of regulatory directions as well as deliberate and negligent nonconformity with the legal requirements of the Radiation Protection Ordinance will be fined. Fines are levied to the responsible individuals and may amount up to 100,000 DM. The regulatory body gets no budget from these fines.

2.13 HUNGARY

The Hungarian Atomic Energy Authority *(HAEA)* is financed from the governmental budget. The licensees pay a special fee to the Treasury on the basis of the Act CXVI. of 1996 on atomic energy. The actual fee for operating nuclear reactors is approx. 480 USD/MWth/year. In accordance with the Hungarian financial rules this fee is to be used exclusively financing of the regulatory activity.

2.14 ITALY

The running costs of *ANPA* are primarily covered by State funding, however, a small percentage of running costs are funded by reimbursement from public and private enterprise, due to licensing activity for nuclear plants and installations employing ionising radiations. Such income is then employed for subsidising running costs within the Regulatory Authority.

With regard to the radiological protection of workers, there may be instances of faults which are identified during surveillance by *ANPA's* inspectors. In such cases, the inspector reports the failure to the Judiciary and issues a penalty , a quarter of which is payable directly to *ANPA.*, if the enterprise corrects the fault within a specified time. When a fault is not corrected before the allotted time period expires, the Judiciary, informed of that by *ANPA's* inspector, enforces payments of interest of the entire penalty. The proceeds, under these circumstances, go to the State, rather than the Regulatory Authority.

2.15 JAPAN

The expense for personnel and travels for the nuclear safety administration have been financed by taxes and application fees for licensing or inspection. These fees are assigned depending on the types and the objects of licensing and inspection prescribed in the ministerial ordinance. The applicants shall put a revenue stamp with appropriate amount on the application form.

Under the Law for the Regulations of Nuclear Material, Nuclear Fuel Material and Reactors (hereafter referred to as the RNNR Law), the competent minister shall cancel the license or order to stop plant operation for a certain period as well as fine them, in such cases as the licensees of nuclear facilities operate these facilities without a license, or violate the order to take measures to secure safety or for the physical protection.

2.16 KAZAKHSTAN

To implement its task, *KAEC* gets financial resources from the national budget. After the Law on the Use of Atomic Energy was adopted, the licensing expenses are covered by the applicants through established fee to the budget.

2.17 REPUBLIC OF KOREA

To implement its tasks, the *KINS* primarily receives financial resources from the Government Budget and Licensing Fees. These resources are used for both Regulatory Activities and Research & Development in

the field of nuclear safety, as well as Operations Cost and Miscellaneous. The *KINS* receives no budget from fines or other punitive actions.

2.18 MEXICO

The financial resources of CNSNS are conformed as follows:

80% of the budget is constituted by the payment under covenant that the CFE covers for the concept of maintenance of the Operation License for both LVNPS1-& 2.; this includes the cost of assessment, inspection, audit and surveillance activities performed by the Regulatory Body to verify the operation of such nuclear power plant. The agreement between the CNSNS and CFE is a legal document, which is sanctioned by the Ministries of Energy and Treasure. The agreement is reviewed in terms of the amount in a yearly basis; this is due mainly to the national inflation factor. In general terms and considering constant pesos or dollars, the fee imposed to CFE to maintain the Laguna Verde License has been maintained practically constant.

Furthermore, the CNSNS receives additional financial resources from the payment of the licensing process (expedition, renovation and modification) of radioactive installations and from the transportation, exportation and importation of radioactive material.

In the event of a user of nuclear material, radioactive material or ionising radiation sources falls in a violation of a requirement, a fine is imposed and such amount is deposited directly to the Federation's Treasury.

2.19 THE NETHERLANDS

To implement the tasks the competent authorities get their financial resources from the national budget. Only a part of this budget is compensated by the nuclear facilities, who have to pay for licenses. On top of this the NPP-licensee has to pay a fixed annual fee.

Income from fines or other punitive actions will flow to the national budget.

2.20 PAKISTAN

To implement its functions and duties, *PNRA* gets financial resources from:

- Funds of the Commission related to the Directorate of Nuclear Safety and Radiation Protection as transferred to the Authority under section 54 (dissolution of PNRB and DNSRP),
- Grants from the Federal Government,
- Grants from the Provincial Government,
- Income from the grant of authorisation and issue of license,
- International grants, and
- Receipts from such other sources as may be approved by the Authority.

Provisions for fines and punitive actions are included in the ordinance.

2.21 RUSSIA

To implement its tasks, the Gosatomnadzor of Russia gets financial resources from the federal budget. Some of the licensing procedures (expertise's) have to be paid in budget by the applicants. Financial penalties and fines as a method of enforcement are imposed in case of non-conformance with license conditions or regulations.

The Gosatomnadzor of Russia gets no budget from fines or other punitive actions.

2.22 SLOVAK REPUBLIC

The annual budget of the UJD is by 100% subsidized by Governmental funding. There is no provision from fines or penalties paid directly to the UJD budget.

2.23 SLOVENIA

SNSA is financed from the national budget within the Ministry of Environment and Spatial Planning. *SNSA* has independent funds available for strictly defined tasks planned annually. Licensees do not pay special fees for financing of the regulatory body.

SNSA has the authority to levy financial fines or penalties from licensees but such funds are not available for the use of *SNSA*.

2.24 SOUTH AFRICA

The principle of the polluter pays is adopted in South Africa, resulting in approximately 80% of the budget of the *NNR* coming from nuclear authorisation fees, the remainder being provided by the state to cover expenditure which would be inappropriate to levy upon nuclear authorisation holders. In the budgeting process, estimates are made of man-hours to be expended in the various project areas and these funds, once approved by the Board, are made available. The prevailing legislation provides for penalties to be imposed following prosecution, and in addition, for the *NNR* to revoke an authorisation or restrict a nuclear authorisation holder's operations.

2.25 SPAIN

The Nuclear Safety Council services are financed on the basis of taxes paid by the licensees (nuclear and radioactive installations).

In 1999, new functions were assigned to the CSN including environmental radiological surveillance to the whole national territory, emergency response against radioactive materials in any place and others not related directly with licensees. Then, a small part of the total budget (less than 10%) is received now from the State due to new functions not related directly to any licensee.

The *CSN* gets no budget from fines or other punitive actions.

2.26 SWEDEN

Appropriations from the state budget finance the *SKI* activities. *SKI's* proposal for its activities in the forthcoming financial year are considered by the Government in just the same way as other agencies. The activities are evaluated by the Government as is the case for other agencies and the evaluation is provided in the budget bill. Resources are allocated in the Government's letter of appropriation, prescribing in addition agency directives where the objectives for the activities to apply are also specified. Contrary to what is normal for an appropriation financed agency, the Government's costs for the *SKI* activities are offset by regulatory and research fees paid by the nuclear facilities.

Two types of appropriation are available to *SKI:* Administration costs and Nuclear safety research.

2.27 SWITZERLAND

The annual budget of the Inspectorate *(HSK)* is approximately 6.2 million Swiss francs (salaries and infrastructure, including the secretariat of the Advisory Commission *(KSA)*, but excluding the Commission as such). In addition, some 7 million Swiss francs are budgeted for external experts and for research contracts.

The expenses of *HSK* are mostly compensated for by specific revenue from the Federal Treasury. Fees have to be paid by the applicants/licensees for all licensing procedures. The operators of nuclear installations are invoiced by the federal administration for the actual costs of the supervision by the Inspectorate and its experts.

Financial penalties as a method of enforcement may theoretically be imposed in case of non-conformance with license conditions, but they have never been used.

2.28 UNITED KINGDOM

Under the Nuclear Installations Act, *HSE* recovers most of the running costs of *NII*, together with the costs of any research thought necessary from licensees. Fines, which the United Kingdom courts of law may impose on a licensee or person, go to the courts and not *NII*.

2.29 UNITED STATES

The *NRC* is authorised under Title V of the Independent Offices Appropriation Act of 1952 to collect license fees. Pursuant to 31 U.S.C. 9701, any person who receives a service or thing of value from the Commission shall pay fees to cover the *NRC*'s cost in providing such service or thing of value.

Pursuant to 42 U.S.C. 2213, the NRC shall assess and collect annual charges from persons licensed by the Commission. The Omnibus Budget Reconciliation Act of 1990 (OBRA-90), as amended, requires that the NRC recover approximately 100 percent of its budgetary authority in Fiscal Year (FY) 2000, less amounts appropriated from the Nuclear Waste Fund (NWF). The amount to be recovered for FY 2000 is approximately 447.0 million. Certain NRC costs related to reviews and other assistance provided by the Department of Energy (DOE) and other Federal agencies are excluded from the fee recovery requirement for FY 2000 Energy and Water Development Appropriations Act.

The NRC assesses two types of fees to recover its budget authority: 1) license and inspection fees, established by 10 CFR Part 170 under the authority of the Independent Offices Appropriation Act of 1952 (IOAA), 31 U.S.C. 9701, recover the NRC's costs of providing special benefits to identifiable applicants and licensees. Examples of the services provided by the NRC for which these fees are assessed are the review of applications for the issuance of new licenses, approval or renewals, and amendments to licensees or approvals and 2) annual fees, established in 10 CFR Part 171 under the authority of OBRA-90; to recover generic and other regulatory costs that are not recovered through 10 CFR Part 170 fees.

The NRC has recently revised its fee schedule to address fairness and equity concerns related to licensees paying for agency expenses that do not provide a direct benefit to them. The U.S. Senate has passed legislation that would reduce the fee recovery amount to 98 percent for FY 2001, and further reduce the recovery fee amount by an additional two percent per year in FY's 2002 through 2004, and by four percent in FY 2005, for a final recovery requirement of 88 percent in FY 2005.

The *NRC* is required to deposit all revenues collected to miscellaneous receipts of the Treasury unless specifically authorised by an appropriation to retain and use such revenue.

Revenues from Licensing Fees, Inspection Services, and Other Services and Collections shall be retained and used for necessary Salaries and expenses in this account and shall remain available until expended.

2.29.1 Overview of NRC Enforcement Programme

The purpose of the NRC enforcement program is to support the NRC's overall safety mission in protecting the public and the environment. Consistent with that purpose, enforcement actions are used as a deterrent to emphasise the importance of compliance with requirements and to encourage prompt identification and prompt, comprehensive correction of violations. The NRC's enforcement policy is contained in NUREG-1600 and is outlined below. Because it is a policy statement and not a regulation, the Commission may deviate from this statement of policy and procedure as appropriate under the circumstances of a particular case.

The enforcement approach divides violations into two groups, those evaluated through the Significance Determination Process (SDP), and those that are not addressed by the SDP. The SDP is a risk or significance characterisation process that is applied to inspection findings. For the first group, NRC evaluates the significance of inspection findings using a documented SDP and determines the appropriate regulatory response action in a pre-determined manner such that regulatory actions become more extensive as the significance of the findings increases. These responses are defined in an "action matrix". Findings that involve violations that are evaluated under the SDP as having very low safety significance (characterised as "green") are normally addressed by the licensee and are not normally cited in a Notice of Violation (NOV), unless the licensee fails to restore compliance within a reasonable time after the violation was identified, the licensee fails to place the violation into the corrective action program, or the violation was wilful. Findings that involve violations and that were evaluated through the SDP as having greater than very low safety significance (characterised as "white", "yellow", or "red") are normally cited by issuing a NOV and are considered in the assessment process, but typically are not subject to civil penalties.

The second group of potential violations involves issues that result in actual consequences, violations that are not evaluated under the SDP, such as wilful violations including discrimination, and violations that may impede the regulatory process. Violations for which there are actual consequences are those that result in worker or public doses greater than regulatory limits, releases of radioactive material greater than regulatory limits, and failure to make required notifications during an actual general or site-area emergency or during a transportation event. Violations in this category are processed as described in the NRC's enforcement policy using both severity levels and civil penalties.

There may be particularly significant violations, addressed in the action matrix, for which it is appropriate to impose a civil penalty. While expected to be rare, the NRC is not prohibited from exercising its authority under Section 234 of the Atomic Energy Act. Examples in which a civil penalty may be warranted include a significant violation of a safety limit as described in 10 CFR 50.36 (a) or for an inadvertent criticality, both of which are classified as Severity Level I violations.

In addition to the issuance of NOVs, the agency may issue orders to licensees or individuals. Orders may be issued to modify, suspend, or revoke licenses or require specific actions by licensees or individuals. Orders may be issued for violations, or in the absence of a violation, because of a public health or safety issue.

CHAPTER 3 - INSPECTION PROGRAMMES

This chapter provides a brief look at the inspection programmes in each of the countries during normal operation. A description is provided of the types of inspections performed relating to plant operation, equipment evaluation, plant modifications, health physics aspects, operator performance, security, etc.. Further information is furnished on the frequency of inspections, reporting requirements, evaluation of events, and follow-up activities, and public information requirements.

3.1 ARGENTINA

The regulatory activities include: regulatory inspections and audits performed to verify compliance with both operation and construction licenses; independent safety analysis and assessments; the issue of formal standards and guidelines; analysis of incidents; and personnel training, both for those responsible for safety in practices submitted to control and for that performing regulatory activities. Concerning NPPs, the *ARN* has established a set of minimal requirements that are mainly based on fundamental safety objectives. The regulatory approach is probabilistic in nature and involves a criterion for risk acceptance in NPPs based on the concept of individual risk and using the philosophy underlying the ICRP's dose limitation system.

Regulatory inspections are carried out through programme on a routine and non-routine basis. Routine inspections are related to routine plant activities; they involve monitoring the process and verifying compliance with the applicable regulations (Operation/Construction Licenses) and standards. They are usually performed by an on-site resident inspector who applies the regulatory criteria and acts as a direct liaison between the *ARN* and the NPP. Non-routine inspections are performed when specialised expertise is required for monitoring specific activities. They are carried out by other *ARN* inspectors and serve to support and supplement the on-site resident's activities. Basically, overall inspections involve: the assessment of hardware availability; hardware challenges; administrative controls and operators actions; and the verification of certain items, through carefully selected sampling, to determine whether processes are within the acceptable tolerances. The inspection programme does also include matters that are specific for each installation, as described in the operation license, basically taking into account the type of installation and operational experience.

NPP safety assessments include a systematic review of the ways in which structures, systems and components might fail and an identification of the consequences of such failures. Several methods have been developed for assessing whether safety objectives are met or not. These methods are applied during the design and constructions stages, as well as during operation —on the basis of operational experience— and when evaluating modifications in the plant configuration. Both a deterministic and a probabilistic method are currently being used —supplementarily— in safety assessments. The former involves: thermohydraulic analyses, reactor physics, structural integrity, control systems and human factors, so as to ensure that the appropriate safety margins are attained. The latter, in which PSA is applied, serves to ensure a sufficiently low global risk and a sufficiently high and well-balanced reliability in safety-related functions. PSAs constitute an analytical technique aimed at integrating diverse matters related to design and operation, so as to assess risks in a particular NPP and develop a data base that allows for analysing both plant-specific and generic issues. The *ARN* requires a full-scope plant PSA as part of its regulatory philosophy. Furthermore, PSAs are used by the *ARN* as a regulatory tool for the analysis of reliability, human actions and precursors. In the future, they will also be applied to risk-based inspections. Reliability analyses serve to identify safety-significant components and their failure modes and, in order to achieve the reliability targets in safety systems, an analysis is performed of preventive and corrective maintenance, as well as of downtime (excessive or insufficient), of high component failure frequencies and of

surveillance aspects. Proposals for backfitting and plant modifications are also analysed under the light of reliability. Human actions involved in the analysed accident sequences, the most important pre- and post-accidental errors and the major human error contributors are identified and inspected, as well as recovery actions.

Risk-based inspections aid inspectors in selecting safety systems or components to be inspected on the basis of their ranking and of their failure modes, as established in the plant's PSA. Consequently, among the regulatory applications of the PSA, plant-specific risk-based inspection guides (RIGs) are going to be issued for the NPPs in operation. Furthermore, risk-based inspections shall provide a system walkdown including a checklist containing only items related to dominant failure modes. RIGs will contain the dominant accident sequences, a system priority list and the identification of the risk significant items by system, with accompanying inspection recommendations, common-cause or dependent failures and important human errors.

3.2 ARMENIA

The ***ANRA*** is in charge of inspections of nuclear power objects of Armenia. The inspection activity embraces nuclear and radiation safety. The ***ANRA*** carries out inspection activities by means of periodic, special and complex inspections.

Periodic inspections include daily, weekly and monthly inspections carried out on the NPP site.

Special inspections cover the following areas: modernisation of the unit, readiness of safety systems, training of personnel, preparation and realisation of nuclear-dangerous works, radiating safety, emergency readiness, nuclear materials etc.

The purpose of complex inspection carried out by ***ANRA*** on NPP is to control the readiness of NPP to planned maintenance works and control of NPP after their realisation.

The inspectors participate in investigation concerning abnormal events occurred at the NPP, they also check corrective actions implemented by the plant.

According to the low the Armenian Nuclear Regulatory Authority (***ANRA***) is responsible for providing information on nuclear and radioactive safety issues to the mass media and the public. The Technical Information Section of the ***ANRA*** is responsible for this task.

The information on events occurred at NPP, which attract the attention of the public, is reported to the media with assessment on INES scale.

3.3 AUSTRALIA

Part 7 of the Act enables the CEO to appoint inspectors and authorises them to undertake searches and exercise a range of powers to establish compliance with the Act, its Regulations and conditions of licence. In general, inspectors may search premises, inspect, examine, take measurements, take samples or conduct tests. Inspectors may also take photographs, record video pictures, take audio recordings or make sketches. Books, records and documents may be inspected and copies may be taken. Special powers are also provided for inspectors to deal with hazardous situations or to gather evidential material. In dealing with hazardous situations, inspectors may also give directions for such steps to be taken as considered necessary.

Further details on the manner and form of inspections can be found at www.arpansa.gov.au/inspection.htm.

ARPANSA's inspectors carry out both regular and irregular inspections of plant operation, safety equipment performance, radiation protection and operator accreditation/re-accreditation. Regular inspections include field audits of the operating log of Australia's only operating nuclear reactor, HIFAR, (operated by the Australian Nuclear Science and Technology Organisation (ANSTO)) which are carried out approximately monthly. Reviews and inspections are performed as required with regard to safety-related plant modifications, operator accreditation/re-accreditation and after certain abnormal occurrences. Audits of defined areas of operational safety are also undertaken periodically. Reporting of abnormal occurrences by licence holders are reviewed and evaluated by *ARPANSA*'s Regulatory Branch on receipt.

ARPANSA's Regulatory Branch also performs reviews and audits of radiation protection at HIFAR. Additional inspections with regard to radiation protection may be performed in response to abnormal occurrences or modifications to the reactor or its operation. Following the audits and inspections, ANSTO is required to submit a schedule for rectifying any deficiencies found, and *ARPANSA*'s Regulatory Branch follows up to ensure that actions are completed. *ARPANSA* also monitors reactor operating staff dose records as well as radioactive discharges.

ARPANSA'S public information activities include publishing of newsletters and answering enquiries from the public. Formal *ARPANSA* reports on particular topics, as well as quarterly and annual reports of *ARPANSA* activities, which are tabled in Federal Parliament, are freely available to the public. The results of the annual audits are published as formal *ARPANSA* reports. Lists of all *ARPANSA* reports are included in the *ARPANSA*'s annual report.

3.4 BELARUS

Promatomnadzor inspectors carry out the following types of inspections:

- routine inspections;
- special inspections and
- integrated inspections which are carried out together with inspectors from other concerned bodies (Ministry of Health Care, Ministry of Labour, Ministry of Internal Affaires, etc.) and cover a number of related activities of users.

During inspections Promatomnadzor inspectors use their own measurement equipment. They check :

- fulfilment of previous prescriptions;
- license and compliance with its conditions;
- organisation of work (designation of those responsible for radiation safety and accounting of nuclear materials and/or radiation sources, awareness of personnel of safety norms and procedures, compliance of such procedures with relevant requirements, etc.);
- relevant equipment and its maintenance;
- technology (if applicable), including radioactive waste management;
- quality and sufficiency of control carried out by user;
- maintenance of physical protection of nuclear materials (if applicable);
- measures taken to prevent accidents and emergency preparedness.

In most cases users are notified of an inspection in advance. Inspection frequency depends on the characteristics of facilities. Routine inspection are carried out whether once in three years, annually or once in 6 months. As a result of any inspection inspector gives an obligatory prescription in which he points out inconsistencies with relevant requirements, indicates measures to be taken to eliminate them and deadlines for such measures. In some cases such prescription may also indicate certain punitive measures. Promatomnadzor should be informed of the results of the fulfilment of such prescriptions in 2 months, otherwise a special inspection is likely to be carried out.

Promatomnadzor co-operates with mass media in order to ensure public awareness and it issues its own monthly edition titled "Industrial Safety" in which documents, articles and interviews on different issues of nuclear and radiation safety are published.

3.5 BELGIUM

3.5.1 Type of Inspector Organisation

One inspector is dedicated for each unit (a twin unit counts as one). Supervisors assigned for each site or common site entities and an Inspection Division Head provides co-ordination and guidance. Periodic and special inspections are co-ordinated through all the units.

3.5.2 Inspection Categories

Periodic inspections involve a synthetic overview and perspectives for each entity of the plant/site and are performed on a 3 to 6 month basis. The scope includes;

- radioactive release, waste treatment
- chemistry, radiochemistry
- radiation protection
- conventional safety
- operation
- nuclear support
- tests
- mechanical and electrical maintenance
- quality assurance
- management
- training centres
- Ad-hoc inspections are carried out at any time in any field of activity. For example, specific inspections are performed in the case of incidents, modifications, or license examinations for control room operators.

3.6 CANADA

To promote consistency, the *CNSC* developed a systematic core inspection programme for power reactors that specifies minimum frequencies, depth and coverage. This programme includes 31 core inspections, a policy governing implementation, standard inspection procedures and checklists, an estimate of resource requirements, and a procedure covering periodic reviews of findings.

Types of inspections include the following:

- operating practice assessments - fuel handling, waste management, maintenance, start-up, normal operation, shutdown safety, and heat sinks.
- appraisals - security, radiation protection, safety culture, chemistry, emergency preparedness, fuel, physics fire protection and design engineering control.
- interviews - fuel & physics.
- audits - pressure boundary, prescribed substances, change control, record keeping.
- rounds - control room, field (area).

- systems - shutdown system 1, shutdown system 2, emergency core cooling, containment, standby safety systems, safety-related systems, electrical systems.
- observations - software maintenance, setback/stepback, turbine testing, emergency drills.

Although the inspection programme focuses on verification of each plant's compliance with regulatory requirements, it recognises also the need for re-active inspections. Whereas the core inspections are broad in nature, re-active inspections usually have a deeper focus. These inspections are prompted by such things as core inspection findings or events. Multidisciplinary team inspections are encouraged. Inspection reports are formally sent to licensees.

At the end of each year, staff from head office and resident inspectors produce a Canadian Nuclear industry report which summarises and compares the safety of operation of all sites. The inspection reports themselves are available to the public.

3.7 PEOPLES REPUBLIC OF CHINA

The nuclear surveillance consists of 2 tasks, .e.g., nuclear inspection and enforcement.

The objectives of nuclear safety inspection are to verify the implementation of safety regulatory requirements and license conditions, to perform surveillance on the correction of items that are not in conformance with nuclear regulatory requirements and the license conditions, to justify the qualification of the personnel related to nuclear safety, to ensure the materials, components structures, systems and activities conform with nuclear safety requirements, and to ensure licensees reporting of any defect and abnormal event in time.

For carrying out nuclear safety surveillance, the *NNSA* has established 4 regional offices, e.g., the Shanghai Regional Office, the Guangong Regional Office, the Suchaun Regional Office and the North Regional Office. They are responsible for the nuclear safety surveillance in the regions of East China, South China, West China and North China.

The *NNSA* or its regional offices may send inspectors (group) to the sites of the nuclear installations to exercise the functions of nuclear safety surveillance.

The nuclear safety inspection on NPP are classified into daily inspections, routine inspections and non-routine inspections.

Monthly inspections are carried out at research reactors, critical assemblies, and fuel cycle facilities, and the findings are reported to *NNSA* headquarters through monthly reports. Routine and non-routine inspections are planned and carried out by *NNSA* headquarters and its regional offices. The inspection reports are distributed to operating organisations after being approved by *NNSA* management. The operating organisation should take corrective actions according to the requirements in the reports.

The *NNSA* is responsible for the supervision of possession and usage of civilian nuclear materials. The main items of the supervision are implementation of nuclear materials control and license condition , the effectiveness of control, account and physical protection for nuclear material.

The operating organisations should observe reporting requirements of *NNSA*. The reports are composed of regular reports, ir-regular reports, and emergency reports. Emergency reports should reach the *NNSA* according to the regulations on emergency preparedness of nuclear installations.

In order to protect the site personnel, the public and the environment form possible adverse effects arising form nuclear installations, the *NNSA* requests that operating organisations and related organisations should

eliminate unsafe factors of items and activities in nuclear installations. The *NNSA* will take enforcement action to order the operating organisation to take safety measures or to stop activities endangering nuclear safety when necessary.

3.8 CHINESE TAIPEI

The inspection of nuclear facilities is one of the most important tasks of Nuclear Regulation Department. The following approaches have been used to implement the plant inspection:

- Resident plant inspectors perform daily monitoring and regulation on site with well informed and in good control of the plant operating conditions.
- Periodic outage inspections are performed during each unit outage to assure the quality of maintenance work by means of team inspections.
- Non-periodic inspections are performed without pre-notice to enhance the alertness of the plant operators.
- Annual plant visits are made at each plant at mid-year and also near the year end. A review of complete plant operating condition is conducted at each site to improve the nuclear safety. The scope of inspection encompasses primarily all safety related items of the nuclear power plant. In recent years, selected specific scene has been set to conduct an in-depth inspection of the system at each unit. In order to assure safe operation of the power plant, daily monitoring is necessary. The frame work of plant operation monitoring is the same as the nuclear power plant design philosophy -Depth Defence Barrier.

Atomic Energy Council (*AEC*) constantly assigns one resident inspector for each nuclear power plant. There are normally 4 to 5 *AEC* technical staff performing this duty in rotate for each nuclear power plant. The duties of the resident inspector are as following:

- Monitoring the control room operator activities.
- Reporting the daily plant operating status to *AEC* headquarters.
- Performing the hold point check on surveillance test
- Issuing Memorandum for plant corrective action.
- Touring the plant to notice any abnormal circumstances of any equipment or system.

AEC sets safety operation rules for the safe operation of the nuclear power plant. If the *AEC* inspector finds any violation of the regulation or the plant procedure, a violation notice will be issued. For each violation notice, the nuclear plant shall submit corrective plans and make necessary actions. The violation notice could be closed after *AEC* reviewing and verifying the completeness of the correction.

The main regulatory activities of *AEC* can be categorised as following items:

- Outage Inspection
- Non-periodical Inspection
- Operation Experience Feed back
- Establish the safety conscious work environment
- Root Cause Analysis
- Local Worker's skill Qualification

The regular and irregular inspection of health physics is aimed to guarantee the radiation safety of operating personnel and to ensure the safety of environment. The main inspection items are radiation management organisation, radiation protection training program, internal and external exposure control, ALARA program, radiation instruments calibration, radioactive materials and contamination control, etc. In addition, in order to prevent radioactive gas and liquid from entering the environment and causing

adverse effect, *AEC* also regulates the discharge of radioactive substances and monitors environment radiation. When improper operations are found, notices of "violation items" or "improvement required items" are issued after inspection.

Besides the regular and irregular inspections, *AEC* also executes the review of the radiation safety semi-annual and annual reports, and the liquid and gaseous effluent monthly, quarterly and annual release reports.

3.9 CZECH REPUBLIC

SÚJB inspection programme covers all activities related to the use of nuclear energy and ionising radiation sources. It is carried out by the nuclear safety and radiation protection inspectors, who are appointed by the Chairman of *SÚJB.* The objective of the inspection programme is to verify how licensees comply with all license conditions and other safety regulations. Inspectors work at the headquarters or directly at the NPP sites, as well as in regional centres.

The inspection programme is prepared in accordance with *SÚJB* Internal Rules, specifying the unified approach in the planning of inspection activities of the nuclear safety inspectors, with the objective to obtain well balanced and sufficient information needed for the evaluation of how nuclear safety requirements are observed. The *SÚJB* inspection activities do not substitute for the responsible organisation (Operator) controls.

3.9.1 Inspection activities are composed of regular (general) and specialised parts.

Regular inspections are as a rule, performed by the resident inspectors and comprise of the observations, assessment and documenting of relevant Operator and Supplier activities. These activities are performed according to the inspection plan of the resident inspectors, and to a certain degree, also according to that of headquarters.

Specialised inspections are carried out in accordance with the Plan of Inspection Activity of *SÚJB* or following the resident inspectors recommendation, as a result of regular inspection findings, or in the case caused by an emergency.

A special part of the Plan concerning the NPP Temelin (under construction) is prepared especially with regard to activities related to construction and start-up steps. It includes mainly inspections of quality assurance of equipment and civil construction work, inspection of relating documentation and the course of personnel training.

The part of the Plan concerning NPP Dukovany includes inspections during operation and shutdown stages of the installation, as well as schedule of the regular inspections by the resident inspectors. This inspection plan is prepared especially with regard to the following aspects:

- annual operation plan,
- evaluation of the inspection programmes and operational safety during preceding period.
- how the *SÚJB* binding conditions and requirements are fulfilled,
- evaluation of the quality assurance programmes, and
- information acquired by the *SÚJB* individual departments.

3.10 FINLAND

Regulatory control of NPP operations contain reviews and inspections which can be divided into three categories as follows:

- Control of operation
- Topical inspections: state of vital components, plant modification, fuel reloads, control room operators, etc. Topical inspections are performed at request by the licensee, as required in YVL guides.
- Review and assessment of applications, plans, analysis, etc.

The control of operation in Finland contains:

- Periodic inspections as specified in plant specific programmes by *STUK*
- Reactive actions; event specific inspections / investigations
- Safety review and assessment: reassessment of the plants' safety cases. Consideration of operating experience/safety research/development of science and technology. These are included in the Annual Plan of the Department
- Resident inspectors controlling the day to day work at the site
- Periodic Safety Review which are made every ten years and connected to licence renewal.

Topical inspections cover areas including; qualification of personnel, event investigation, supervision of the outages, modification and repair of systems, in-service inspections, surveillance activities, start-up, nuclear fuel and nuclear materials, etc. Also unannounced inspections covering different activities of NPPs' organisation are performed especially during outages.

3.10.1 Periodic Inspection programme

The periodic inspection programme account for about 10% of the work load of the Nuclear Reactor Regulation department.

The inspections of the periodic inspection programme are focused on the licensee's activities which are most important to safety. The goal of the inspection program is to

- verify that the plant is operated and maintained according to regulatory rules, design basis and QA manual and procedures of the licensee
- produce an assessment of the status of the licensee activities to maintain and develop the safety of the plant and also to assess the safety policy of the management and operating experience feedback process

In general, to assess the functioning of the licensee quality system. The program also produces information for the development of the regulatory control.

An internal YTV guide has been prepared to help and guide the inspectors work. The programme, planning process, conducting of inspection, reporting, and individual inspections are described in that guide.

Inspections cover organisation and management, personnel training, conduct of operations, maintenance and repairs, technical support functions, fire protection, radiation protection, radiation safety of the environment, nuclear waste management, physical protection, and emergency preparedness. The inspection programme contains 15-20 inspections depending on the annual plan. Inspections are divided into three levels as follows:

A. Safety management:
   Level and development of the management's activities from the safety point of view.
   Attention is paid on the following areas of management activities: Quality management (mission, values, vision, short and long time planning processes, commitment of the organization to goals

and plans, follow-up of performance and results), Fulfilment of safety regulations, Co-operation with regulatory body, Safety culture issues. This inspection is performed once in two years.

B. Main processes:
Propriety of the safety functions in the main working processes. Special attention is paid on: the methods and procedures used in the main working processes, the interface between different working phases and on the feedback included into the main working processes: (B1) safety assessment and enhancement; (B2) operations; and (B3) maintenance. These inspections are performed annually.

C. Specific technical areas and organisational units:
The goal of these inspections is to verify the fulfilment of the set requirements in specific technical areas and organisation units: safety systems and functions; electricity and I&C; mechanical components; civil engineering and structures; use of PSA; information technology; chemistry; nuclear waste management; radiation protection; fire protection; emergency preparedness and radiological safety of the environment; physical protection; and Quality Assurance. These inspections (C1 - C13) are performed annually.

The annual plan also includes unannounced inspections. The topics and time of those inspections are not announced to the licensees before the inspections. Annually one or two unannounced inspections are conducted.

3.10.2 Planning process:

Annual plan of the periodic inspection programme is presented in form of timetable. Every inspection leader assesses his or her inspection and based on that assessment suggests whatever the inspection should be done and what would be the best month to conduct the inspection. The information of these assessments are catered up in one table and circulated in the department for comments by the co-ordinator of the programme. The final plan is submitted to the licensee for information.

The planning of an individual inspection is done by the inspection group. The leader of the inspection group has the overall responsibility for the planning of the inspection. The formation of the inspection group depends on the topics of the year. In most of the inspections the constant topics have been divided into several years. The annually changing topics depend on the experiences from previous inspections, possible incidents and plant modifications. The inspection group prepares a detailed inspection plan which is then submitted to the licensee for about one week before the inspection.

3.10.3 Conduct of inspections:

An inspection starts with a kick-off meeting. In the meeting the inspection topics, timetable and inspection methods are shortly discussed.

After the start up meeting the group may split up to review their own areas. There are usually two inspectors interviewing one person. Situations where there are employee and manager interviewed at the same time, should be avoided. An independent assessment of the status of inspection area is formed based on the material and findings collected before and during the inspection. Both major deficiencies and minor deficiencies especially in a case of repetition are noticed. During the inspection, the group may have meetings to discuss about findings and to build up a general view from the area. At the end, the results are compared against to the set criteria. Findings are written in protocol.

The inspection ends up with an exit meeting. The findings and general assessment of the status of the inspection area are presented to the licensee and a protocol is prepared.

3.10.4 Documentation and reporting of the inspections:

The deficiencies and findings are presented in the protocol. It is recommended that the requirements for corrective actions would be given in a *STUK*'s decision. Requirements for corrective actions can be given in protocol if there is need for rapid actions. In this way the information is circulated more efficiently in the department and similar requirements can be avoided.

Inspection report is prepared from every inspection. In the report the requirements for corrective actions and recommendations are presented with justifications. The development taken place after the previous inspection and issues according the inspection plan are also presented in the report. Also remarks considering regulatory work should be presented in the report.

An annual report is written describing the periodic inspection activities. It includes the execution of the programme, an assessment of the results of the inspections, the most important findings, the feedback from the licensee and next years programme.

3.10.5 Follow up of the programme:

The execution and the progress of the programme are followed with inspection meetings. The co-ordinator of the programme organises the meetings approximately once in two months. The inspection plans for coming inspections and findings from the executed inspections are presented by the inspector leaders. The memos of the meetings are distributed to the inspectors and management of the department. Through the meeting the department management gets information and feedback from the inspectors and it also changes information between inspections.

Annual seminar of the inspection activities is organised at the end of the year. The aim of the seminar is to give feedback to the inspectors of the implementation of the program, discuss about the results and forthcoming. It also serves as feedback tool from the inspectors to the department management and to the co-ordinator of the inspection program.

3.10.6 Inspections of specific technical and other topics

Nuclear power plant operation includes activities which can be implemented only after *STUK*'s approval for the activity has been granted. The approvals are tied to preceding inspections. It is also verified afterwards that the implementation complies with the plans and meets possible regulatory conditions. Requirements and obligations which apply to inspections of different topics are presented in YVL guides.

The inspections cover the following items: documents concerning operation; competence of operating personnel; outage planning and execution; refuelling of reactor; in-service inspections done or contracted by the operating organisation; in-service inspections as referred to in the Decree on Pressure Vessels; repairs, modifications, and preventive maintenance; post-outage plant start-up; procurement of nuclear fuel; safeguards; exemption of nuclear waste from regulatory control.

The important inspections which the operating organisation is obligated to request are the inspections of repairs and modifications. For all repairs of safety relevant components, as well as modifications of the safety systems the operating organisation has to present their plans in advance for *STUK* approval. The plans have to include technical documentation as needed to verify the acceptability of the functional features, structure, and materials of the repaired or new equipment. Also the repair or installation method, quality control, and tests after the work have to be presented. When the work has been completed, the operating organisation has to ask for construction and/or commissioning inspections.

Special attention has been paid to plant modification processes and documentation at Finnish nuclear power plants. The requirements for modifications designed by the utility and their independent assessment have been reassessed and included into appropriate YVL Guides that are now being updated. New requirements mean in practise that all safety significant plant modifications have to be assessed by a unit, which is independent of the design and implementation of the modification. Results of these assessments are to be included in the documentation submitted to *STUK*.

3.10.7 Safety assessment

Comprehensive and systematic safety assessment is an essential part of the licensing process and license renewal. As a condition for getting a license, both deterministic and probabilistic safety assessments (PSA) need to be carried out and be submitted to *STUK* for approval. Both assessments are kept up to date throughout the operation of the nuclear facility, reflecting advancement of science and technology. Changes in these documents are submitted to *STUK* for approval.

During the last 4 years the PSAs have been updated, and the scope of the PSAs has been extended at both nuclear power plants. Plant specific living PSAs, including internal initiators, fires, flooding, harsh weather conditions, seismic events for operation mode, and internal events for low power mode, have been completed for the plants. These PSA studies are used in support of decision making at the regulatory body and safety management at utilities, respectively. The risk informed regulatory scope at *STUK* is progressing towards Risk Informed In-service Inspection/In-Service Testing, and Risk Informed Technical Specifications activities. A related study has recently been completed by *STUK*.

Special attention has also been paid to seismic events in Finland, although Finland is not seismically active area. Training on seismic events (earthquakes, origin, measurements) in Finland was organised at *STUK* to increase awareness and consideration of seismic risks at nuclear facilities. Training included presentation of seismic PSAs for Finnish nuclear power plants and presentation of the report on seismic hazards in southern territory of Finland. Based on the PSA results, seismic events do not cause major risks in Finland. *STUK* is also reassessing regulatory requirements related to seismic events in Guide YVL 2.6.

3.10.8 Event specific inspections / investigations

STUK monitors operational events at nuclear power plants by resident inspectors and through a formal reporting system described in YVL Guide 1.5. In general, all operational events shall be reported to *STUK*. The licensees are obliged to report on all special situations or incidents that have, or may have, importance to the nuclear, personnel or radiation safety. This is done on event basis by special, reactor and turbine scram as well as operational transient reports. The Office of Operational Safety at the department of Nuclear Reactor Regulation is responsible for the preliminary assessment and screening of all operational events in Finnish nuclear power plants in *STUK*. Reports are also distributed to selected offices on the basis of necessary specialist know-how. In principle, all regular reports are submitted to *STUK* as a notice whereas special reports need *STUK*'s approval.

On the basis of a proposal prepared by the department of Nuclear Reactor Regulation, the department management will decide on the initiation of investigation and nomination of an investigation team. The nomination may take place either immediately or later in the regular department meeting. *STUK* initiates an investigation into events especially when the power company's organisation has not operated as planned, or when an event is assessed to lead to significant modifications in the plant's technical structure or procedures. A *STUK* investigation team is set up also if the power company has not investigated an event's root causes well enough. In addition, the team shall be nominated whenever the event has been classified at INES level 1 or higher.

The safety level of the nuclear power plants is re-assessed after any abnormal event, and the need for corrective measures is considered. To ensure a systematic analysis of the event and its causes, an investigation team by *STUK* is nominated. The team has to find out root causes of equipment failures and human errors and weaknesses in the performance of the operating organisation as a whole. At the end the team has to present a report including recommendations for corrective actions, intended to prevent recurrence of similar events. A similar parallel activity is required from the operating organisation, and it has to submit its special report for the regulatory body for approval.

A thorough evaluation of the situation at the Finnish plants is also done if an event reported from a foreign nuclear power plant is suspected to be such a nature that it might as well occur in our country. Besides feedback from the operating experience, safety reassessment is done on the basis of PSA studies and in view of new information gained from research programmes.

3.10.9 Verification of safety

Several requirements concerning the verification of the physical state of a nuclear power plant are given in the Decision of the Council of State (395/1991). More detailed requirements are given in YVL Guides.

Main programmes used for verification of the state of a nuclear power plant are

- periodical testing according to the Technical Specifications
- preventive maintenance programme
- in-service inspection programme
- periodical inspections of pressure vessels and piping
- surveillance programme of reactor pressure vessel material
- programmes for evaluating the ageing of components and materials.

Activities for verifying the physical state of a power plant are carried out in connection with normal daily routines and with scheduled inspections, testing, preventive maintenance etc. Activities are performed by the licensee personnel, and in the case of certain inspections by contractors approved separately.

Detailed programmes and procedures are established and approved by the licensee, and reviewed and, to some extent, approved by *STUK*. The results of tests and inspections are documented in a systematic way and used through a feedback process to further develop the programmes. The operational limits and conditions are provided in the Technical Specifications, which are subject to the approval of *STUK*. In general, the role of *STUK* is to verify that the licensees follow the obligations imposed on them and carry out all activities scheduled in verification programmes.

Comprehensive evaluations related to the state and operation of the Loviisa and Olkiluoto plants were carried out by Imatran Voima Oy and Teollisuuden Voima Oy in 1996-1998. These evaluations also covered the trial tests of the plants at the increased power levels. These activities were controlled by *STUK*.

The qualification of non-destructive testing (NDT) systems and procedures requires high priority in Finland. Implementation of qualified NDT systems has been started in Finland. *STUK* has decided that consensus document, EUR 16802 EN, shall be followed in Finland. ENIQ documents (European Network for Inspection Qualification) can also be followed. Application of the documents is still under discussion. A national strategy document for the NDT qualification has been written.

3.11 FRANCE

The main objective of the inspections is to ensure that licensees comply satisfactorily with safety provision requirements. These inspections are neither systematic nor exhaustive, and use spot-checking methods to

detect specific deviations or non-conformances, together with any indicators suggesting a gradual decline in plant safety.

These inspections give rise to findings, made available to the licensee, concerning :

- non-conformances in regard to plant safety or safety-related issues, requiring additional justification in the opinion of the inspectors,
- deviations between the situation observed during the inspection and the regulatory texts or documents prepared by the licensee, in application of the regulations, whether in the safety or environmental fields.

These inspections are planned within a yearly inspection programme which is set up at the end of the preceding year, according to a list of predetermined periodic topics to be dealt with (which cover technical issues or systems, as well as organisational matters), and also a few (1 to 4) up to date "priority" topics.

These inspections take place either at the nuclear sites or at licensee's corporate offices.

These inspections which are either announced to the licensee (85 % of them in 1999) or unannounced (15 %) belong to six different types:

- routine inspections
- work site inspections
- inspections conducted by senior inspectors on more specific topics,
- reactive inspections on particular events,
- inspections involving sampling measurements, like on effluent release.
- special team inspections on safety reviews, lasting 5 days and involving several inspectors and technical experts, to be planned about every 3 to 5 years for each nuclear site.

As an example, it can be said that 696 inspections have been planned for 2001, nearly half of them at PWRs (58 units on 19 NPP sites, the licensees being the NPPs, belonging to EdF), the rest at the other plants, and nearly 10 % on transportation.

The inspections are carried out by 120 commissioned inspectors or so, one third of them being senior inspectors, nominated by a special committee.

It must be added that the main inspection results, showing licensee's weak and strong features are compiled in a yearly assessment NPP report, called "monographie".

3.12 GERMANY

The inspection programmes cover all activities of the licensee related to the legal requirements and to the provisions of the Construction and Operational Licence of the plant.

During the construction of a nuclear installation or during implementation of modifications so-called accompanying controls are carried out, which are designed to ensure that the manufacturing, construction and testing of all safety systems and components comply with the requirements of the permit. After start of operation, inspections are carried out at regular intervals.

The supervisory programme during the plant's service life includes:

- monitoring compliance with legal regulations and licensing notifications, compliance with safety regulations and guidelines,
  - compliance with physical security regulations
  - inspection for safety deficits
  - safety reviews, assessment of licensees safety reviews
  - normal operation, recurrent inspections and in-service inspections and tests
- evaluation of abnormal occurrences
- approval of minor modifications (major modifications require a licence)
- control of radioactive discharges
- operating the KFÜ-System (automatic transfer and recording system of important nuclear power plant-status, emission data and selected operation data)
- radiation protection monitoring of personnel and environment, independent control of radioactive emissions and immissions
- control of the licensee's QA-programmes
- control of professional skills of the operation personnel and training programmes

In addition to monitoring compliance with legal regulations and requirements, the regulatory supervision is requesting the licensee to constantly improve on the plant's safety status.

Onsite visits at the plant take place on average of about once a week. Personal contacts are made at different levels (plant manager, shift supervisor, RP manager, section heads). Operational procedures, testing procedures and the General In-service-testing Programme is reviewed by experts or expert organisations (TÜV) assigned by the regulatory authority. (see chapter 7). Also, experts supervise in-service inspections and tests and review their results. There are topical team inspection meetings at regular intervals involving the licensee, the experts and the regulatory authority. There are no resident inspectors at the site.

Complementary to the regular and continuous inspection programme, a Periodic Safety Review (PSR) including a probabilistic safety assessment (PSA) and a deterministic safety status analysis is carried out at 10 year intervals for all operating nuclear power plants. This PSR is reviewed by the supervisory authority involving their expert or expert organisations. Necessity and urgency of safety improvements are identified by such PSRs. Federal regulatory guides and associated technical documents describing details of the analysis have been provided. The licensees of German NPP have committed themselves voluntarily to carry out PSRs. According to the agreement between the Federal Government and the Utilities of June 2000, (see under 1.12) the PSR will become a legal obligation.

The supervisory authority may order to discontinue any situation which is contrary to legal provisions or conditions of the licence or which causes danger to life, health or property through the effects of ionising radiation. It may, in particular, order that (specific) safety measures be taken, that radioactive substances be stored or kept in custody and that the construction or operation of a nuclear installation be suspended temporarily or permanently.

On behalf of the Federal Government, the BMU ensures, that the instruments available to the *Länder* Authorities are used uniformly and effectively with regard to law and expediency. In particular, the BMU:

- requests regular reporting on operation experience
- involves advice of the Reactor Safety Commission (RSK) and of the Commission on Radiological Protection (SSK)

- involves a central registration office for reportable events at the Federal Office for Radiation Protection (BfS) and in-depth evaluation by the Gesellschaft für Anlagen- und Reaktorsicherheit (GRS)
- evaluates accumulated operational experience nation-wide and international

3.13 HUNGARY

Inspection activity of *HAEA* can be categorised by the frequency and to the subject of the inspection.

By the frequency there are daily, quarterly, occasional, and exceptional inspections.

According to their subject the inspections may concern manufacturing-maintenance, normal operation, research reactors, cyclical tests of reactor units and unit start-up tests.

In order to supervise nuclear safety the *HAEA* NSD – in all phases during the life cycle of nuclear facilities – regularly inspects the fulfilment of provisions prescribed in applicable laws and in the Safety Regulations, including the quality assurance system of the nuclear facility; the fulfilment of conditions and the execution of instructions issued by *HAEA* NSD represent the basis for issuing of a license;

The *HAEA* NSD inspects design, manufacturing, import (from the viewpoint of safety), installation, commissioning and operation, modification, dismounting (piece or standard) activities related to safety classified equipment and fuel of nuclear installations, and also technical radiation protection activities.
HAEA NSD inspects the nuclear related buildings, their structures and the connected construction activities.

HAEA NSD inspects directly or via a designated institution the quality assurance systems of organisations taking part in licensees' activities related to nuclear installations, systems and equipment.

The most frequent inspection activity is the one related to the normal operation of the nuclear power plant units. Phases of the inspection activity, as well as the process in which the inspector is bound to compile a record on the inspection are defined in the inspection procedure. During regular daily inspections the inspector visits the plant control centre and the control rooms, inquires about the actual technical parameters of the units, about the status of the scheduled tests and about any other unforeseen events. During regular monthly inspections, a selected specific area is controlled, this inspection may be linked to investigation of an incident or accident or to any other operational activity.

If it is so stipulated in the relevant manufacturing and import license, the representative of *HAEA* participates in the inspection of the manufacturing process.

If failure of safety classified equipment is revealed during maintenance operations, the information related to the failure is recorded by NBI in the framework of a survey.

3.14 ITALY

Section 10 of Decree no. 230 of 1995 governs the inspection of activities covered by this Decree and by Act no. 1860 of 1962. It is responsibility of the *ANPA* to check that the installation is constructed in accordance with the initially approved project and to supervise the carrying out of the nuclear tests. To this effect, the *ANPA* inspectors, who are appointed by the *ANPA* Chairman, are vested with wide powers, both as regards inspection of the installations and access to documents. They are also empowered to undertake regular inspections of installations during operation.

The vigilance activities may be either:

- ordinary (planned in advance for each technical area) or
- extraordinary.

After Chernobyl accident, Italy stopped definitively the nuclear power plants for energy supply. Consequently, all the NPPs are at present shut down and, at different levels, under decommissioning.

In this new situation, the vigilance activities are mainly devoted to the verification of right respect by the licensee of the technical prescription referring (if applicable):

- containment and ventilation systems;
- handling systems for fuel assemblies;
- radiation monitoring;
- environmental impact (discharges);
- radioactive waste systems;
- approved activities for decommissioning such as decontamination, waste treatment, etc;
- organisational structure of the operating organisation;
- emergency procedures and emergency plan;
- role and requirements of plant personnel responsible for safety.

The inspections are planned on the basis of a 12 month cycle; if necessary, for particular situation (for instance fuel discharge from the vessel, decontamination activities, abnormal behaviour), this programme may be readjusted.

3.15 JAPAN

The licensees of a reactor shall undergo periodical inspection by the ANIS within a period not exceeding one year according to the RNNR Law.

The approval of a construction plan or a design and construction methods prescribed in the RNNR Law is required for the maintenance/modification as well as the new construction, and pre-operation inspection shall be undertaken before the start of the plant.

Referring the lessons from the criticality accident at uranium fabrication plant in Tokai-mura in September 1999, the RNNR Law was amended and the Special Law for Nuclear Emergency Preparedness(hereafter referred to as the NEP Law) was enacted to enhance the measures for securing nuclear safety and preventing nuclear disaster. The ANIS and *MEXT* have assigned nuclear safety inspectors to post in the municipality located nuclear facilities and has undertaken safety inspections of their observance of the safety rule (self-safety regulation) four times a year. Additionally, entry inspections of nuclear facilities shall be undertaken as appropriate to check the observance of safety regulations.

In 1992, the ANIS issued a notice requesting the licensees of a commercial nuclear power plant to undertake periodical safety review voluntarily at a certain interval (about 10 years), including feed back of operation experiences obtained so far, application of latest technical knowledge and probabilistic safety analysis specific to the plant. The review results shall be reported to the ANIS.

The ANIS, based on the statement by JAEC in 1992, has examined and reviewed the technical feasibility of the accident management proposed by the electric utilities.

3.16 KAZAKHSTAN

The inspection programme covers all activities related to the legal requirements and to provisions of the site, construction, operation licenses of the nuclear installations.

There is special division at the Central Office of the *KAEC* of Inspection and Analysis which conduct inspection activities. Inspection activities are headed by the Deputy Chairman. (The inspection programme consists of routine inspections and special inspections).

KAEC has 3 resident inspectors, who are located at each NPP. Every 3 months resident inspector shall to issue quarter report for Central Office of the *KAEC*. In case of emergency he shall reported immediately.

3.17 REPUBLIC OF KOREA

In Korea, regulatory inspection programmes include the pre-operational inspection, periodical inspections, quality assurance inspections, daily inspection conducted by resident inspectors, and special inspections as follows:

- Pre-operational Inspection ***(KINS)*** - The applicant shall be subject to pre-operational inspection to prove the performance of the reactor facility meets safety requirements specified in the relevant technical standards. If utility passes all pre-operational inspections, then the Operating License is officially issued by the Ministry of Science & Technology (*MOST*).

  If these functional test results are unsatisfactory and/or inspectors decide on proper corrections which should be made to improve the performance of the equipment and components, official findings or recommendations are issued, which should be followed up and resolved to pass the pre-operational inspection..

- Periodical inspection (KINS) - In accordance with the provisions of the Enforcement Decree of the Atomic Energy Act, the licensee shall be subject to regulatory periodical inspection, which is usually conducted on an annual basis. This inspection should confirm that the performance of reactor facility, designed to withstand pressure, radiation, and other operating environments, is actually maintained in the state of passing the pre-operational inspection. The Government, then, approves the re-start of the plant.

  Periodical inspection consists of standard inspection items (usually 50 - 60 items) which are established for each reactor type. It also includes some special inspection items selected strategically based on the operating history as well as on the experiences gained through the previous operating cycle. The inspection items are developed to cover all the safety related technical areas and operational aspects of the plant. During periodical inspection, inspectors also review the related utility documents, observe utility activities, and evaluate maintenance and test records.

- Quality Assurance (QA) inspections *(KINS)* - This inspection is carried out on an annual basis by *KINS* inspectors to check whether the quality assurance activities of the utility are performed in accordance with the QA programme submitted to and approved by the regulatory body.

- Daily inspections (Resident Inspectors) – The operational safety of an NPP is continuously monitored through daily inspections at the plant by resident inspectors. The Resident Inspectors Office at each plant site consists of several government officers and *KINS* staff. They monitor the safety parameters and review the station logs everyday to confirm whether the plant is operated in

compliance with the plant's technical specifications. They also routinely witness safety-related functional tests such as the start-up test of the emergency diesel generator, etc.

- Special Inspection - If an event or a significant safety system failure occurs, the resident inspectors investigate the event and report it immediately to the *MOST* and *KINS*. If the *MOST* decides that the event is safety-significant and that an in-depth investigation is necessary, a joint special inspection team comprised of *MOST* and *KINS* staff will be organised and assigned to the site. This inspection is controlled and co-ordinated by the *MOST*.

3.18 MEXICO

The inspection programme for nuclear power plants is carried out in two departments in different division within the *CNSNS*, one of them is devoted to inspect the following aspects: Construction Programme, Operational activities, and Trend analysis, the other has been devoted to topics related with radiological protection and emergency preparedness. Due to the specialisation of the people of radiological protection, this matter is under control of the Office of Radiological Safety.

The inspection programme is orientated to cover the following activities: Periodic inspections (annually programmed), Resident Inspector inspections, and inspections on demand basis to cover special events (like operational, shutdown, reloads, etc.).

Periodic inspections are programmed on an annual basis and focused on the typical utility activities; organisation responsibilities, maintenance, operation, QA/QC, ISI, operation experience, design modifications, engineering, fire protection, radiological protection, emergency preparedness and security.

Inspections performed on research reactors and pilot fuel fabrication plants are less intensive in activities but also comprises of: personal training, radiation protection and quality assurance. Normally there are at least two inspections per year.

Resident Inspectors inspections are carried out continuously. *CNSNS* has two resident inspectors (one for each nuclear power plant unit). Their responsibility is to cover the following aspects: Operating procedures, safety systems, control room tours and management.

Special team inspections are usually initiated in response to an unexpected, unplanned or unusual situation or event at a nuclear installation. The main objectives are: to find out the root causes of equipment failures or weaknesses in human/organisation performance.

3.19 THE NETHERLANDS

The supervision tasks of *KFD* regarding inspections are; to perform inspections and audits at nuclear power installations, in order to assure they fulfil requirements of the Nuclear Energy Act and license, to compare operational characteristics with the safety concept of the original license, and to utilise various enforcement instruments depending on the seriousness of the shortcoming.

The general inspection programme covers all aspects of operation and is performed in a cycle of about three years. This programme consists of; basic inspection plan (operation, system walk downs, maintenance and surveillance), management inspection plan (licensee's organisation, management and administration of surveillance, maintenance, radiation protection, etc.), active / reactive inspection plan (incidents and other important selected items), and team inspection plan (operation, maintenance, refuelling stops, and special items). Specific inspection procedures to implement the general inspection programme are written.

The (only) nuclear power plant is inspected twice a week. Of each inspection a report is made and, when applicable, actions to correct deviations are listed. A regular check on the implementation of these actions is made. At least two times a year an audit is also held by the Regulatory Body.

At the end of each year the inspection process and the results of the inspections are evaluated. The result of the evaluations is presented/discussed with the licensee. In the public annual report of the *KFD* all important items concerning inspections are presented.

All INES-events (including INES 0), occurred in the Netherlands, are reported to the Parliament.

3.20 PAKISTAN

The inspection activities of *PNRA* covers all aspects of nuclear power programme. For the under construction power plant at Chashma, *PNRA* has established Regional Nuclear Safety Inspectorate *(RNSI)* with a mandate to carry out surveillance during all phases of the project. In addition a programme of inspection of the safety related equipment at the manufacturer's site has also been established. For KANUPP two type of inspection is carried out. Regular inspections are carried out quarterly, in addition special inspection team visit KANUPP after every safety significant event.

3.21 RUSSIA

The inspection programmes cover all activities related to the legal requirements and to the provisions of the site, construction and operational license of the plants. Regulation for inspection activity establishes requirements to inspections preparing and implementing.

The Central Office of the Gosatomnadzor of Russia conducts scheduled inspections periodically - each plant once every 5 years. The periodical inspections of Central Offices (Complex Inspections) comprise the wide range of the NPP activity:

- management,
- operation,
- maintenance,
- nuclear safety,
- testing of safety systems,
- resource of equipment (its condition),
- radiation safety,
- account and safeguard of nuclear materials,
- spent fuel and radioactive wastes management,
- event investigation, training of personnel and so on.

Usually the regional inspectors are included in these inspections too.

Health physics lie outside the scope of the activity of Gosatomnadzor.

Additionally the Central Office conducts inspections of some complicated reporting events and of NPP readiness to physical start-up and to commissioning and performs specific inspections preparatory to issuance of license.

Regional bodies conduct their own inspection programmes according to annual plans. These inspections are conducted with participation of site inspectors. They include more detailed investigation of several directions of the NPP activity – operation, maintenance, training of personnel and so on. Additionally

Regional bodies conduct inspections of organisations, rendering services for NPP, before issuance of license.

Usually inspections are planned and the main programmes known to the operator.

Site inspectors at each NPP carry out routine inspections of all activity, related to safety, and specific inspection of readiness to some types of works. Such inspections are conducted before outage, start-up after outage and shutdown, welding, modification, some specific testing of safety systems.

Inspection results are reported every 6 month to the Central and Regional offices of the Gosatomnadzor of Russia.

The reportable events are specified by the reporting criteria and subdivided into categories. Normally site inspectors participate in investigation of reporting events from the very beginning and perform special inspection of NPP readiness to start up.

Normally The unplanned inspections will be carried out by some emergency events on the NPP and under the instructions of the heads of the Central or Regional offices.

Purpose inspections are focused on one or several specific technical topics including: operational safety, maintenance, qualification of personnel, event investigation, nuclear fuel management, radioactive wastes and discharges, quality assurance, physical protection and others. They may be conducted by individual inspector or by team of inspectors.

The tasks to be performed during plant inspection are:

- visual inspection of the plant;
- review of the operating records kept by the plant operator;
- review of the plant instructions condition;
- examination of adherence to the rules and safety specifications, licenses conditions, previous prescriptions and so on;
- completeness of investigation of reporting events;
- other problems such as, for instance, Millennium Problem.

3.22 SLOVAK REPUBLIC

The basic philosophy behind the *UJD* inspection programmes is to ensure the safety of the nuclear facilities and thereby to avoid endangering the environment, the health and the lives of people.

The inspection programme for the nuclear facilities is carried out by the Inspection Branch which is headed by the Chief Inspector. There are four (4) departments with main activities devoted to:

- Nuclear Safety Inspection and Assessment
- Systems and Components
- Nuclear Materials
- Radwaste and Decommissioning

There are resident inspectors located at each nuclear power plant site. The Inspection programme consists of routine, special, team and retroactive inspections. Areas generally covered by inspections include:

- Plant operation - operational safety verification
- Emergency systems verification

- Events investigation
- Fire protection
- Maintenance
- Surveillance programs
- Plant security / physical protection
- Engineering / technical support
- Commissioning
- Personnel training
- Nuclear waste management
- Nuclear fuel storage and transports
- Safety control of nuclear materials
- Major outages, modifications
- Decommissioning.

Types of inspections include:

- Core inspection programme - routine inspections carried out by resident inspectors
- Special planned inspections
- Special unplanned inspections
- Team planned inspections
- Team unplanned inspections
- Retroactive inspections.

Long term planning - *UJD* issues annually the long term inspection programme. This programme fully covers Core inspection programme, Special and Team planned inspections.

Unplanned inspections - they are initiated by the *UJD* in response to unexpected, unplanned or unusual situations, occurrences or *UJD*'s needs. Inspection can be occasioned by a single situation occurring at a particular plant or can be a response to a generic problem encountered at another plant or identified by the review and assessment of inspectors.

3.23 SLOVENIA

The section of inspection control within *SNSA* consists of the section head and 4 inspectors for nuclear and radiation safety. There is one additional inspector in the Section of Radiation Safety. The main task of the inspectors is to perform inspections in compliance with the regulations and to determine scope and depth of the inspection.

The inspections are planned in accordance with the general annual programme of inspections, which is divided by the nuclear facilities and by the type of inspection. After the end of each 3 month period the inspection reports are reviewed and compliance of the objectives and the scope of the inspections with the general annual programme are established. The new 3 month plan is then amended according to the findings given in the review of the inspection reports. The general annual programme is divided into the following areas:

- Operation of nuclear installation
- Radiation surveillance
- Maintenance and surveillance tests
- Emergency preparedness
- Physical protection
- Modifications and training

- QA/QC
- Other activities

Other activities comprise inspections after reactor trips or abnormal events, follow-up inspections, "post-outage" inspections, inspections of recommendations of international safety missions and similar activities.

The inspections are organised as a single or as a planned series of inspections in order to determine whether the licensee's actions meet regulatory requirements. The inspections can be (a) planned or (b) non-planned (e.g., inspections which cover reactor trips, abnormal events, etc.). Planned inspections can be announced or unannounced.

There are no resident inspectors that would have an office on-site, but the continuous monitoring of the nuclear power plant performance is performed through the planned inspections of 2 inspectors once or twice a week (there are about 100 such inspections per year). The inspection report is written on the spot and a copy of this report is handed over to the plant staff.

3.24 SOUTH AFRICA

The resident inspectors carry out inspection for licence compliance based on a risk approach which targets those areas and activities of highest risk. Random inspections are also undertaken in response to the dynamic requirements of the plant states, occurrences and operating trends.

The inspection programme is computerised and generates inspection requests for action and records inspection results for trending and history. The scope of the inspections covers the full range of licensed activities including operations, maintenance, ISI, NDT, fuel, chemistry, radiation protection, effluent and waste management, environmental monitoring, emergency planning and preparedness, physical security, quality management.

Daily visits are made to the control rooms and all aspects of operator training and requalification are monitored. The *NNR* maintains a permanent examinations staff at the plant responsible for regular examination and licensing of plant operators.

Information is made available through an annual report of the *NNR* activities and performance, and in addition is supplied to the media and public on an ad hoc basis through press releases and meetings with interested parties.

At Koeberg, the *NNR* site staff also monitors the plant, utilising self developed regulatory safety indicators.

3.25 SPAIN

The *CSN* has different inspection programmes for nuclear power plants, nuclear fuel facilities and radioactive installations (medical and industrial).

Over the last 5 years the number of inspections carried out by the *CSN* has been almost the same. About 190 inspections to NPPs, 60 to nuclear fuel facilities and 500 inspections to radioactive installations have been carried out during 2000. Furthermore, other minor activities as transport of nuclear fresh fuel and radwaste, X-rays medical installations, medical and dosimetry authorised services and companies that import radioisotopes for medicine and industry are inspected also by the *CSN*.

The human resources dedicated to inspect the 9 Spanish nuclear power plants (7 sites) have been 20.000 hours during the year 2000, apart from the activities of the 12 resident inspectors. The average is 100 hours

per inspection, taking into account the preparation tasks, realisation and post-inspection activities. The real time of presence in the plant is about 30 hours per visit.

The *CSN* inspection programme for nuclear power plants includes three types of inspections that are described as follows:

- Systematic inspections
- Specific inspections
- Reactive inspections

The **systematic inspections** are a group of generic inspections conducted to the main processes of the plant in a systematic way during a period of 2 years. There are 25 processes of the operation plant that should be inspected at least once every 2 years in all nuclear plants. These processes are as follows:

- Operation activities
- ALARA management
- Control of radioactive effluents
- Chemistry of the reactor coolant
- Management of maintenance
- In-service inspection activities
- Life extension programmes
- Design modifications management
- Quality Assurance programme
- Operational cycles and refuelling design
- Safety during shutdowns programmes
- Emergency preparedness
- Fire protection programmes
- Training of the operation staff
- Performance of the dosimetry service
- Environmental radiological impact surveillance
- Radioactive waste management
- Corrective and preventive maintenance performance
- Equipment qualification programme
- Purchases and suppliers management
- Technical support to the operation
- Operating experience management
- Human factors
- Site parameters surveillance programme
- Health physics

These inspections should be carried out by specialist in the different areas using generic inspection procedures and systematic check-lists. The scope of the inspections is independent of the plant performance. The human resources dedicated to the systematic inspection programme are about 50% of the total resources for inspection activities in the *CSN*.

The **specific inspections** are usually planned inspections conducted to the main activities performed in the plants during the year or special tasks according to each plant situation. Licensees send to *CSN* an annual programme that containing the main activities planned to perform in the plant during the year, and it includes refuelling activities and design modifications. In many cases, these inspections have to be planned in a shorter period, so the annual plan is reviewed every 3 months and a formal review is carried out every 6 months to cover unplanned activities and changes that happen along the time. This type of inspections are used also to close deviations from past inspections and as support of licensing processes carried out by the *CSN* in each plant. Specialists who carry out inspections are the same that assesses the licensing processes, so both activities can be complementary. The human resources dedicated to these inspections are about 40% of the total.

Finally, **reactive inspections** are carried out due to unusual events, incidents, checking corrective actions taken by licensees, and others. Usually, these types of inspections are a 10% of the total inspection activities over the year.

Additionally, resident inspectors cover operational safety areas including plant operations, health physics, chemistry, maintenance, technical support, training, and emergency preparedness. A report summarising its activities is issued monthly to the *CSN* headquarters. Usually, this report is showed to licensees and they

discuss the deviations and findings directly. If the deviations are significant to safety, enforcement activities will be conducted according stated procedures.

According the procedures, a written inspection report is made for each inspection and signed by inspectors. These reports are sent to licensees in two weeks for comments and licensees have to return the reports and comments if any in two more weeks. The inspectors have to analyse the licensee comments and write a paper with their position about them. At this moment the inspection activities have finalised and start the enforcement activities if needed. The inspection reports with all comments are public documents and they are send to the Ministry to be on file. The original records are available in the *CSN* files and a copy is distributed to the project manager of the plant.

Enforcement activities are carried out from headquarters staff, following inspection findings. The initial proposals are made from inspectors and then, a management procedure about how to proceed has been established in the *CSN*.

3.26 SWEDEN

In accordance with legal authorisation and the mandates define by the Government, SKI and SSI conducts regular inspections and assessments of the Swedish reactors to ascertain compliance with regulations and licence conditions.

The programme of inspections put most emphasis on systematic evaluations of the quality of safety work at the installations.

SKIs has made a few modifications from earlier inspection practice. Only one type of inspections is carried out, i.e. topical inspection with a team of experts, to find out the licensees compliance with relevant regulations. Topical inspections aim at deeper insight into the quality of licensee activities in particular topical areas. These inspections are documented in extensive reports covering the purpose and objectives of the inspection, observations, compliance and deviations from requirements, an assessment of the extent and safety significance of the deviations and a proposal on further regulatory action. Careful planning is needed for these inspections documented in an inspection plan.

Earlier routine or regular inspections have been transferred to another manual and renamed “covering of current plant issues”. The purpose with this practise is to be kept generally informed about activities at the plants, to collect information about plans status of ongoing projects, etc. Another purpose is to have a practical possibility to detect early signs of deteriorating performance. The SKI inspectors visit each site several days per month. The annual outages for overhauls and refuelling are subject to intensified from SKI. The information is mainly used by SKI for preparation and planning of regulatory activities. Preparation and documentation is much simplified in comparison with a formal inspection.

All inspection procedures are described and documented in internal quality manuals. Written reports that are open for the public are required. According to SKI regulations, detailed inspections related to structural integrity are performed by third part control and testing organisations.

3.27 SWITZERLAND

The inspection programme covers siting, construction, commissioning and operation. Routine inspections cover all items of an operating plant, which cannot be handled by headquarters office. Non-routine inspections are mostly dedicated to hardware problems or modifications, and to a smaller extent to management problems.

Most visits are scheduled for case of preparation and to accommodate NPP staff availability. Unscheduled visits are not considered unless the licensee or his personnel have deficiencies in safety culture. Access is possible without escort of the licensee, although is required or preferred to improve efficiency.

Types of inspections include:

- Monthly inspection of the plant co-ordinator (site inspector) - operating history, monthly reports, reportable events, modifications, maintenance activities, tests, etc.
- Periodical specific technical inspections - operating mode, availability of safety relevant equipment, compliance with operating limits, test programmes and procedures, functional tests, surveillance programmes, QA, radiation protection, personnel licensing, etc.
- Special extraordinary inspections of non-periodical cause - Incidents or other relevant events, major repairs, modifications, backfitting, special tests, reassessments, etc.
- Periodical meetings with NPP management - meetings on operating experience (once every 3 months) and meetings on managerial level (twice per year).

Health physics aspects, waste management and operator performance (such as licensing of operational staff) are covered by the inspection practices of *HSK*. On security aspects, a different federal department is responsible.

3.28 UNITED KINGDOM

NII allocates a site inspector to each licensed site. Typically, a power reactor station consisting of 2 reactors will have a single site inspector responsible for inspection duties. The site inspector carries out a range of duties including planned inspections, re-active inspections and management of modifications proposed by the licensee which require *NII's* involvement (Major projects are managed by a separate group of inspectors). Site inspectors call upon the resources of Specialist Inspectors who specialise in specific topics to support them in these duties. *NII's* inspection activities are similar at all types of nuclear installations, though different inspection frequencies and coverage may be appropriate.

Planned annual programme of inspections are carried out at each site to confirm that licensees comply with the license conditions and other regulations. The topics covered in each programme include:

- Control of the site and Nuclear Matter
- Quality Assurance and Control of Records
- Investigation and Reporting
- Instruction, Training and Authorisation of Persons on the Site
- Emergency Preparedness
- Advice on Nuclear Safety
- Control of Safety Cases
- Control of Plant Design and Status
- Control of Employee Doses
- Control of Operations
- Plant Shutdown and Test Requirements
- Control of Waste

Planned inspections also cover other nuclear safety related topics such as pressure and lifting systems and management of safety. In addition, a small number of team inspections or audits are carried out when a particular need has been established.

Inspections can cover checks on the adequacy of licensee's arrangements; checks for compliance with relevant safety legislation, license conditions and licensee's arrangements; plant inspection; witnessing of

activities; discussion with management, operators, and work people; and checking of records. Site inspectors also take part in liaison meetings with representatives of members of the public who live near the nuclear facility.

Each Site Inspector spends about 30% of working time on the site, in typically 20 visits per year. Following an inspection visit, the Site Inspector writes a report on the activities undertaken and implements any necessary follow-up actions. The remainder of time is spent on management of modifications and changes to safety cases and modifications, assistance to other Site Inspectors, licensing activities, training. etc.

Further details may be found in the document "The Work of *HSE**'s*** Nuclear Installations Inspectorate" published by *HSE*.

3.29 UNITED STATES

NRC's inspection program is its principal process for collecting information about licensee performance. NRC inspectors perform a fundamental mission in collecting this information and determining whether or not licensees operate their plants safely and in accordance with their regulatory requirements and commitments. NRC has resident inspectors assigned to each plant site and augments the inspections, as appropriate, by sending additional inspectors from NRC regional offices and headquarters.

The inspection program emphasises achieving a balanced look at a cross- section of licensee activities important to plant safety, reliability, and risk, as well as other licensee activities that may warrant additional attention, while recognising that NRC has a finite amount of inspection resources. The inspection program is intended to provide regional administrators flexibility in the planning and application of inspection resources to deal with risk-significant issues and problems at specific plants. Inspections are planned on the basis of a 12-month cycle and are updated semi-annually to reflect any changes in performance that may require a readjustment of inspection resource allocation. The inspection program is discussed in greater detail in NRC Inspection Manual Chapter 2515, "Light-Water Reactor Inspection Program - Operations Phase."

NRC's inspection program generates data and information about licensee performance and documents this information as findings in inspection reports. The findings from inspection reports are summarised in a Plant Issues Matrix (PIM) for each plant. Inspection findings are evaluated for significance so that the level of NRC response is appropriate to ensure the issues are corrected. For findings related to reactor systems and functions, NRC uses a risk-informed approach called the significance determination process (SDP), which uses generic and plant-specific risk information to assess most inspection findings for risk significance. All inspection findings determined to be significant are used as input to the assessment process and generally prompt additional inspections, called supplemental inspections, by the NRC.

The SDP categorises the safety significance of inspection findings using a colour scheme similar to performance indicators. Green findings are issues that represent licensee performance deficiencies that result in very low safety significance impact to the public. White findings are issues with low to moderate safety significance that may require additional NRC inspections. Yellow findings are more serious issues with substantial safety significance that require NRC action. Red findings represent issues with high safety significance that involve an unacceptable reduction in safety margin and result in significant NRC actions that could include ordering a facility to shut down. Detailed guidance for the SDP is contained in NRC Inspection Manual Chapter 0609, "Significance Determination Process."

The inspection program is comprised of the following three major elements.

3.29.1 Baseline Inspections

The risk-informed baseline inspection program is the routine level of inspection conducted at all power reactor facilities, regardless of licensee performance. It is designed to detect indications of declining safety performance in key areas. Licensees performing at a level not requiring additional NRC oversight are typically inspected only at this level of effort. The baseline program is conducted by the resident and region-based inspectors, who inspect licensee performance across seven "cornerstones of safety" (i.e., initiating events, mitigation systems, physical barriers, emergency preparedness, occupational radiation safety, public radiation safety, and physical protection). The baseline inspections in certain cornerstones (e.g., emergency preparedness, radiation safety, and physical protection) are typically performed by region-based specialists. Licensee performance within cornerstones is assessed by a combination of both performance indicators and inspection results.

The scope of the baseline program is defined by inspectable areas that are linked to the cornerstones of safety. The baseline program includes inspections for those areas in which no performance indicators have been identified and in which performance indicators do not fully cover the inspectable area. It also includes periodic verification of a licensee's process to collect and report performance indicator data. The baseline inspection program assesses licensee performance in cross-cutting areas (i.e., human performance, safety-conscious work environment, and problem identification and resolution) through either direct inspection or inference from performance indicators and inspection findings.

The baseline inspection program is risk-informed by selection of the inspectable areas based on their risk importance in measuring cornerstone objectives; determination of the inspection frequency and sample size for each inspectable area based on risk information; and selection of sample activities and equipment to inspect in each inspectable area based on risk insights that incorporate plant-specific information.

3.29.2 Plant-Specific Supplemental Inspections

Supplemental inspections are conducted at a facility when significant issues are identified either by the SDP as significant inspection findings or when performance indicator thresholds are exceeded. In general, supplemental inspections are performed for white, yellow, or red performance issues (based on either performance indicator or inspection findings), although NRC regions may decide not to inspect issues identified by a licensee's self-assessment. These are more diagnostic inspections than the baseline inspections and are designed to root causes that are beyond the scope of the performance-oriented baseline inspections. The scope of the supplemental inspections consists of a range of activities which may include oversight of licensee root-cause evaluations, expansion of the baseline inspection sample, a focused team inspection (as necessary to evaluate the extent of condition), or a broad scope, multi-disciplined team inspection for substantive safety performance issues to examine multiple cornerstone areas and inspect cross-cutting areas.

3.29.3 Generic Safety Issues and Infrequent Inspections

Concerns with safety issues that have generic applicability for many facilities may be addressed through a combination of NRR's license review process, regulatory communications issued to licensees, and one-time inspections under the safety issues program element. Examples of these inspections could include steam generator replacements or upgrades to digital instrumentation. This element of the program also includes infrequently performed inspections such as those conducted to fulfil NRC obligations under interagency memoranda of understanding.

The NRC assigns at least two resident inspectors to each operating reactor site. Their primary job is to observe, evaluate, and report on the adequacy of licensee nuclear safety activities concentrating on day-to-day licensee operations, event follow-up activities, and licensee activities and processes important to safety and reliability. In addition, they co-ordinate on-site activities of the various agency offices and participate

in emergency exercises. Resident inspectors carry out the major part of the baseline inspection program and participate in other inspections at their assigned site.

Vendor/contractor inspections are reactive in nature and determine whether suppliers of materials, components, and services used in nuclear power plants are complying with NRC requirements. The NRC has the authority under the Energy Reorganisation Act of 1974 to perform inspections of records, components, systems, and of the premises of organisations (i.e., vendors and contractors) providing components or activities important to safety to oversee the commercial nuclear industry to determine whether its requirements are being met by licensees and their contractors. However, the NRC does not perform routine periodic audits or inspections of vendors or contractors. Rather, the majority of the effort to ensure compliance with the regulations is performed by the licensees. The licensee is responsible for developing and maintaining a detailed quality assurance (QA) plan in accordance with 10 CFR Part 50, Appendix B requirements. Through a system of planned and periodic audits and inspections, licensees are responsible for ensuring that suppliers, contractors and vendors have suitable and appropriate QA programs that meet NRC requirements, guides, codes, and standards. Although the NRC does not routinely inspect suppliers, contractors or vendors, the NRC does perform inspections if there is an allegation implicating these entities and the allegation has some merit for further investigation.

Reactor operator licensing requalification inspections were implemented as part of the FY 1994 amendment to the NRC's operator licensing regulations. The NRC uses this performance-based inspection program to evaluate licensee examination and training programs and to improve operational safety through early identification and correction of programmatic weaknesses.

CHAPTER 4 - SHUTDOWN ACTIVITIES

This chapter provides a brief summary of inspection programme functions during periods when the plant is shutdown. The section provides a look at inspection activities performed during refuelling, plant modification work, and similar evolutions.

4.1 ARGENTINA

During planned outages *ARN* performs inspections related to safety-significant components, surveillance program (functional tests), maintenance activities (in-service-inspections, corrective, preventive and predictive maintenance), check the ALARA performance program, plant modifications and plant configuration control. The importance of these activities are also based on the PSA results and they are carried out by resident inspectors and specialised teams

4.2 ARMENIA

All planned maintenance and modification programmes are submitted to the ***ANRA*** for approval before the refuelling shutdown. Shutdown activities include inspection programmes, safety improvement programmes, design modifications, control and authorising of reactor start-up.

4.3 AUSTRALIA

ANSTO's operating research reactor has short shutdowns at monthly intervals for refuelling and *ARPANSA* does not usually perform any additional inspections at this time. Much longer shutdowns occur every four years to permit equipment inspections and special maintenance, as well as certain plant modifications, to be carried out.

ARPANSA closely monitors activities during the four-yearly shutdowns and may carry out field inspections if deemed necessary during inspection and maintenance activities. All ANSTO reports of shutdown maintenance and inspection activities are reviewed by *ARPANSA*. Formal *ARPANSA* agreement is required for restart of a reactor after such a shutdown.

4.4 BELARUS

Not applicable as there are no NPPs in Belarus.

4.5 BELGIUM

Inspection Programme - Modification Control

- Before the beginning a refuelling activities the planning of interventions is discussed with the Utility. Items such as planned unavailability of safety related systems, maintenance activities, application of ALARA principles, organisation of the refuelling activities are covered during these discussions.
- Supervision of small projects or modifications by dedicated inspectors.
- For greater (larger) projects, follow-up of the projects by the dedicated inspector, with the help of a project leader for the management of the safety assessments and as necessary with the help of safety specialists.

- After the start-up of the plant, the experience feed-back is discussed with the Utility, in domains such as radioprotection, maintenance, operation.

4.6 CANADA

Several inspections in the core programme involve activities that take place during shutdown. Operating Practice Assessments (OPAs) involve an examination of aspects such as the quality of the preventive and corrective maintenance programmes, post maintenance testing with respect to procedural adherence, the quality of start-up operation, shutdown safety, and heat sink availability. The programme also includes an Observation of turbine testing with respect to major valves and overspeed equipment.

Resident inspectors monitor the administrative and equipment related measures in place during outages to ensure the reactor remains sub-critical. They verify that equipment and components are in specified position, that locking/blocking devices have been applied correctly and that proper tags have been hung. Opportunities are taken also during outages to conduct re-active type inspections in areas where it is judged that licensee performance requires additional scrutiny.

4.7 PEOPLES REPUBLIC OF CHINA

The operating organisation should submit a plan for refuelling outages, modifications or similar activities and get approval from the *NNSA* before NPP shutdown. The inspections should be made by *NNSA* or its regional office during the shutdown period. After shutdown maintenance and refuelling, the restarting of the NPP should be authorised by *NNSA*.

4.8 CHINESE TAIPEI

Shutdown activities conducted by *AEC* inspectors are plant walk-through, interview with plant personnel, and documents review, to verify the quality of all refuelling outage activities under pertinent control. The contents of inspection are as follows:

- Activities of reloading fuel and detecting leakage,
- In-service inspection and test,
- Preventive maintenance and repair activities of SSCs,
- Verification of conformance to technical specification, procedures, and related codes,
- Operation safety during plant shutdown,
- Surveillance tests per 18 months,
- Modifications of SSCs concerted by *AEC*,
- Quality assurance program,
- Reactor chemistry,
- Training and qualification of contractor,
- Fire protection and industry safety,
- Health physics.

Communication Meetings have conducted at different stage of the plant refuelling outage, such as:

- Pre-Meeting of Outage Inspection - Meeting discussions are: the outage schedule, the management program of schedule, repairs of important safety SSCs items, industry safety concerns, ALARA program, and quality control program.
- Post-meeting of Outage Inspection - Meeting includes: briefing the root causes of all unusual occurrence reports, and the results of the outage inspection. The purpose of this meeting is to supply an opportunity for both, the authority and the utility, to clarify all possible safety concerned issues before reactor restart up.

AEC has set three regulatory points that are Reactor Critical, Unit Synchronisation, and Operation Above 90% power, to supervise the quality of reloading fuel and maintenance of SSCs.

The notifications were made to *AEC* as part of shutdown activities:

- Unusual Occurrence Report - Any unusual occurrence report covering root cause analysis and modifications are required for TPC to submit to *AEC* within three working days. The followings are the situations necessary to report to *AEC*:

  - Impertinent repairs or maintenance of safety related SSCs,
  - Degradation of the quality of safety related SSCs,
  - Abnormal release of radioactivity liquid and gas.

- Daily Report Notification encompasses unit conditions, necessary requirements of technical specification, and the works of the latest 24 hours, urgent actions needed to take care, and cautions. These status reports should be submitted to *AEC* for regulatory reference during the last two weeks of unit refuelling outage.

Quality evaluation and Feedback at shutdown are as follows:

- SSCs Failure Report in Three Months after Unit Restart - A report of SSCs Failure during the three months after unit restart is required to submit to *AEC* for evaluation. An additional report shall be submitted to *AEC* to show the maintenance quality of safety related SSCs in five months after unit synchronisation. The report should delineate failure mode of equipments, root cause analysis, correct actions, long-term modifications, and trend analysis. All the outcomes of unit refuelling outage will be treated as a regulatory reference to next plant operation cycle.

- *AEC* Inspection Notice - A notice of violations will be sent to the utility when the *AEC* inspectors find any inconsistency with applicable regulatory requirements. The severity level of violations should be subject to the graded criteria for the violations of nuclear power plant established by *AEC* (As shown in Figure 2 and 3). The utility should take corrective actions for the violations and submit to *AEC* for review.

There is an inspection plan of health physics during every outage of plants. The inspection items are similar to those during normal operation of plants, but more inspectors will be involved in the outage inspection. Specific inspection will also be performed during the plant modification work.

4.9 CZECH REPUBLIC

Inspections during shutdown are performed by:

- resident inspectors in accordance with a resident inspectors' inspection plan.
- inspection team in accordance with a plan of inspection activities of the *SÚJB*.

These inspection plans cover:

- shutdown programme
- maintenance
- safety valves tests
- housekeeping
- design modifications

- surveillance tests of safety systems
- surveillance tests of reactor protection systems
- in-service inspection
- personnel training
- start-up programmes
- technical specifications during start-up
- Specialised inspection is always carried out to check the preparedness of equipment and personnel for start-up of the unit.

4.10 FINLAND

The inspection in relation to shutdown activities cover: outage planning and execution, refuelling, in-service inspections, repairs, modifications and preventive maintenance, post-outage plant start-up, etc. The plant can be started up after the refuelling and/or larger maintenance outage after *STUK* has given a decision on plant start-up. *STUK*'s control is described in the guide YVL 1.13.

The inspections connected to repairs and modifications which the operating organisation is obliged to request are performed during the maintenance outage. Upon completion of work, the operating organisation has to request for construction and/or commissioning inspections.

4.11 FRANCE

Supervision of PWR's outages for refuelling is a major inspector's activity, where the inspection itself is only part of the process. This is mainly due to the fact that, in France, each reactor start up (after any standard outage) is systematically subject to regulatory approval.

The regional inspectors, belonging to the *DRIRE*s, are to check licensee's compliance with regulatory requirements, most of them being agreed upon between EdF corporate services, and the *DSIN*. This methodology, which is made possible by the generic design of PWRs in France, enables the *DRIRE* inspectors to track the NPPs deviations from these requirements.

This supervision work consists mainly in :

- prior to shutdown, checking the licensee's programme,
- during shutdown, assessing non conformances, reported events, pressure vessel regulation, etc.
- reviewing the whole process at the end, prior to start up authorisation,
- after shutdown, reviewing start up tests and periodic tests.

This work comprises office work mostly, on site meetings, and a few formal inspections on worksites, or following reported events.

Typically, one inspector is devoted to two PWR units, and supervises one to two shutdowns per year.

Like for inspections, the main issues of regulatory shutdown supervision are emphasised in the NPPs yearly assessment report, written by the dedicated site inspector.

Apart from PWRs, other plants like fuel fabrication plants do shutdown each year for maintenance or modification activities, and there is now more regulatory supervision than before : it mainly consists in carrying out site inspections during the shutdown period.

4.12 GERMANY

The operation organisation (licensee) is required to provide plans for the outage period in advance. These plans shall define the refuelling, all maintenance and testing programmes and the implementation of planned modifications. The conduct of the outage must meet the operational conditions (availability) of the safety systems, namely the available trains of the electrical supply, the decay heat removal system, etc., as laid down in the Technical Specifications (Operation Manual) for shut down conditions.

A detailed inspection programme will be set up to cover repairs, modifications, reactor core refuelling, fuel element inspection, and recurrent testing of systems, components, valves, weldings, etc. Almost all recurrent tests and inspections are supervised and reviewed by experts (TÜV). The calculation of the reactor core composition is to be validated by experts (TÜV) performing independent calculations and reviewing the start-up testing programme.

Individual working plans expected to consume more than 50 mSv collective dose are to be described in detail and are checked for ALARA provisions.

The plant start-up usually requires approval by the regulatory body after the formal notification, that all required tests have been completed successfully.

4.13 HUNGARY

NSD performs its activity by written procedures in all phases of the refuelling outage.

4.13.1 Regulatory approval of the maintenance during shut-down.

NSD reviews the maintenance plan before 30 days of the shut down respecting the following conditions:

- all planned modification are approved by *NSD*
- the actual scheduled periodical tests are complete
- the valid *NSD* requirements are fulfilled for the outage

Finally the maintenance plan shall be approved by *NSD.*

4.13.2 Inspections on shut-down activity

NSD takes part in all important safety related testing and investigations. Occasionally *NSD* inspect other maintenance activities 2-5 times per outage (which are selected preliminary at the approval for the shut-down maintenance). *NSD* performs detailed audits for some selected works including the organisation of the licensee and its subcontractors. *NSD* examines the anomalies, failures that are explored in the outage period.

4.13.3 Acceptance of the final report on the outage maintenance

The NPP submits the final report about the outage activity and the related important occurrences. The acceptance of the final report based on the evaluation of the works completeness and on the consequences of the works that have not taken place.

4.14 ITALY

The Licensee is required to prepare the shutdown programme in advance and to produce a final report of the finding at the end of the shutdown activities. Plant modifications for safety related systems must be submitted to *ANPA* for approval.

During shutdown periods the inspection work is increased: the inspectors dedicated to the plant perform inspections of important systems or plant modifications, in particular all components and equipment kept in service or stored on-site must be checked by systematic inspection (specified according to risk and the available knowledge of their behaviour with time).

The Regulatory Authority inspection programme will be set-up in advance; the general objectives of the programmes are:

- To check the physical condition of the engineered barriers.
- To monitor the state of conservation of other systems and structures in the facility.
- To record any relevant changes in behaviour of material remaining within the facility.

4.15 JAPAN

Though the safety of reactors may basically be secured through self-regulation, the ANIS and the *MEXT* have assigned safety inspectors to post in each municipality located nuclear facilities to inspect the observance of a safety rule and to examine as well as to undertake entry inspection as appropriate. The licensees of a reactor shall undergo periodical inspection for key components of the plant according to the RNNR Law. The periodical inspection shall be undertaken by shutting down the reactor within a period not exceeding one year.

4.16 KAZAKHSTAN

The operation organization has to inform K*AEC* about the shutdown programme in advance of the outage. The shutdown programme includes maintenance and modification work, in-service inspection, and testing and surveillance activities. Plant modifications for safety related systems and components must be submitted to *KAEC* for approval before implementation.

4.17 REPUBLIC OF KOREA

During the shutdown period of a NPP, the *KINS* carries out the Periodical Inspection. The pressure and radioactivity retaining systems which isolate the fission products, and safety related systems which prevent or *miti*gate accidents should be inspected during the periodical inspection.

Those systems are as follows:

- Reactor (including fuel)
- Reactor Coolant System
- Instrumentation and Control System
- Fuel Handling and Storage System
- Radioactive Waste Management System
- Radiation Protection System
- Containment System
- Reactor Safety System
- Emergency Power Supply System
- Other Reactor Safety Related Systems.

After the periodical inspection is completed, the *KINS* submits the inspection report to the *MOST*. The *MOST* reviews the inspection results and issues a license for power operation of the related NPP.

4.18 MEXICO

During shutdown the resident inspector in charge of each nuclear power plant unit receives support from headquarters office, due to increase in normal inspection activities in areas in which he is not specialised, such as: In-service Inspection, ALARA Programme, Valve and containment leak tests and plant modifications. Also, as part of the normal duties during reload or shutdown, the resident inspector is supported (at his request) with additional personnel (with similar qualifications and experience) in order to provide more efficient coverage for areas such as: system availability to fulfil Limits and Conditions of the Technical Specifications and surveillance requirements.

4.19 THE NETHERLANDS

Minor and major modifications and modification and projects in the framework of backfitting activities stemming from periodic re-evaluations are assessed by the specialists of the *KFD* staff. Every three months a meeting on managerial level with the NPP is held to discuss the progress of projects and other important items.

All planned maintenance and modifications are submitted for approval at least three months before implementation. Inspection activities during shutdown are increased and focused on aspects such as redundancy planning, radiation protection, in-service inspection and surveillance activities and specific modifications.

At the end of the shutdown period a dedicated inspection is performed to make sure that the plant has carried out all the necessary modifications, inspections and tests before the start of a new operational cycle.

Before each shutdown period a special inspection is made in order to discuss the planned dose-reduction measures (ALARA) and the results are evaluated within 2 months after the shutdown.

4.20 PAKISTAN

KANUPP the currently operating power plant is a PHWR type in which on power fuelling is done, therefore no shutdown is required for refuelling. However, shutdown is planned for routine maintenance. For the under construction plant (CHASNUPP) which is a PWR type, it is envisaged that shutdown for refuelling will be notified to the regulatory body.

4.21 RUSSIA

During planned outages resident inspectors performs inspections programmes, related to functional tests of safety systems, in-service inspection results, plant modification control and start-up program.

During of shutdown site inspection shall provide specific inspections before beginning of specified works, including:

- detail design of repair and modification work;
- technological instruction of the work;
- reporting documentation;
- documentation of developing of an equipment and its spare parts;
- decisions on modification;

- correction of license conditions (if necessary);
- quality of instrumentation and tools and so on;
- qualification of personnel.

Control of repair, modifications and preventive maintenance of mechanical components and structures is carried out in accordance with the relevant Guides. Repairs mean the restoration to the required condition if it does not comply with the actual condition.

The decision on modification of components and systems important for safety shall be preliminary approved by Department on Nuclear and Radiation Safety of Gosatomnadzor.

Site inspectors participate in periodical surveillance of equipment, in pressure tests of systems. Normally, inspectors on NPP not perform any measurements by own forces. Necessary works personnel of the NPP perform at attendance of inspector.

4.22 SLOVAK REPUBLIC

Special and team inspections are carried out during shutdown periods (especially during refuelling and reconstruction), while routine inspections are performed mainly by resident inspectors.
Shutdown activities include:

- confinement opening and tests
- safety valve(s) tests
- surveillance program tests (safety systems, reactor protection)
- start-up programmes
- housekeeping
- shutdown programme (maintenance)
- design modifications
- fulfilment of conditions for start-up after outage
- in-service inspection results
- training of personnel.

4.23 SLOVENIA

During refuelling or longer outages the frequency of planned inspections is increased to 3 (sometimes 4) a week. The inspection for this purpose is reinforced with the staff of authorised organisations *(TSO).* There are 8 authorised organisations, which are assigned to work mainly during the outage. The authorised organisations survey maintenance activities on the safety equipment, major non-safety equipment, electrical equipment, instrumentation and control, and witness functional testing, surveillance testing and NDT. TSOs also review on-line maintenance records. The representatives of each authorised organisation are requested to present written reports about their findings and to explain the findings in regular weekly meetings with the nuclear safety inspectors. Forty-five days from the end of the outage the full written report about the outage, compiled from all 8 authorised organisations and with the suggestions and recommendations for improvements is submitted to *SNSA*. This report is used as the basis for "post-outage inspections", in which the nuclear safety inspectors, representatives of the authorised organisations and the plant staff take part. The suggestions and the recommendations are discussed with the plant staff to clarify them and to find the best way to implement them.

There must be enough evidence that the authorised organisations are capable to perform their work as it is expected and requested. Therefore, the audits of authorised organisations, which are led by *SNSA* staff, are taking place biennially. Funding of the TSOs during the outage is charged to NPP Krško.

4.24 SOUTH AFRICA

The nuclear authorisation holder has to inform the *NNR* in advance of the intention to shutdown for refuelling and of any modifications to be carried out during shutdown, scope of work and details of unloading and reloading of fuel. Written permission is required from the *NNR* before any of the above can be commenced. During shutdowns, the *NNR* inspectors, comprising of residential inspectors supplemented by *NNR* specialists from Head Office monitor ALARA, radiation protection activities, in-service inspections, fuel handling activities, containment integrity, Operating Technical Specification (OTS) compliance, modifications implementation, contractor control, systems line up and subsequently criticality and low power tests, etc.

4.25 SPAIN

At shutdown periods (specifically during refuelling) inspection work is increased. Resident Inspectors review and follow the shutdown programmes in order to verify:

- System availability fulfils the Operability Limiting conditions established in the Technical Specifications.
- Surveillance requirements established for the reload period in the Technical Specifications are performed.
- Plant Modifications important for safety are implemented and tested.
- Plant configuration is maintained.
- ALARA provisions are respected.

Specialists in different areas inspect the following:

- ALARA programme
- In-service Inspection Programme
- Fuel Cycle Safety Analysis
- Nuclear Tests
- Containment Leak Tests
- Design Modifications
- Surveillance Tests
- Fuel assembly inspection

4.26 SWEDEN

The licensee has to inform *SKI* about the shutdown programme in advance of the outage. Principal plant modifications for safety related systems and components must be notified to *SKI* before implementation. The programme includes maintenance and modification work as well as testing, examination and in-service inspection activities.

Inspection activities may include the planning process prior to the outage and the implementation of plans during the outage, management involvement, control of safety system line-up and outage scheduling. Inspections are also carried out to ensure that the requirements of the Technical Specifications for shutdown are fulfilled.

4.27 SWITZERLAND

Refuelling shutdown activities require an inspection programme of their own. In shutdown periods inspection frequency is increased. It comprises core configuration, in-service inspection programme, plant modifications, ALARA provisions, maintenance activities, functional tests according to the Technical

Specifications, etc. The inspections are carried out by site inspectors, inspection teams, and field specialists.

At other shutdowns, e.g., for repairs or caused by events, inspections are also necessary on the specific event and for start-up.

4.28 UNITED KINGDOM

The licensee prepares a programme of work, including maintenance and modifications, for each major shutdown which takes place every 2 or 3 years on gas cooled reactors and which is reviewed by *NII*. During the shutdown, the site Inspector and *NII* assessors will witness some activities and may inspect parts of the plant which are not normally accessible during operation. Inspections are also carried out to ensure that the work is done in a safe manner. The licensee is required to produce a report on the findings of the shutdown activities and to make the case for start-up. This report is assessed by the site Inspector and *NII* assessors and, when found satisfactory, *NII* consents to restart the reactor for a further specified period of time.

4.29 UNITED STATES

Resident inspectors and regional specialists conduct inspections during each outage. The inspectors evaluate plant activities to ensure that licensees consider risk in developing outage schedules, adhere to administrative risk reduction methodologies to control plant configuration, develop mitigation strategies for losses of key safety functions, and adhere to operating license and technical specification requirements to ensure a defence-in-depth strategy. Additionally, the inspectors monitor refuelling activities, subsequent start-up operations, and the manner in which licensees identify and correct deficiencies in their corrective action program.

CHAPTER 5 - ABNORMAL OCCURRENCE

This chapter provides a brief description of the requirements for reporting abnormal occurrences within the plant, the response by the inspection programme and the follow-up actions taken.

5.1 ARGENTINA

The *ARN* pays close attention to relevant events occurring at domestic plants —which must be reported in accordance with the license—, as well as to those occurring at foreign plants, whose details are obtained through various information channels, such as the IAEA's IRS and regulators meetings. Every relevant event occurred in a domestic plant is submitted to an independent in-depth analysis, in which both the deterministic and the probabilistic methods are applied, so as to minimise recurrence. In the case of events occurred in foreign plants, an in-depth analysis is carried out to determine whether a similar event could be expected to occur in a local plant. The process of abnormal occurrence (at domestic and outside plants) includes:

- Detection, characterisation and communication
- Classification and feeding the reports into the databases.
- Selection of events for their analysis
- Analysis of direct and root causes
- Assessment of corrective actions
- Review, search for consensus and approval
- Implementation and follow-up of corrective actions
- Diffusion of the experience gained

Once a relevant event has occurred, the authority present at the installation (Manager or Shift Supervisor) shall quickly send a very brief and summarised "Immediate Communication" to the Regulatory Authority, describing the characteristics of the event. The communication shall be sent by fax or by electronic mail at the *ARN*, which must be available at the installation's control room. When out of the regular working hours, it is recommended that the resident inspector be reported by telephone or radio message. In case of accidents involving overexposure, a significant dispersion of radioactive material or a significant failure in safety-related systems, within 24 hours, a more detailed report shall be sent to the Regulatory Authority. Once the event has come to an end and the situation is back to normal, the causes that originated the event shall be investigated and a detailed report shall be prepared. In case of a relevant event, the Regulatory Authority shall appoint a technical committee that must perform an independent review of the event.

Precursors are operational events or plant conditions constituting an important part of a postulated core-damaging accident sequence. Their analysis provides a systematic evaluation of events and a probabilistic estimate of how close was the plant to core damage and of plant vulnerabilities.

5.2 ARMENIA

In accordance with the legal document the implementation of the procedure for reporting of information concerning operational events at NPP is mandatory. The previous information about abnormal occurrences must be reported to the ***ANRA*** office within 24 hours. The licensee is required to transmit a written final report and address it to the ***ANRA*** within 21 days. All reports concerning events at Metsamor NPP to be submitted to the ***ANRA*** must contain description of safety assessment, as well as corrective actions proposed. The inspectors of the ***ANRA*** control the implementation of the programme of corrective actions.

5.3 AUSTRALIA

ANSTO's reactor operating division is required to provide *ARPANSA* with a quarterly summary of abnormal occurrences including those that do not significantly affect safety. Accidents involving controlled material, controlled apparatus or controlled facilities must be reported to *ARPANSA* within 24 hours and provide a written report with 14 days of the accident happening. All accidents are reported in the *ARPANSA* quarterly and Annual reports.

Where warranted by the seriousness or nature of the abnormal occurrence, *ARPANSA* will conduct inspections on a case by case basis in relation to corrective actions taken by the operating organisation to prevent a recurrence.

5.4 BELARUS

All abnormal events are to be reported to all the concerned as soon as possible.

5.5 BELGIUM

Operating Experience

- Operating experience from foreign countries is first analysed by the PEM (Project and Experience Management) Division in ***AVN***, which proposes actions to the NII (Nuclear Installation Inspections) Division .
- The Belgium operating feedback is treated by the NII Division, with technical- administrative support provided by the PEM Division.

5.6 CANADA

As a condition of its operating license, each licensee must report abnormal events to the *CNSC* within specified time limits. The reports are made usually to a resident inspector, who reviews the reports against reportability requirements, checks for completeness and accuracy, carries out a preliminary analysis, and checks for trends and corrective actions taken for any previous or similar occurrence. The inspector also decides if the follow-up actions identified are adequate and treated with appropriate priority, and if other organisations or utilities require notification. There is also consideration of specific actions that *CNSC* staff may take in response to the event, including inspections.

The resident inspectors also forward copies of the reports to an Event and Investigation Section at headquarters. The objective of the Event and Investigation Section is to ensure a unified and consistent approach to the evaluation of events occurring at all NPPs in Canada, while determining or confirming the following:

- Licensee's compliance with reporting requirements stipulated in the operating license and with all applicable regulatory requirements;
- Whether an event constitutes a violation of a license condition;
- The need for additional *CNSC* actions;
- Trends and patterns of failures through systematic studies.

The Section also provides information to resident inspectors on precursor events occurring at other plants, to management, to various *CNSC* staff groups/divisions and to the Incident Reporting System (IRS) of the IAEA and OECD. This information is on a data base that is available to *CNSC* inspection teams. Then the *CNSC* proceeds with regulatory actions such as augmented inspections or a formal investigation, based on criteria such as significance with regards to safety.

5.7 PEOPLES REPUBLIC OF CHINA

Significant abnormal occurrences within the plant have to be reported to the *NNSA*, according to the reporting requirements in the nuclear safety regulations. The *NNSA* evaluates the occurrence and requires the operating organisation to carry out activities if necessary.

Safety-related events are recorded at the plant site, and made available to the inspectors. Evaluations of events from nuclear installations in other countries are also carried out by *NNSA* and made available to the *NNSA* and operating organisations.

5.8 CHINESE TAIPEI

AEC request that any abnormal occurrence has to report to the *AEC* headquarters as specified in the Technical Specifications, a detailed report of the situation and remedy measures must be submitted to *AEC* within 30 days in all cases. When NRD receives this report, it will immediately evaluate the remedy measures of the plant, dispatch inspectors to the plant as necessary, and trace the corrective actions.

Any plant scram incident has to report to *AEC* within two hours of the occurrence of a reactor scram, TPC must report to NRD about the consequences of the scram and probable causes. If the cause is unclear or with some possible safety concerns, the restart of the unit will be under rigorous control. The unit may be allowed to restart only if the root cause is cleared or a satisfactory safety assessment is completed.

Investigation of Nuclear Power Plant Equipment Malfunctions is to assure the safe operation of nuclear power plants. Whenever there is a malfunction of any major equipment, NRD will immediately dispatch personnel to the site for conducting an on-site inspection, making a detailed review of TPC's analysis of the root cause, and demanding the plant for further improvement within a certain period of time.

Whenever operating nuclear power plants require safety-related design modification or equipment change, TPC should submit a request and necessary evaluation before any measurement. After issuing the approval, NRD will conduct the on-site inspection during the modification to assure the quality.

According the bylaws of the Atomic Energy Law, no technical specifications could be revised without submitting a written request and obtaining *AEC*'s approval.

As for the public information, NRD and TPC periodically hold a nuclear regulatory meeting discussing items that include newly issued nuclear regulations in other countries, malfunctions and abnormal occurrences, safety measures, and implementation status, etc. The purpose of the conference is to reach mutual understanding to continuously enhance nuclear safety.

5.9 CZECH REPUBLIC

The legal basis for event reporting system in the Czech Republic is the Act 28/1984 and special instructions of *SÚJB*. They lay down the duties of the responsible organisation to inform without delay the inspector of nuclear safety concerned and *SÚJB* of important facts, especially of extraordinary events affecting nuclear safety of the nuclear facility and deviations from the approved limits and conditions (Technical Specifications).

Criteria for events reporting to the Regulatory Authority are quite comprehensive and basically are in compliance with the IAEA recommendations. Nuclear power plant reports must be prepared and transmitted in accordance with the Technical Specifications, adopted by the Regulatory Authority.

A. Within 72 hours from the moment of occurrence detection:

- Non-planned decrease of unit power without emergency protection actuation.
- Presence of foreign objects in primary circuit.
- Radiation set-up which exceeds the intervention levels determined by the Regional radiation protection inspector.
- Occurrence of nuclear related dangerous situations in shutdown reactor during handling of the fuel.
- Loss of normal and emergency lighting in the reactor hall for longer than 10 minutes.
- Non-tightness of the primary circuit's main components.
- Automatic actions of ESFAS and stepwise start-up automatics.
- Non-planned actuation of steam generator safety (relief) valve and that of pressuriser.

B. Within 24 hours from the detection of an occurrence:

- Any fires within the NPP fenced area.

C. Immediately (not later than within 8 hours from the moment of occurrence detection):

- Activation of reactor protection system.
- Pressure loss of primary coolant (>=2t/h, or radioactivity according to limiting condition) from selected systems.
- Violations of limits and conditions for normal operation.
- Loss of natural circulation and impossibility of its restoration within 1 hour.
- All occurrences evaluated by a shift personnel as of level 2 and higher on the INES scale.

5.10 FINLAND

STUK follows the operation of nuclear power plants through constant reporting, which includes daily, monthly or quarterly, and annual reports. The reporting requirements are given in YVL Guide 1.5. In general, all operational events shall be reported to *STUK*.

The guide YVL 1.5 itemises the special situations as examples of incidents that necessitate the compilation of a special report. Such situations are incidents, defects, observations, deficiencies and problem if they have importance to the nuclear safety of the plant, to the safety of the plant personnel or to radiation safety in plant's environment. A special report shall provide a comprehensive description of the incident containing information e.g. on the operational condition of the plant at the beginning of the incident, course of events and their consequences, safety implications, direct and root causes, and proposed measures to avoid the recurrence of similar incidents in the future. The root cause analysis report shall be submitted in four months from the event *STUK* for information. In the root cause analysis reports licensee gives detailed information on root causes and corrective actions. Reactor scram reports and operational transient reports are sent in one month. Such events are i.a. events, which include a forced reactor or generator power decrease.

The International Nuclear Event Scale (INES) has been in use in Finland since the very beginning, i.e. since 1990. The classification has been performed according to the qualitative rules of IAEA. The scale has been a useful tool in the *STUK*'s information policy, for putting incidents into perspective for media use. For this purpose *STUK* has required the utilities to classify events on the INES. The provisional rating should be available in *STUK* so that the INES level can be used when informing the public about the event. *STUK* reports to the IAEA on INES ratings as required. Events classified as level 2 or above, and also events having public interest internationally, will be reported to the IAEA.

In case of a significant operational event, as described in YVL 1.5, *STUK* shall be immediately informed by telephone or other feasible means. Contact persons at *STUK* and plants can be reached 24 hours a day. Having received information on an unusual event *STUK* will assess, whether there is a need for an immediate intervention and/or other swift measures. As part of the initial assessment process *STUK* may carry out inspections on site, too.

Daily reports contain plant operational data, faults in safety-significant structures, systems and components. Quarterly reports contain e.g. summaries of the operational data and incidents. Outage reports contain e.g. the important incidents, the significant deficiencies and faults observed during periodic tests and inspections. Annual reports concerning feedback on operating experience a summary of activities which power company has done based on operating experience gained at own and at other nuclear facilities. The report describes all significant operational events, which have been dealt with, and also their handling phases. It also describes the corrective measures already implemented and decisions of corrective actions, which will be carried out later.

Requirements relating operating experience are presented in the legislation and exactly in the Decisions of the Council of State. Guide YVL 1.9 presents among others also requirements relating incident investigation. Guide YVL 1.11 presents the detailed requirements and practices relating incident investigation in Finland. It requires that a licensee examines all operational events, which have safety significance, using a sophisticated root cause analysis method if an event's root causes are not evident. Both Finnish utilities have their own methods for root cause determination. *STUK* inspects and assesses, that the procedures and the activity in power utilities meets the requirements set by *STUK*. The inspection of instructions and procedures are carried out in *STUK*'s office and the inspection of the activity of the utilities at the plant site.

STUK's own incident analysis method is based on the use of a specific data collection form. The form was created in 1992 and improved in connection with the introduction of a new computerised event database system (TAPREK) in 1996. The form shall always be completed when the incident is considered to have specific safety significance and when at least one of the following six registration principles has been fulfilled: INES level greater than or equal to 1, special report has been prepared of the incident, the incident relates to a significant organisational failure, the incident relates to a significant change or defect in a plant component, the incident relates to a significant change or failure in plant operation, or the incident relates to a common cause failure mechanism.

The safety level of a plant is re-evaluated after any abnormal event. To ensure systematic analysis of an event and its causes, an investigation team, may be nominated by *STUK*. This team considers root causes of equipment failures and human errors, weaknesses in performance of operating organisation, etc., and presents a report including recommendations for corrective actions, to prevent reoccurrence of similar events.

5.10.1 PSA-based event analysis method and risk follow-up

STUK has developed a PSA based method to assess the safety significance of operating events. For the risk follow-up, risk contribution of the following operating events is included: exemptions from the Technical Specifications, failures of devices covered by the Technical Specifications, preventive maintenance and other disconnections of devices covered by the Technical Specifications, and other operating events that reduce the availability of safety relevant equipment.

Pilot studies were carried out in the early 90's and the method has been developed further. Plant specific living PSA models are applied to the risk calculations of events. Assumptions and modelling details are clarified and specified. Conservative assumptions and model simplifications are often used in order to reduce the amount of analysis work. In connection with the development work, the method has been

applied to the calculations and analysis of operational events from the years 1995 - 2000. The PSA based event analysis method is now in regular use, and the results of the calculations are followed as risk based indicators. PSA is also used to support INES classification.

5.11 FRANCE

All licensees (EdF's NPPs and the others) must report any safety-related event to the Safety Authority, and, moreover, must rate it on the INES scale.

At level 1 and above, the event is to be released in a public reporting data system (called MAGNUC) and, in addition, systematically press released at level 2 and above.

The dedicated site inspectors are to assess the event (especially the INES level), but also any licensee's commitment following it ; this event processing is particularly fruitful for PWR supervision, since the series aspect of PWR design in France helps identifying generic initiators, or even precursors.

Reactive inspections may be carried out following specific or level 1 events (systematically for level 2), with adequate enforcement actions. Feedback from licensee's capability for event follow-up is stressed upon in the yearly assessment NPP reports ("monographies").

5.12 GERMANY

Abnormal events have to be reported to the supervisory authority of the *Länder* according to the reporting criteria laid down in the Nuclear Safety Officer and Reporting Ordinance. The criteria are categorised in S (immediately), E (within 24 hours), N (within 5 working days) events. These categories refer to possible administrative actions to be taken by the authority. The INES-scale is used to refer to the safety significance of such events.

The supervisory authority evaluates the events, in general by involving the TÜV's or other independent expert organisations, to ask for corrective actions, if necessary. All reported events from all nuclear installations in the Federal Republic of Germany are documented and evaluated by the Incident Reporting Office at the Federal Office for Radiation Protection (BfS). Summary reports of abnormal events are forwarded to the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) and to the Federal Parliament.

A systematic in-depth screening of all events is performed by the Gesellschaft für Anlagen- und Reaktorsicherheit (GRS). Events identified by this process to be of a significant relevance to other nuclear installations are investigated in depth. GRS provides these evaluations to all licensing and supervisory authorities of the *Länder*, to the TÜV's and to the operators of nuclear installations. In return, the supervisory bodies of the *Länder* require the operators to check this information for relevance and necessary corrective actions in order to avoid similar events.

Evaluations of events from nuclear installations in other countries are also carried out by GRS and made available to all supervisory authorities and the utilities in Germany.

5.13 HUNGARY

Abnormal occurrences have to be reported to *NSD* according to the reporting criteria, based on the Governmental Decree 108/1997.(VII.25.) and its Appendices (Safety Standards volume 1.) and Regulatory

Safety Guides 1.25, 1.125. The licensees in case of abnormal occurrences are required to submit eventual report:

- immediate notification by phone within 2 hours
- INES rating suggestion within 16 hours
- notification, preliminary report within 24 hours (by FAX max. 1 page)
- evaluation report within 30 days

In the frame of quarterly regulatory report:

- quarterly status report and brief assessment of corrective actions,
- summarised notification of not safety significant occurrences - quarterly

In the frame of the Authority's inspection activities, it is obliged to investigate nuclear operation breakdowns. As a result of the inspection, it defines the reasons for the occurrence of operational breakdown, reveals irregularities and takes measures in order to prevent similar events. In the framework of its control activities, the *NSD* is obliged to evaluate the reports it receives. If this is justified by the results of the assessments, it is obliged to conduct the necessary inspections, to reveal the irregularities and to take measures in order to eliminate and prevent the same. In the course of nuclear operational breakdown, the *NSD* may take over - against a receipt - the things serving as exhibits, without violating the process of special authorities entitled to take measures, or the operator may have store the same in a separate way, and furthermore may take the necessary measures in order to protect life, health and property.

NSD supervises the event using the evaluation report of the licensee or NSD performs field inspection itself. If NSD deems necessary it will initiate regulatory action in connection with the event.

NSD prepares annual assessment report on the reporting events of the licensees that makes a basis for NSD in the annual evaluation of the activities of the licensees in the safety point of view. NSD will publish its assessment report.

5.14 ITALY

In accordance with the Management Specifications imposed by the plant operating prescriptions, the licensee of a nuclear installation is required to report all safety relevant events to *ANPA*. The Technical Guide n. 11, which is issued by the Regulatory Authority, gives the criteria for supplying periodic and extraordinary information on events, in particular, abnormal occurrences relating to operation. Every event is classified on the IAEA-INES scale.

ANPA must be notified of the event as rapidly as possible (and in any case no later than 24 hours after the event), by telephone. Confirmation must be sent by telegram or telex, not later than one working day after the event. A written report must follow within 4 weeks. Human factor aspects are one of the items to be addressed in the report. The report is also required to address whether the event was due to a cognitive or procedural error.

Every 6 months, an Operating Report must be forwarded by the licensee to the Regulatory Authority, giving an analytical and reasoned assessment of the operation and maintenance of the nuclear power plant with suitable references to and comparisons with the contents of the Final Safety Report. This report must constitute a documented assessment of the plant operation and maintenance.

Once a notification about an abnormal event has been received, the Regulatory Authority investigates the event and evaluates the need and sufficiency of the corrective actions taken or proposed by the licensee. As a preliminary activity, off-programme inspections are normally performed by the

Regulatory inspectors to gather supplementary information and, if necessary, to impose specific plant requirements. After clarification of the event scenario, a technical report will be prepared by the Regulatory Authority in order to disseminate information concerning operating experiences.

In order to collect, screen and store operational data more effectively, the information is maintained in a computerised data base. Moreover, events reported from a foreign plant are also evaluated if they considered significant for Italian plants.

5.15 JAPAN

The licensees of a reactor must notify the accident or troubles with the report describing the details and measures taken, when it occurred, to the ANIS or the *MEXT* according to the RNNR Law.

The ANIS and the *MEXT* issued an administrative notice requesting to notify minor abnormal events that are not so significant as the notification criteria. The ANIS and the *MEXT* shall make public the conditions and actions against them during the events, the cause and the measures to prevent recurrence of the events, and apply the measures to other reactors.

The frequency of unscheduled shutdown of commercial nuclear power plants in Japan is 0.3/reactor/year, significantly smaller than the average in the world. Since August of 1992, the International Nuclear Event Scale has been used in the evaluation of accidents/troubles in Japan and any abnormal event with a level higher than level 2 has not occurred in commercial power plants. Most of events were the level 0.

5.16 KAZAKHSTAN

Abnormal events are evaluated according to the K*AEC* regulations within the nuclear installations. Abnormal events have to be reported to the *KAEC* over the telephone (in any case, no later than 1 hour after the event), by fax messages (within the next 24 hours), and special report forms addressed to the *KAEC* within 10 to 25 days.

Criteria for event reporting are in compliance with the IAEA recommendations.

Every abnormal event is also classified according to the IAEA – INES scale. Since 1995, Kazakhstan has participated in the IAEA – INES information system.

5.17 REPUBLIC OF KOREA

National regulations require licensees to immediately notify the regulatory body, the *MOST* of abnormal occurrences as specified in the Notice of the Minister of Science and Technology, Notice 96-25. This Ministerial Notice was enacted in December 1992 and effected on 1 March 1993. The Notice provides in detail the scope of reports and administrative procedures, the evaluation criteria for event rating of the accident and incidents in the nuclear power plant. The event shall be communicated immediately by telephone to the regulatory organisation or to the resident inspectors on-site with a written follow-up report by the next working day. The detailed report shall be submitted to *MOST* within 30 days after the event occurrence. The accident and incident reports including event scale will be submitted to the international organisation, IAEA - INES and IAEA - IRS for level 2 or above, or for international interest requiring a press release as stipulated in Notice 96-25.

In the case of commercial nuclear power plants the technical evaluation committee has been run by the *KINS* and is composed of 15 experts (including 8 experts outside of *KINS*). This committee examines and evaluates the causes, corrective actions and event scales of abnormal occurrences based on licensees reports and site investigations by *KINS* experts.

5.18 MEXICO

According to the regulatory framework, LVNPS must report to the CNSNS the occurrence of all incidents using the format identified as "Notification of Reportable Event" (NER). This format includes a summary of the event, immediate corrective actions,, emergency core cooling systems and engineering safety feature system conditions as well as information on radiological conditions. This notification is sent to the Resident inspector on-site as well as to the Regulatory Body's headquarters. According to the importance of the incident is whether the notification is to be sent immediately: within 1 hour or within 4 hours. Additional, LVNPS must send a "Licensed event report" (LER) within 30 days after the occurrence of the event to completely describe the event, the result of the root-cause analysis and both preventive and corrective actions proposed. In addition, the CNSNS maintains a 24-hour operations contingency centre to receive the most significant information by telephone from LVNPS for significant events.

It is responsibility of the Regulatory Body to evaluate NER's and LER's. A characteristic of the evaluation process is to conduct periodic meetings between Regulatory Body and LVNPS personnel to discuss every aspect of each event reported. Emphasis is put on root-cause analysis and their corresponding corrective actions, and when applicable, on the evaluation and witnessing of tests and verifications to ensure the effectiveness of corrective actions.

The resident inspectors are the primary on-site evaluators of site events or incidents. It is expected that the greater part of event-related inspection effort will be performed by the resident inspectors, who may be supplemented by other inspectors, depending on the type of event.

The CNSNS takes part in the "Incident report System" - IRS of the NEA and IAEA. Also, as part of the bilateral agreements with other Regulatory Body Organisms from other countries maintained. Depending of the type of information, these experiences are sent to the LVNPS for their inclusion in the External Operational Experience Programme or inclusive, to form part of the regulatory framework of the Operation licenses.

5.19 THE NETHERLANDS

In accordance with the Technical Specifications the licensee is required to report abnormal occurrences. Significant events have to be reported immediately, within 8 hours. Depending on the safety relevance, an inspection is carried out. Events are evaluated within the nuclear utility and by the authorities. If necessary, corrective actions are taken.

All nuclear facilities have received a procedure on how to contact the *KFD* in case of an abnormal occurrence. The procedure indicates the sort of information that has to be reported immediately and later on by writing.

5.20 PAKISTAN

Any significant abnormal occurrences within the plant have to be reported to the *PNRA* within twenty four hours. A detail report should be submitted later, but not later than one month after the incident. The abnormal occurrences are also routinely reported to IAEA-INES and IRS.

5.21 RUSSIA

The recording and classification of reportable events is done with the help of reporting criteria and report forms. The report criteria and classification are defined by the Provision on Events Investigation that is in compliance with the IAEA recommendations (IAEA Safety Guide No. 93 and ASSET Methodology). Conclusions on results of abnormal event investigations are included in the annual report of site inspection.

The Provision on Events Investigation and internal plant procedures require to report abnormal occurrences to the Central and Regional Offices of Gosatomnadzor. Necessary notification performs personnel of the NPP. There are 3 categories of reporting:

- immediate notification over the phone or fax in many addresses - within the following hour;
- report to the Central Office and in other addresses by telex, fax, E-mail within the next 24 hours;
- final report addressed to the Central and Regional Offices and in other addresses within 15 days.

The licensee is obliged to assign the special commission for the event investigation. The resident inspector supervises the work of the commission and sends his own conclusions on its results in Central and Regional Offices.

Feedback is the operator's responsibility. The Regulatory Authority accesses quality of investigations, implementing of corrective measures and results of root cause analyses.

5.22 SLOVAK REPUBLIC

In accordance with the Technical Specifications approved by *UJD*, the licensees are required to report abnormal occurrences. Reporting criteria comprise of three (3) parts:

- immediate notification (not later than within 8 hours)
- report within 72 hours (preliminary report)
- report within 30 days (final report)

Criteria for reporting events to the *UJD* are quite comprehensive and basically are in compliance with the IAEA recommendations (IAEA Safety Guide No. 93).

The nuclear power plant is primarily responsible for event investigations and assessment, but investigation of some events is carried out by *UJD.* If necessary, corrective actions are taken by the plant or requested by the *UJD.*

Finally, *UJD* carries out assessment of all events in Slovak NPPs and events included in the IAEA Incident Reporting System (IRS). *UJD* is also responsible for dissemination and exchange of information.

Concerning corrective measures, which have an influence on the safety of the plant, the complete documentation including design description, safety analysis and quality assurance programme has to be submitted to *UJD.* The evaluation of the effectiveness of the corrective measures is performed during and after their implementation and annually on a regular basis.

5.23 SLOVENIA

In accordance with the regulations on reporting, NPP Technical Specifications and plant internal procedures on reporting, abnormal occurrences are reported to *SNSA*, depending on their severity. There are 3 categories of reported occurrences, which require:

- Immediate notification by telephone followed by fax within 24 hours and written report within 14 days,
- Report within 30 days, and
- Special report (deviations, tests, etc.).

Once a notification has been received, *SNSA* starts an investigation of the occurrence. It consists of inspections and of evaluation of the information. Corrective actions taken by the plant are closely followed. Based on the first hour information *SNSA* prepares an INES report. At the end of each year a complete review of all occurrences of the year is performed in order to decide which will be reported to the IAEA - IRS.

5.24 SOUTH AFRICA

The *NNR* has requirements set down in the operating licence to cover the reporting and evaluation of occurrences. These define reportable events, time constraints for reporting, details of individuals and channels of communication. Occurrence and event reporting response is maintained by a 24 hour call out facility through the *NNR* site staff and is integrated into a *NNR* Head Office system for emergency response if necessary.

All occurrences/abnormal events are assessed for their degree of severity by the *NNR* and responses are actioned accordingly. The *NNR* also monitors the rating of events via the IAEA INES System. Events are tracked, trended and fed back into the inspection programme as relevant.

5.25 SPAIN

The *CSN* Safety Guide No 1.6 " Reportable events in nuclear power plants under operation" from 1990 defines the reportable events, fixes the periods of time to inform *CSN*, and establishes the minimum content of the reports. The safety guide establishes two kind of reportable events; the abnormal reportable events according the emergency plan of licensee for incidents of category I, and other reportable events following the standard technical specifications of the plant approved by the *CSN*. The events considered as a emergency of category I are for example a fire with a duration up to 10 minutes, automatic actuation of emergency core coolant system, total station blackout, violations of safety limits, and degradation of a safety barrier or a safety function. These events should be noticed to the *CSN* emergency centre and resident inspector if available, as soon as possible and, in any case, in less than half an hour by fax, using the stated formats for notifications. In the other hand, there are other events as automatic reactor trip, actuation of ECCS not required, plant shutdown unplanned, violation of operational limit conditions, actuation of safety systems, etc. These situations should be noticed in an hour and a written report is required in 24 hours to explain the causes of the events, their consequences and the actions taken by the licensee.

All events shall be included in the monthly operational report with a detailed explanation of the circumstances, causes, consequences, lessons learned and so on.

The functions of *CSN* in event follow-up are as follows:

With the preliminary data collected, an Information Note is issued for commissioners and public information. The information is sent to the technical staff for evaluation and a special inspection is conveyed if the case requires. The event is classified on the IAEA-INES scale. The distributed Information Note is transmitted to the Administrative Authorities, if the event is classified >1, on the INES scale, and sent for public and media. The event, root causes, and corrective actions are evaluated, with different degrees of depthness, depending upon the importance of the event. Event investigation techniques are utilised if required as well as root causes analysis. If the event is considered a generic issue, a letter will be transmitted to other plants.

Events that have led to special inspections include:

- Repetitive events.
- Events with direct or root cause uncertain.
- Events classified > level 1 (INES scale).

A computerised data bank (DACNE) is maintained on behalf of all nuclear power plants. Two sub-banks exist; one for component failure data and the other with event data.

5.26 SWEDEN

Reporting requirements are specified in SKIs safety regulations. These include daily, monthly and annual reports. If an "abnormal event" occurs S*KI* shall be informed within one hour. Examples of an abnormal event are:

- Safety limit has been exceeded.
- Degradation of a barrier for confinement of radioactive material.
- Major release to the environment.
- Unexpected major change of reactivity in the reactor.

The response by *SKI* can be to call out the emergency staff or to send an investigating team to the site. Before plant start-up following an abnormal occurrence a safety assessment must be performed and permission to re-start must be approved by *SKI*.

5.27 SWITZERLAND

Events have to be reported according to a guideline. The guideline includes the criteria for notifying, reporting, categorising and investigating all events with safety significance.

Event investigation is carried out by both the utilities and the regulators. Event investigation and follow-up actions are connected with inspections as suitable. Moreover, events in plants of other countries are also evaluated if they are significant for Swiss plants.

5.28 UNITED KINGDOM

The licensee is required to make arrangements for notification, recording, investigation and reporting of abnormal occurrences on the site. Some occurrences are categorised as requiring immediate reporting to

NII. Any such report is channelled within *NII* to a senior inspector who will make a judgement on the nature of the initial response. The response might be one of the following:

- to initiate *NII*'s emergency arrangements;
- to send inspectors to site to determine the causes of the occurrence and whether enforcement action is required;
- to leave *NII* follow-up action to the next routine visit to site by the site Inspector.
- to carry out a team inspection into the occurrence.

The licensee is also expected to review all occurrences at his own and similar plants with a view to preventing future occurrences and the site Inspector also inspects this function.

5.29 UNITED STATES

Federal Regulations require licensees to immediately notify the *NRC* of operational events. These and other operational experiences are evaluated by the *NRC* to identify the more significant events for consideration. The NRC maintains a 24-hour operations centre to receive the most significant information by telephone and requires written Licensee Event Reports within 30 days for less significant events.

The resident inspectors are the primary on-site evaluators of site events or incidents. It is expected that the greater part of event related inspection effort will be performed by the resident inspectors, who may be supplemented by other inspectors, depending on the type of event. The collection of information is used by risk analysts in evaluating the risk significance of the event and the subsequent level of NRC response. The event response is based on a graded approach and may include a Special Inspection (SI), Augmented inspection team (AIT), or an Incident Inspection team (IIT).

An IIT is the most in-depth team inspection and consists of technical experts from the headquarters and regional offices who have not had significant involvement with the licensing and inspection activities at the site. A senior NRC manager leads the IIT and reports directly to the Executive Director for Operations (EDO) and is independent of the regional and headquarters management. An AIT consists of technical experts from the regional office in which the event took place. The team may be supplemented with headquarters personnel and reports directly to the appropriate regional administrator. An SI is similar to an AIT inspection except that the team is generally smaller and is generally not augmented by headquarters or other regional staff.

All operational events and conditions reported to the agency and those that are identified through the *NRC* inspection programme are screened for generic significance. An Information Notice may be issued within a few months to all affected licensees (approximately 100 are issued each year). For the most significant events or conditions identified, a Bulletin or Generic Letter may be issued, which requests actions or analysis to be performed and requires a response regarding current and planned actions.

On a sampling basis, the *NRC* inspects the adequacy of licensee evaluations and corrective actions with regard to the events at their own facilities and the information available to them from the agency and industry sources.

CHAPTER 6 - EMERGENCY RESPONSE

This chapter provides information on the role of the inspection agency during an emergency response situation. Included are the role of the inspectorate and other governmental departments or ministries, actions taken during an emergency response period and the follow-up activities after the emergency is ended.

6.1 ARGENTINA

As a part of their mandatory documentation, the Argentine nuclear power plants have their respective Emergency Plans for early intervention, within a territory with a 10 km radius, in case of nuclear accidents involving the release of radionuclides into the environment and affecting the neighbouring population. Such plans contemplate the application of measures aimed at preventing and mitigating tentative radiological consequences. The regulatory authority responsible for the areas around nuclear power plants is Civil Defence, an agency that —for this purpose— reports to the local municipal government. Through agreements, the local government transmits the required provisional authority to the NPP manager, so that the latter can apply the above mentioned measures for the protection of the population. There are two types of measures applied, as required by the nuclear Regulatory Authority. On one hand, those applied automatically, when there is evidence of a nuclear accident within the station, since the very beginning of the release into the environment, such as: sheltering, stable iodine pills and road control. On the other, the measures applied after evaluations confirmed by measurements, such as a later evacuation of the population, restrictions in food consumption and return to the affected areas. The Regulatory Authority evaluates the functional capacity for response to potential accident by analysing the results of emergency drills to be performed annually by the nuclear power plants. Also, a role to be carried out by the Regulatory Authority during the development of a nuclear accident is advising on this issue to Civil Defence and to other public agencies that may be summoned to participate and that must make decisions.

6.2 ARMENIA

In case of an emergency situation, the licensee is responsible for mitigating the on-site consequences of the incident. The Licensee is responsible for reporting the event to the ***ANRA***. The responsibilities for off-site emergency actions are within the Emergency Management Administration.

For cases of serious problems, the Prime Minister organises the State Emergency Commission. In this case the Armenian Nuclear Regulatory Authority carries out function of the national adviser on organisation of response and is competent authority and contact point on the Convention "Early Notification of a Nuclear Accident".

The national emergency response plan determines functions of organisations of national emergency response system and also material, human and technical resources for performance of measures on population protection.

6.3 AUSTRALIA

ARPANSA provides advice and technical support to the Commonwealth's disaster, emergency planning and operations agency, Emergency Management Australia. *ARPANSA* also provides a technical advisor for emergency planning in relation to nuclear powered warship visits. Where requested, *ARPANSA* will provide States and Territories with advice and assistance. *ARPANSA* does not have any formal role in the

emergency response planning of ANSTO for HIFAR or other on-site facilities. However, *ARPANSA* may undertake a role in relation to dealing with off-site emergencies if requested by Emergency Management Australia.

In its capacity as regulator, *ARPANSA* receives notified of all safety-significant incidents and emergencies from licence holders. As part of its function to monitor and review safety at the reactors, *ARPANSA* monitors emergency response actions and reviews follow-up activities. Staff of *ARPANSA* are available to advise the operator on emergency response and follow-up actions, and, where considered necessary, *ARPANSA* may require actions be taken to ensure the safety of the operating staff, the public and the environment.

6.4 BELARUS

In case of emergency licensee is responsible for mitigating and eliminating consequences of an accident. He is to report the accident to Promatomnadzor and other concerned. Promatomnadzor in co-operation with all the concerned conducts special investigation and indicates cause of an accident and measures to be taken to prevent such accidents in future. Off-site emergency response measures are taken by the relevant departments of the Ministry for Emergencies and some other governmental agencies.

6.5 BELGIUM

The Belgian regulation related to emergency planning/preparedness is covered by the Royal Decree of 27th September 1991 which describes the National Emergency Plan (NEP) for nuclear risks on the Belgian territory.

The organisation put into place by the regulatory body (***AVN***) to fulfil its missions in the frame of NEP has been integrated into the current internal organisation.

The role of ***AVN*** during an emergency can be split into three aspects:

- an **advisory role** in the national emergency plan: the presence of a senior officer in the Governmental Crisis Centre (GCC) inside the Evaluation Cell in charge of establishment of proposed recommendations of protective actions has proven to be very useful: his knowledge of the plant and the understanding of the incident is very effective for the other members of the Evaluation Cell;
- a **supervision role** on site: verification of the respect of the on-site emergency plan, especially concerning the evaluation of the radiological impact by the Licensee and the communication of the results and of the general status of the plant to the GCC;
- **support and independent evaluation** in the Headquarters Emergency Centre (HEC): general co-ordination, technical and logistic support of the ***AVN*** crisis team, use of alternative codes for impact calculation, use of codes for evaluation of damage, alternative evaluations using specific boundary condition hypotheses (e.g. sensitivity calculations).

To achieve these roles and missions, 5 roles on duty (two roles associated with the two Belgian nuclear power plants sites, one for the Belgian nuclear installations, one for the GCC's Evaluation Cell, one for evaluations support) are established in order to be able to fulfil 4 emergency functions (one representative

in the GCC, one inspector on the affected site and 2 support & co-ordination functions in the ***AVN***'s HEC). The following groups, called "minimal crisis team of ***AVN***", are activated in case of an emergency:

- ***AVN*** representative in the GCC (Evaluation Cell):

  - gathering and evaluation of all necessary information on the concerned installation;
  - evaluation of the installation status and its possible technical evolution;
  - evaluation of the real or potential radiological consequences of the accident in order to advise on protective and/or intervention measures for the population and the environment.

- ***AVN*** representative on the affected site:

  - supervision on site (verification of the licensee actions, information on installation status, the releases, the impact of calculations and measurements, ...)
  - gathering all relevant information to be transmitted to the ***AVN***'s HEC.

- ***AVN*** headquarters link:

  - Co-ordination of all the emergency activities of ***AVN***;
  - Support to ***AVN***'s experts present on the affected site and in the GCC (such as organisation of the turnover process);
  - Contact with internal and external authorities.

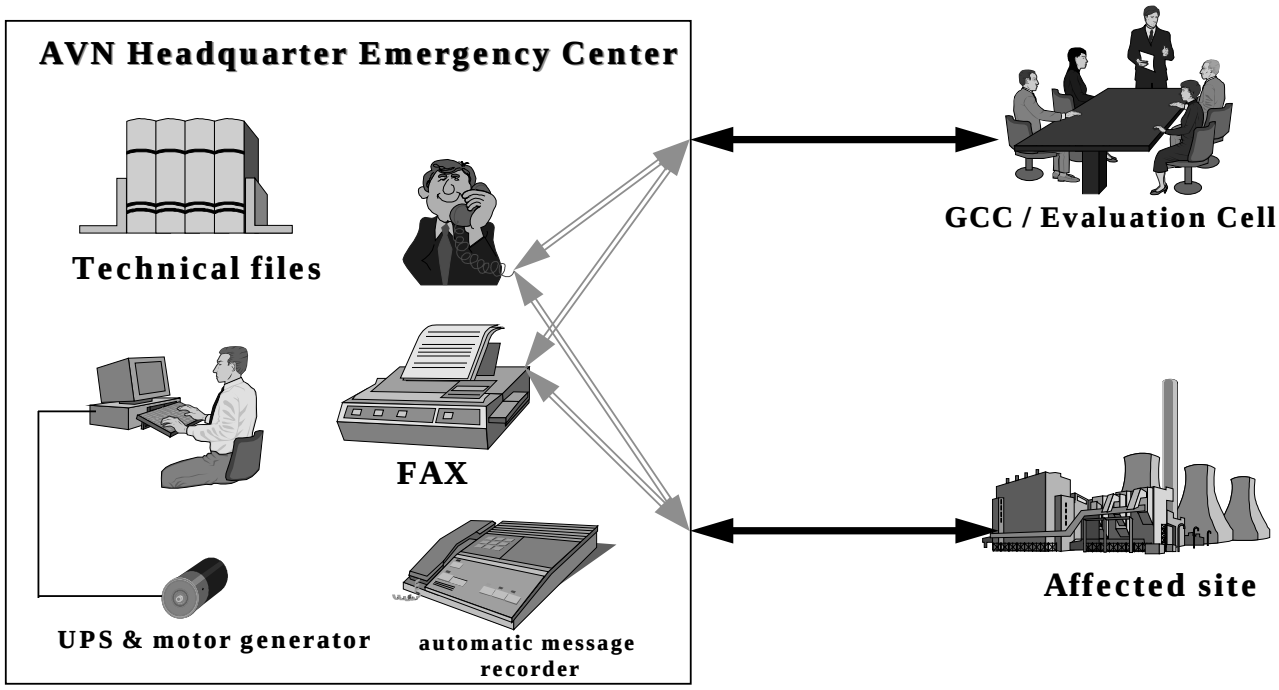
- ***AVN*** radiological impact evaluation

  - Independent evaluation of the technical status of the plant and the associated radiological impact.

The technical and logistical means available in the HEC are the following:

- General documentation (emergency plan and procedures of the sites,...)
- Computerised means to evaluate the radiological consequences
- Manual means to evaluate the radiological impact (standard tables, simplified procedures,...)
- Communication means: phones, fax, automatic message recorder
- Uninteruptible power source (autonomy of at least 1,5 hour) and electrical generator

The general structure of the ***AVN*** emergency organisation is given in the figure below.



[more detailed information can be found in the following document, available on the ***AVN*** web site *www.**AVN**.be* : « Emergency Preparedness : Belgian Nuclear Emergency Plan »

6.6 CANADA

Within the context of the *CNSC's* emergency response plan, the licensee is the on-site authority, responsible for the management and implementation of on-site emergency response in accordance with an approved emergency response plan. Off-site response falls under provincial jurisdiction. Although the *CNSC* evaluates licensees' preparedness with respect to on-site capability, it also verifies the interface with off-site authorities

The role of the *CNSC* during an emergency is to monitor the response, evaluate the emergency response actions, provide technical advice when requested, provide regulatory approval when required and inform the government and the public on its assessment of the situation, as a federal regulator. The *CNSC* fulfils this role by acting at 4 different levels: on-site (or at the accident scene for transportation events), at the provincial operations centres, at the *CNSC* headquarters, and at the federal government.

As soon as the on-site emergency is terminated the *CNSC's* Emergency Director will determine the need for post-accident assessment and, if required, will direct one or a team of *CNSC* staff to go to the location of the emergency to evaluate the impact of the accident and determine the cause. This team should also assess the performance of the *CNSC's* emergency actions.

6.7 PEOPLES REPUBLIC OF CHINA

The operating organisation is in charge of the on-site emergency response. The local government is in charge of the off-site emergency response under the leadership of the National Co-ordination Committee for Accident in NPP. The *NNSA* takes supervision of the on-site emergency response and supports off-site emergency response in the technical area during the emergency response period.

6.8 CHINESE TAIPEI

The emergency preparedness organisation is divided into on-site and off-site organisations; Taiwan Power Company (TPC) takes charge of the on-site mission, while the National Nuclear Emergency Management Committee (NNEMC) and its established units take the responsibility of carrying out the preparedness missions outside the plant.

In case of nuclear accident, the on-site emergency planning is performed by an Emergency Control Team set up within the plant in co-operation with the "Emergency Planning Execution Committee" (EPEC) in TPC headquarter. The Emergency Control Team is responsible for organising all supporting personnel to handle on-site accident tasks. The responsibilities include accident detection, assessment, rescue, personnel mobilisation notification, off-site radiation monitoring and impact analysis, and executing off-site preliminary emergency preparedness action in co-operation with NNEMC.

In order to effectively carry out the off-site emergency preparedness action, NNEMC shall be organised immediately by relevant government agencies including Atomic Energy Council, the Ministry of Interior, Ministry of Defence, Ministry of Economic Affairs, Ministry of Transportation and Communications, Department of Health, Department of Police, TPC, etc. The following units have been established under NNEMC: Near-site Directing and Co-ordinating Centre, Crisis Directing Centre, Supporting, and Media Relations. The goal is to unite each institution's capabilities to protect the health and safety of the public.

In order to assess whether working personnel can correctly response according to emergency operation manuals, whether the related software and hardware in nuclear power plants can carry out their functions and whether people living around the plant possess emergency preparedness capability, our 3 nuclear power plants individually performs on-site emergency planning drills once every year and performs off-site as well. To emphasise the concept of "openness", we invited people from the news media and nuclear medical centres to the scene to participate in. After the drill, NNEMC held a review meeting in which experts and scholars of various backgrounds offered assessments and recommendations. These recommendations will be reflected for future modifications of emergency preparedness planning.

6.9 CZECH REPUBLIC

Emergency planning structure is divided into 2 levels - national and regional. On the national level, the Governmental Commission for Radiation Accident *(GCRA*) is established. It is responsible for all components of the preparedness for handling radiation accidents. In case a serious accident happens, *GCRA* co-ordinates all activities aiming at the mitigation of its consequences.

GCRA is supported by the Expert Advisory Group (EAG) and the *SÚJB* Emergency Response Centre *(ERC). EAG* is appointed to:

- Prepare an expert evaluation and recommendations concerning the emergency planning programmes, the model aiming at the prediction of exposure of the public and programmes of implementing countermeasures after a nuclear accident.
- Provide in case of accident proposals and recommendations to *GCRA* on application of protective measures and handling consequences under the specific conditions of the occurring event.

ERC performs function of the Contact Point, co-ordinates activities of Radiation Monitoring Network of the Czech Republic, ensures technical and expert support in the field of nuclear safety and radiation protection for *GCRA* and Regional Authorities as well.

Introducing regional off-site protective measures completely rests with the Regional Authorities and their advisory bodies - Regional Commissions for Radiation Accident *(RCRA).* They are responsible for

planning and performing of all necessary steps for the protection of population and mitigation of consequences of the radiation accident in the Emergency Planning Zone of the NPP. Regional Authorities are supported by *SÚJB-ERC* and the NPP.

In case of radiation incident or accident it is the responsibility of the NPP to perform initial assessment of the event and its probable development. The NPP must notify immediately *SÚJB* and Regional Authorities, ensure warning of the population in the Emergency Planning Zone and contribute to the assessment and prediction of accident consequences. Simultaneously, NPP ensures monitoring and evaluates radiation situation in its vicinity by means of its laboratory and prepares recommendations of the protective measures for Regional Authorities in early phase for radiation accident.

6.10 FINLAND

The basic regulations for on-site emergency planning are given in the Nuclear Energy Act and in the Decision of the Council of State (397/1991). Off-site emergency plans are required by the Decision 1/97 by the Ministry of Internal Affairs. According to the Nuclear Energy Act, adequate on-site emergency preparedness arrangements are required before starting the operation of a nuclear facility. Detailed requirements are issued in Guide YVL 7.4. On-site emergency plans are subject to approval by *STUK*.

STUK is a National Warning Point and National Competent Authority regarding to any event, of either domestic or foreign origin, when radioactive material is involved. *STUK* shall draw up an overview of the accident and radiation situation, access harmful effects regarding safety of the population and the environment, and give recommendations for protective measures. *STUK* shall disseminate information about the situation to domestic and foreign counterparts and to the media. In addition, *STUK* shall advice e.g. industry, trade, transport and customs authorities regarding the reduction of harmful effects. *STUK* shall also be responsible for international assistance relating to radiation expertise.

In order to take necessary precautionary measures, it is important to be informed of the threatening situation as soon as possible. For this purpose, Finland has concluded to arrangements with its neighbouring countries and international organisations concerning notification of radiation and nuclear accidents. The nearby Russian power plants have communication systems, which will speed up the notification of accidents. These notifications are conveyed via satellite.

Even if there are no advance notification of a radioactive release, even a minor rise in the radiation level in Finland will be detected by means of radiation monitoring network. When the radiation level exceeds the limit set to the measuring stations (0.4 micro-sieverts per hour), the system gives immediately alarm to *STUK*. The alarms are received automatically also from the monitoring networks of Leningrad and Kola NPP areas.

STUK carries out periodical inspections at nuclear power plants to verify operational emergency preparedness of the licensees. Among other things, the maintenance and adequacy of appropriate rooms and equipment, communication and alarm systems, computerised support systems as well as personnel training and qualifications are inspected.

The on-site emergency plans established by the licensees and off-site plans prepared by local authorities include provisions to inform the population in the case of an accident. In addition, written information on radiation emergencies, emergency planning and response arrangements have been provided to the population. Such information can also be found in the telephone directories of Finland. Citizens living near nuclear facilities are regularly provided with more detailed written information on nuclear accidents and emergency measures needed.

STUK has established an Emergency Preparedness Manual for its own activities in the case of a nuclear accident or radiological emergency. *STUK* has an officer on duty for 24 hours a day to ensure receipt of a message, and to be able to immediately give advice to local and governmental authorities on needed emergency response actions. Operations can be launched within 15 minutes.

STUK notifies the duty officers of the principal ministries. The ministries give the alarm to their own organisation and to their regional and local administration, if required. If necessary, *STUK*, too will send the alarm message to emergency response centres, which in turn will pass on the information to provinces and municipalities. *STUK* will also inform the media about the situation and the operations that have been launched.

In radiation hazard situation, quick and uniform communication, which conveys the correct information can prevent the spread of rumours and false information. If the situation requires rapid protective action, a general alarm signal will be given by alarm sirens. Instructions will be issued on radio and TV by the authority in charge of the rescue activities. Should an urgent situation arise, first notification of the situation may also be given by *STUK*..

The authority in charge is responsible for general information about the accident and rescue activities. Authorities at governmental, provincial, and municipal level provide information about their own activities and give instructions regarding their own sphere of responsibility. In a very serious situation, the information unit of the Council of State is responsible for the co-ordination of the information. Information is mainly conveyed through the media. Many authorities will also supply additional information via their Internet pages. *STUK* supplies information concerning the accident, the radiation situation, and the impact of the situation on public health and safety via the media.

Depending on the extent of the hazard situation, decisions concerning safety operations are made by the rescue authorities on the municipal, provincial or governmental level. Other measures required by the situation shall be decided upon by relevant administrative sectors.

The rescue authority will be the general supervisor of the situation co-ordinating co-operation between the various authorities, too. At each supervisory level command centres will be used. Representatives of the most important co-operative sectors will also be operating at these centres.

After the radioactive cloud has passed, the emphasis shall be on minimising the effects of exposure from foodstuffs and the environment. *STUK* and the relevant organisations shall give instructions for producers, manufactures of foodstuffs, and consumers of self-produced foods and natural products.

6.11 FRANCE

An emergency situation is defined in the following way : an incident compels the plant management to trigger the on site emergency plan, according to specific criteria.

For such an incident occurring in a NPP, the emergency site team is immediately set up, as well as national emergency response teams, set up by EdF and FRAMATOME. Its main task is to control the situation, and mitigate the incident consequences.

The Nuclear Safety Authority is immediately informed of the triggering (by a Biplus signal transmitted to the *DSIN* management and inspectors) : the *DSIN* then sets up its own emergency management team, in Paris, together with the National Technical support centre of the IPSN based at Fontenay-aux-Roses, near Paris (for expertise of the accident, and mostly follow-up of radiological releases).

In the mean time, the relevant *DRIRE* Regional office sets up its own emergency team.

If the accident develops off site, then the off site emergency plan is triggered by the Prefect (the highest State representative in the relevant Region), who must take the right decisions for the populations (basically, to stay indoors, or to be evacuated), because they are under his responsibility.

It should be added that the Nuclear Safety Authority (*DSIN* emergency team in Paris, and *DRIRE* emergency team) has the following tasks :

- monitoring the licensee's actions all along the incident development, at the *DSIN* emergency team, through an on line communication link from the Region *DRIRE* inspector who has been dispatched from his Region office to the plant emergency team, and using IPSN technical assessment on possible short term scenario ;

- assisting the Prefect in its decision making, by the Region *DRIRE* inspectors who have been dispatched from their Region Office, to the Prefect emergency team (these inspectors having a direct communication link with the *DSIN* team) ;

- informing the media, in co-operation with the licensee, and the Prefect, both at national and regional levels ;

- informing other national and international authorities.

Finally, it should be said that the government has decided in 1996 to distribute the iodine tablets to the populations surrounding the NPP sites, prior to any emergency.

6.12 GERMANY

The off-site emergency management in Germany is divided in disaster response under the responsibility of the *Länder* and in precautionary radiation protection measures, mainly under the responsibility of the Federal Government. The responsibility for off-site emergency actions is not within the nuclear regulatory bodies, their responsibilities are to inspect the licensee's precautionary measures, and in case of an accident to evaluate the licensee's actions on-site and to support the emergency response team of the local authority in making dose projections.

The responsibilities of the licensees in emergency situations are set out in the regulatory framework. All German nuclear power plants have set up an emergency organisation consisting of crisis teams supported by task forces for in-situ measures. The emergency manuals of the plant contain procedures to built up on-site crisis teams and define the responsibilities within the crisis team. These manuals and the procedures as well as corresponding exercises are subject to regulatory inspection.

In the event of an accident, the utility is required to take the appropriate on-site measures for preventing core damage and mitigating the possible impact to the environment of the plant. The licensee must also classify the situation conditions as one of the emergency levels and notify the competent authorities (the *Länder* and local government authorities).

In cases that the environment is affected by the accident, the emergency response team of the local authorities takes the necessary actions to assess the implications and to protect the public. Assessment and evaluation of the accident and the radiological situation and pertinent advice to this emergency response team are given by the nuclear regulatory authority. In addition, the emergency response team is supported by a delegate of the licensee.

6.13 HUNGARY

The Hungarian crisis management system in general has undergone an essential change following the entering into force of the Act LXXIV of 1999 on the control and organisation of the protection against catastrophes on January 1, 2000. As a consequence of this Act a single leading organ (the Governmental Co-ordination Committee) has been formed to deal with every type of catastrophes in contrast to the former system in which the leading role was assigned to different organs depending on the nature of the emergency (in case of nuclear accidents a specific governmental committee was in command of the nuclear emergency preparedness and activity).

The minister of internal affairs heads the Governmental Co-ordination Committee; his deputy in case of nuclear emergencies is the Director General of the Hungarian Atomic Energy Authority (*HAEA*). The Committee consists of high-ranking representatives of the ministries and national organisations involved in the given catastrophe. Two subcommittees of the Governmental Co-ordination Committee – the National Defence Committee and the Operational Staff – serve as vehicles in assisting in decision making in case of a nuclear emergency. These sub-committees have as members the expert-representatives of the ministries and national organisations involved in nuclear emergencies.

The Directorate General for National Emergency Management (including the national civil protection organisation and the national fire service) operates a Nuclear Emergency Information Centre. The Hungarian Atomic Energy Authority operates its nuclear emergency centre CERTA (Centre for Emergency Response, Training an Analysis) for its emergency preparedness organisation (*HAEA* EPO) with the responsibility of giving evaluation of the accident and recommendation on protective actions.

In case of the on-site emergency planning, the *HAEA* Nuclear Safety Directorate (*HAEA* NSD) – as the regulatory body in first instance in every question related to the safety of the Hungarian nuclear installations – approves the nuclear emergency plan of the installations. *HAEA* is responsible for the evaluation of any on-site nuclear incident and accident with respect to its possible off-site consequences. More closely, in case of a reactor accident (inside Hungary or elsewhere), the *HAEA* Emergency Preparedness Organisation is expected to analyse the situation, forecast the possible consequences and to estimate the actual and/or possible future source term following a release from the damaged nuclear installation. In the recent years the *HAEA* EPO has acquired and developed the tools and expertise necessary to cope with these tasks .Similarly the source term resulting from a radiological emergency inside the country or elsewhere from where radiological consequences may affect Hungary is also to be determined by the *HAEA* EPO.

The new developments in the legal framework of the Hungarian crisis management have resulted in the enlargement and broadening of the responsibilities of the *HAEA* EPO in case of nuclear and radiological emergencies. Primarily this means that the entire process of supporting decision-makers in case of a nuclear or radiological accident is the responsibility of the *HAEA* EPO. Accordingly the former tasks have been supplemented by the estimation of the propagation of radioactivity following a release as well as the determination of the possible/suggested counter-measures. Although the primary tools for this activity have been made available in the *HAEA*, nonetheless more knowledge and practice should still be gained before the organisation becomes fully capable of fulfilling the related responsibilities.

HAEA is a contact point for receiving notification on any nuclear or radiological emergency on both national and international level. In practice this means that – on a 24 hours basis – the Inspector on Duty of the *HAEA* receives messages from the Hungarian nuclear installations as well as from the international community on any nuclear emergency. This community first of includes the IAEA and the neighbouring countries with which Hungary has signed bilateral notification agreements. Having received a notification the Inspector on Duty makes the necessary alerting of the *HAEA* EPO. (Actually a parallel notification

route is in existence through the ministries of foreign and internal affairs, respectively, which is meant to alert the operative and logistics branch of the national emergency preparedness organisation.).

Activity of the *HAEA* EPO is defined and regulated by a set of organisational procedures. Another set of procedures called the Operational Procedures gives support in the early and fast analysis of a nuclear accident when only limited information is available. For more detailed analysis in the course of the progress of an emergency an on-line power plant data acquisition and displaying system is available and also a number of computer-based tools are used. Various informative databases are available for training, exercise, as well as emergency uses. The crisis centre CERTA is provided with the hardware tools necessary for its functioning.

The *HAEA* EPO is regularly exercised. Three main types of exercises are organised: alerting, mini-(or thematic) exercise, and full-scale exercise. In the case of the first type the *HAEA* EPO is alerted and either the expected arrival times of the participants are recorded, or an actual calling-in is performed. In mini-exercises one or more selected groups perform their tasks without the functioning of other groups. Mini-exercises are based on pre-recorded scenarios or pre-prepared materials. In full-scale exercises the entire EPO is involved, preferably with all its external relationships (i.e. in a joint exercise with the other organs of the Hungarian emergency response system). These exercises usually utilise the NPP training simulator. Communication exercises, testing the availability of the contact points and messaging devices are occasionally organised by the IAEA.

A number of international co-operation programs have largely contributed to the development of the *HAEA* emergency preparedness. Two of them have been organised by the IAEA, two by the European Union and one by the British Government.

6.14 ITALY

Chapter X of Legislative Decree no.230 deals with nuclear emergencies. This chapter describe the procedure to be followed in preparing “external emergency plans” to be put into action when an accident occurs in a nuclear installations and involves a risk for the local population.

A centre for preparing and evaluating data concerning radiation emergencies has been established at *ANPA* H.Q.. In this context, it should be noted that, at the international level, Italy has ratified the 1986 Vienna Convention on Assistance in the case of a Nuclear Accident or Radiological Emergency.

6.15 JAPAN

As mentioned in 3.17, the criticality accident at uranium fabrication plant in Tokai-mura in September 1999 was a significantly severe accident, where two operators died and the residents were evacuated and sheltered to indoors for the first time in Japan. Making the accident lessons, the Government decided to take special measures considering the uniqueness of nuclear accidents, which leads to the enactment of the NEP Law in December 1999, come into force in June 2000.

This law specifies the measures to be taken during nuclear emergency in commercial power reactors, test and research reactors and nuclear fuel facilities, including, as the measures for reactors, for example, prompt initial action, functional cooperation of national agencies and municipal corporations, designation of off-site center, declaration of emergency by a prime minister, setting up the Disaster Countermeasures Headquarters/On-site Disaster Countermeasure headquarters and deployment of Senior Specialist for Nuclear Emergency Preparedness.

6.16 KAZAKHSTAN

According to Atomic Use Law, the nuclear facility is responsible for installation safety and for mitigating the consequences of the incident. The Licensee is responsible for reporting the event to *KAEC* (Kazakhstan Atomic Energy Committee). The role of the *KAEC* is monitor the response, evaluate the emergence response actions, provide regulatory approval when required related to nuclear and radiation safety. The inspectorate response includes verification that the licensee takes all safety actions.

6.17 REPUBLIC OF KOREA

During a radiological emergency response situation at a nuclear facility, the licensee is responsible for mitigating the consequences of the incident and for providing appropriate action recommendations to local governments, and for insuring that *KINS* and *MOST* (National emergency Co-ordinator) are immediately informed.

In case the environment is affected, responsibilities for off-site emergency actions are within the local authority. National response activities are co-ordinated with local and national authorities, and the licensee's response efforts.

KINS activates its Technical Advisory team at the Technical Emergency Operation Centre in Taejon Headquarters and *KINS* emergency personnel evaluate the plant situation, assess the implications, and forecast the radiological consequences. *KINS* recommends to local governments any additional actions needed to protect the public.

The *KINS* response includes verification that the licensee takes all necessary safety actions. The *KINS* monitors the incident in order to be ready to give advice to the licensee based on its assessment of the plant situation, so the Licensee can obtain needed expertise and equipment. *KINS* will also investigate the course of events and causes, assess and decide which further measures need to be taken. The *KINS* dispatches teams to the local and national governments to provide technical advice, and to the site for significant events. All *KINS* activities are co-ordinated from local and national government headquarters and the licensee's Emergency Operations Facility near the site. *KINS* emergency response teams and local governments provide technical advice to prepare the necessary actions to assess the implications and to protect the public.

As a follow-up action, *MOST*/*KINS* Inspection Teams may investigate significant operational events. Following the achievement of control over the emergency, *MOST*/*KINS* will then be involved in assessing proposals to return the nuclear facility to normality using its powers under the license conditions.

6.18 MEXICO

During the occurrence of any incident, the utility is responsible for the mitigation of consequences. There are 4 classes of incidents. If the severity of incident (external or internal) is such that it is necessary to classify it in any of the 4 classes, the licensee is also required to notify the regulatory body immediately. If the event continues to increase in severity, then it is necessary to notify the ministry of interior, who is the governmental organisation responsible for co-ordinating all efforts to cope with an event which is trespassing the site. After notification and if it is considered pertinent, the regulatory body response emergency organisation (permanently on call), will reassemble at the Operations Emergency Facility Centre at *CNSNS* headquarters. This group can monitor the development of the event and has the capability to give recommendations to the governmental offices (ministry of interior).

6.19 THE NETHERLANDS

In case of an emergency situation (the emergency classification system of the IAEA has been adopted) the National Contingency Plan for Nuclear Accidents (NPK) which describes the emergency response organisation, becomes operative. Co-ordination of the off-site response is the responsibility of the Ministry of Housing, Spatial Planning and the Environment *(VROM).* Personnel of the *KFD* participate in the several groups / teams of the national emergency organisation to provide technical information and advice. The Technical Information Group in this organisation have direct contact with the affected installation. In addition, inspectors on site verify that the licensee takes the necessary actions and have contact with the representative of the *KFD.*

6.20 PAKISTAN

The operating organisation is in charge of the on-site emergency response. Each site prepares its own emergency preparedness plan which is approved by *PNRA.* Emergency drills are carried out regularly to determine the effectiveness of the programme, and are always generally witnessed by *PNRA* personnel.

6.21 RUSSIA

Federal Provisions and licence conditions call for arrangements to be made to deal with any accident that lead to radioactivity being released on or off the site. An Emergency Plan for Personnel Protection must be prepared and submitted to Gosatomnadzor of Russia in complete set of documents for obtaining of licence. The local administration of the region (city) were the NPP is situated must prepare an Emergency Plan for Population Protection. These outlines the organisation and procedures to be used on site and with local Division of Ministry on Emergency Situations. They set out provisions for on-site and off-site radiation monitoring, and for the chain of communication.

The Emergency Situation Centres of Gosatomnadzor and of Ministry on Atomic Energy should be informed at the very beginning of emergency situation.

During an incident at a licensed facility, the licensee is responsible for implementing its emergency procedures for mitigating the consequences of the incident.

In the case of a severe accident the Ministry on Emergency Situations of Russia creates on federal level the special Emergency Group (OPAS), which includes specialists from different governmental organisations including the group of specialists of the Gosatomnadzor. The Group should be delivered on the site of accident in short time. Representative of Gosatomnadzor of Russia in the Group is obliged to supervise the observation of legal requirements at elimination of an accident.
Site inspectors supervise emergency exercises.

6.22 SLOVAK REPUBLIC

There are two (2) levels of emergency response in the Slovak Republic:

National Level:

- The National Emergency Commission for Radiological Accidents. This is a governmental body responsible for emergency preparedness on territory of the Slovak Republic. Members of this commission are representatives of various ministries and organisations involved in the Slovak structure of emergency planning. The Chairman of the Nuclear Regulatory Authority is a member of this commission.

- The Emergency Response Centre of the *UJD*. The Centre provides technical support for the *UJD* Chairman. Its function during an emergency is to independently evaluate the technical state of the facility, the radiological situation in NPP surroundings and to provide advice and recommendations for the Emergency Commission through the *UJD* Chairman. Another objective is to check and supervise the correctness of operator activities.

Local Level:

- The Regional Emergency Commission for Radiological Accidents. It is established at a district office which is under the responsibility of the Ministry of Interior. This is an executive body responsible for all activities covered by the off-site emergency plan. During the emergency, in case of a severe accident, this commission closely co-operates with the National Emergency Commission and the NPP operator.
- Emergency arrangement of the NPP operator is covered by the on-site emergency plan.

6.23 SLOVENIA

The Protection and Rescue Administration (Ministry of Defence) operate the State Emergency Plan with the Civil Protection Headquarters. Within the *SNSA* there are 3 expert groups formed in case of emergency that are giving support to the Civil Protection Headquarters, which are:

- Expert group for the analysis of the nuclear accident,
- Expert group for the assessment of doses to the environment during nuclear accident, and
- Expert group for logistic support and public information.

In accordance with the *SNSA*'s Emergency Plan, one or two inspectors, immediately after the emergency has been declared, go to the NPP. They are equipped with protection and monitoring means. In the plant they are located in the Technical Support Centre. Their role is to collect information on the accident and periodically report to the *SNSA*.

6.24 SOUTH AFRICA

A formal *NNR* system is in place to cover the reporting of and response to any emergency at the KNPS. Regular exercises are held Eskom and monitored by the *NNR*. In addition, the *NNR* devises and implements an annual full scale emergency exercise to test all on-site and off-site capabilities. These exercises are usually witnessed by international experts and other invited persons.

The continued availability of systems, facilities and training to service the emergency plan are inspected and maintained through the *NNR* inspection programme.

6.25 SPAIN

There are two kinds of plans for emergency response situations in Spain. They are named "onsite" or interior emergency plans and "offsite" or exterior emergency plans.

The "onsite" plans are developed by licensees and approved by the *CSN* and the Ministry of Economy. These plans describe the organisation and resources of licensees to face an emergency situation with radiological consequences inside the plant. The personnel are trained according to the plan and its emergency procedures in a systematic way. Furthermore, annual exercises are carried out using different scenarios each year. The *CSN* evaluates the adequacy of the plan, means, and procedures and ensures throughout inspections that the organisation and resources are available and trained. The *CSN* participates in the exercises activating the *CSN* Emergency Centre and inspects directly their evolution in the plant.

The “offsite” plans for nuclear power plants are developed by Civil Defence (Ministry of Interior) according to radiological criteria supplied by *CSN*. There is a national generic plan approved by the government, which contains radiological criteria and organisational arrangements. Furthermore, five specific plans have been developed, following the generic plan, for each province in which a nuclear site is placed. The exterior plan is conducted for the Government Delegate (before named Civil Governor) as the Head of Civil Defence in the province and he is responsible to take the appropriate decisions in each situation. There are three main divisions named radiological, sanitary and logistic groups. The CSN participates in the offsite plans heading the radiation protection group. Enresa, as a public company in charge of radioactive waste management in Spain, also co-operates in this group. The emergency centre of the CSN is in contact with the main emergency centre of Civil Defence in Madrid and the emergency rooms in the provinces, and of course with the emergency organisation at the plant. The *CSN* advises the Government Delegate about the countermeasures as sheltering, iodine tablets ingestion, evacuation etc., needed in each situation to protect public and environment. The sanitary and logistic groups include all civil and public health bodies (fire, police, health agents, etc.) from ministries as Interior, Transports, Health, Agriculture, National Institute of Meteorology and others. Periodic exercises of different offsite plans are conducted by Civil Defence with the participation of the *CSN* and other partners integrated in emergency response preparedness in Spain.

To this end, the *CSN* has developed an emergency organisation with three functional groups; Operating Analysis Group, Radiation Protection Group, and Support Group to follow plant evolutions, calculate doses, and communicate with all outside organisations. The Head of the *CSN* emergency organisation is the Director of Radiation Protection. These groups are concentrated, upon activation, in the *CSN* Emergency Room (SALEM). The Emergency Room has the equipment needed to receive safety parameter evolutions for each nuclear power plant (approximately 30 variables, with the capacity to amplify to 100 parameters), data from meteorological towers at nuclear power plants and radiation measurements of the national radiation networks, computer calculations and communication arrangements. The emergency organisation of the *CSN* is composed by about 20 experts in different specialities, and they are always available for an emergency situation (there are established a rotary system between about 80 people). Also, there are, 24 hours every day, technical people in the emergency centre to receive the notification of events from licensees and to alert the emergency organisation. During an emergency response, the CSN is in contact also with, at least, a resident inspector in the site and other in the emergency centre in the province, that is activated by the Government Delegate.

6.26 SWEDEN

In case of a serious accident at a nuclear power plant, the licensee is responsible for mitigating the consequences and for giving appropriate protective recommendations to the County Board.

When *SKI* is notified of a site emergency, the *SKI* emergency staff is called in. The emergency procedures require that inspectors be located; on the plant site, at the local County, and at the Radiation Protection Institute (*SSI*) emergency centre. *SKI* functions in such an event are to monitor the event on site and to provide technical advice to *SSI* and the County Board and other involved authorities. Basic operational questions which *SKI* answers are;

Will there be any radioactive release ?, and if yes, When ?, What is the source term ?, and How long will it last ?

SKI will also investigate the course of events and causes, assess and decide about which further measures need to be taken.

6.27 SWITZERLAND

In case of an accident, it is the responsibility of the nuclear power plant management to ensure that appropriate measures are immediately implemented and that *HSK* and, if necessary, the National Emergency Operations Centre (NAZ) are immediately informed. The technical criteria for initiating appropriate actions are defined in the emergency regulations.

The *HSK* maintains a duty officer service and an internal emergency organisation. The duty officer must be able to receive messages from the plant within 15 minutes. The emergency organisation of the *HSK* must be ready for action within one hour after mobilisation. The *HSK* is responsible for the evaluation of the plant situation and forecast of radiation consequences. When an accident has happened, which could endanger the population through high radioactivity, the Government decides on the evaluations and recommendations of the Emergency Organisation for Radioactivity *(EOR).*

6.28 UNITED KINGDOM

A very serious occurrence will result in *NII* implementing its emergency procedures and sending teams of inspectors to be located on the site, the local off-site centre, other emergency centres and to the Government's national response centre. The functions of *NII* in such an event are to monitor events on the site and the actions taken to restore plant safety and to provide advice to the Government Technical Advisor (GTA).

The GTA is appointed by the Government and would be selected from one of *NII's* Deputy Chief Inspectors. The GTA reviews advice from the *NII*, together with advice from the National Radiological Protection Board and others about radiological consequences of the occurrence. The GTA acts as the principal advisor to the police and other authorities handling the off-site response for the duration of the occurrence and in relation to the immediate follow-up activities. This function is undertaken at the local off-site centre.

The Government co-ordinates its response through the national response centre which is located either in London, in the case of a very serious occurrence in England or Wales, or in Edinburgh, in the case of a very serious occurrence in Scotland. These responses are described in more detail in the document "Arrangement for Responding to Nuclear Emergencies" published by *HSE*.

Following the achievement of control over the emergency, *NII* will then be involved in assessing proposals to secure and subsequently return the nuclear facility to normality using its powers under the license conditions.

6.29 UNITED STATES

During an incident at a licensed facility, the licensee is responsible for mitigating the consequences of the incident and for providing appropriate protective action recommendations to State of local officials, or both. Federal response activities are co-ordinated with State and local government and licensee response efforts. As Federal Technical Co-ordinator, NRC recommends to the Governors of affected States any additional actions needed to protect the public. The NRC monitors the incident in order to be ready to give advice to the licensee based on NRC's Assessment of the plant situation, and obtains needed expertise and equipment. As a follow-up action, Incident Investigation Teams (see Chapter 4.12) may investigate significant operational events. The NRC dispatches a team to the site from its regional office for significant incidents and all NRC activities are co-ordinated from the licensee Emergency Operations Facility near the site by the Regional Administrator.

CHAPTER 7 - INSPECTORATE PERSONNEL

This chapter provides information on the relative size of the countries nuclear programme and a brief description of the regulatory staff with emphasis on personnel utilised to perform inspections. (Chart are provided in Annex IV and V). Included is a look at the qualification and training requirements for inspectors, training period and required experience of candidates, the level of responsibility afforded the inspectors within their organisations, and the extent of their authority. Also included is the size of the inspection staff, outside experts or specialists utilised during inspections, etc.

7.1 ARGENTINA

Regulatory inspections are performed by qualified personnel to cover all the relevant aspects of nuclear safety, radiation protection, safeguards and physical protection.

The resident inspectors and technical support staff are graduated engineers with experience in areas like safety assessment, design, reactor control, reactor physics, and radiation protection. All of them are recruited with the basic annual course of radiological and nuclear safety approved. Inspectors and safety analysts within the same group is highly experienced and their joint work is very valuable.

The *ARN* permanent staff is 70% with university degree in science and engineering

7.2 ARMENIA

The ***ANRA*** has a staff of 30 people. 14 specialists have at least ten years experience working in the area of atomic energy. The inspector's staff of the ***ANRA*** is 100% graduate engineers or a corresponding degree. The inspectors are trained in professional courses, workshops and by means of exchange of experience. In 2000 specialists of the ***ANRA*** participated as experts in more than ten work groups of IAEA and European Union.

7.3 AUSTRALIA

Australia has no nuclear power programme and only one operating research reactor rated at 10 MW(th). There are 16 scientific and engineering staff involved in regulatory activities including officers with extensive nuclear, health physics and nuclear, electrical, structural and mechanical engineering experience.

Because of the small size of *ARPANSA*'s Regulatory Branch, there are no specific qualification requirements for inspection staff as such. The senior engineers have post-graduate qualifications in nuclear engineering and the senior health physicist also has a post-graduate degree. Inspection staff have previous experience in nuclear plant operation, design or maintenance, and most have experience in nuclear regulation within Australia and in the USA or UK. In general, training of the inspection staff is on-the-job with attendance from time to time at training courses provided by the reactor operating organisation for its staff. Currently, outside consultants are not used to perform inspections.

7.4 BELARUS

Within Promatomnadzor the Interregional Inspectorate on Nuclear and Radiation Safety (10 employees) and Department of Nuclear and Radiation Safety Regulation (6 employees) supervise nuclear and radiation

safety at a state level. 1 expert and 1 specialist of the licensing service are also involved in relevant activities in the field. Radiation safety inspectors (5 inspectors) are employed by Regional Inspections of Promatomnadzor.

The majority of employees of the above subdivisions are highly qualified specialists with experience in industries or research. Practically all employees have a higher education degree. As for the age profile, 5 of them are under 35 years old, 9 – from 35 to 50, 5 – from 50 to 60 and 2 – over 60 years old.

According to their specialisation employees can be divided into the following groups:

- engineers (radio engineering) – 8 employees;
- engineers (chemistry) – 2 employees;
- engineers (radiation safety and protection) – 1 employee;
- engineers (mechanic) – 3 employees;
- medical doctors (radiation safety) – 1 employee;
- lawyers (international law) – 1 employee;
- physics (nuclear physics) – 3 employees;
- radioecologist (radiation safety) –2 employees.

According to the Procedure of training and retraining of Promatomnadzor employees all the newly hired employees are to take up a 2 or 3-week long initial training course. Its programme encompasses studies on the legal basis of activities of the regulatory body, on nuclear and radiation safety norms and rules, on theoretical safety basics, familiarisation with international regulatory experience as well as workshops on non-destructive measurements and control activities. Upon satisfactory completion of the course a special exam is taken and in case it is successful a permission to start working is granted.

Employees constantly develop their skills in accordance with a technical training plan (every subdivision and every employee has such a plan of its (his) own). Self-education and on-the-job training are still the main types of training, alongside with seminars and training courses.

The most effective and sometimes the only accessible type of training is training within the framework of bilateral international co-operation with other countries, such as Japan, Germany, USA, Sweden, France, etc. with European Commission and with international organisations, such as the IAEA and OECD.

7.5 BELGIUM

7.5.1 Qualification and Training

- Legal ministerial license for dedicated inspectors requires:
- University degree in Nuclear Engineering
- Three (3) years of nuclear experience.

7.5.2 Additional training by AVN *includes:*

- Belgian regulations
- Safety analysis
- Nuclear power plant systems
- Nuclear power plant processes and operation
- Radiation protection
- Work in a foreign nuclear power plant (12 - 16 weeks)
- Simulator training (6 weeks).

7.5.3 Retraining is provided in:

- Radiation protection
- Simulator (1 week / year)
- Topics in safety problems,
- National or International missions (OSART, INSAR, IRRT, etc.).
- Participation to international exchanges on inspection practices.

7.5.4 Inspector responsibilities include:

- Verify the compliance of the Utility to the licensing conditions, including emergency planning
- Follow-up of all plant modifications and projects; associated conformity checks.
- Follow-up and check of 10-year safety re-assessments.
- Verify the application of the operating experience.

7.6 CANADA

There are approximately 130 inspectors in all who cover all sectors of the Canadian nuclear industry. Of these, 27 are resident at the 6 NPPs. The number of inspectors there varies between 3 and 9, depending on the number of reactor units at the plant. Other inspectors from head office with specialist expertise in areas such as radiation protection, quality assurance, security and emergency preparedness also conduct NPP inspections. Some of these however are not dedicated to NPPs as their expertise lends itself to other areas of *CNSC* jurisdiction such as research reactors and fuel fabrication facilities.

Resident inspectors are required to have a university degree in science or engineering and extensive experience in the nuclear industry. Inspectors should also have a sound knowledge of reactor safety philosophy. A skill profile has been defined for inspectors that is divided into 5 categories: communication, plant specific, technical, procedural/administrative, and corporate and legal. Approximately 10% of the yearly resources for a resident office are to be devoted to the training of inspectors.

The authority of resident inspectors extends to approving or requesting various changes that may take place at NPPs, and placing actions on licensees to address safety issues that emerge from such activities as document review and inspections. Head office specialists, inspectors, or management also may have a role depending on the technical area or significance of the issue.

7.7 PEOPLES REPUBLIC OF CHINA

The *NNSA* has a staff of 30 inspectors in the headquarters and 20 inspectors in the regional offices for the supervision of nuclear power plants, research reactors and fuel cycle facilities.

The inspectors have education background of bachelor degree (70%) or master degree (30%) in the filed of nuclear technology and science, with at least 5 years engineering experience. The training policies, management, guidelines and programme are defined by the *NNSA* for inspectors. Training courses include the following topics: Nuclear Engineering, Nuclear Safety Regulations, Inspection, Assessment Skills, Basic Course on Nuclear Safety Technology, Nuclear Installation, System and component Knowledge, Accident Analysis, Emergency Preparedness, Radiation Protection, and On-the-Job Training for the Inspection of the Special Nuclear Installation. After training, the inspector has to pass the final examination and be authorised by the *NNSA*.

7.8 CHINESE TAIPEI

The inspectors are all civil servants from administrative bodies, i.e., the *AEC* headquarters, radiation monitoring centre, fuel cycle and materials administration and technical supports from INER. The majority of the regular inspectors are located at the Taipei headquarters, other inspectors are located nearby and conducting the inspection occasionally. The radiation monitoring centre is located at Kaohsiung, the south portion of Taiwan.

The *AEC* headquarters inspectors perform plant dedicated activities as well as any generic issues and licensing activities. Inspectors from other branches perform inspections in their specific area of concerns. Inspectors requested from INER are mainly for the plant refuelling outage activities, or any special technical issues.

The formal resident inspector has the following education background and training:

- Graduate from college with a degree in engineering or science.
- Has basic training in plant operation: principle of nuclear engineering, fluid mechanics, hydrodynamics, thermodynamics, and principle of I&C.
- Take either BWR or PWR system training. Training also includes the regulation rules, and the technical specification in operation application.
- Take monitor application on BWR or PWR intensive training courses.
- Take formal inspector training program at the technical training centre in USA.
- Take annual re-training classes for refreshments.

There are about 50 inspectors who have the full power to enter any plant for regular or unpredicted inspections. Other inspectors, who were drafted from various organisations, are mainly to conduct inspections during refuelling outage or any special missions. None of the inspectors are full time inspectors stationed at the plants. They utilise only 15% to 30% of their time in performing inspection work at the plant. They return to the headquarters to perform other works such as preparations for refuelling outage inspection, specific issue inspection, individual case inspections in safety and technique aspects. Formal reports were documented after the inspections.

In addition, there are 10 inspectors responsible for the regular and irregular inspection of radiation protection and environmental monitoring. Every inspector at least graduated from junior college, and should receive regular and irregular training course relating to health physics and nuclear reactors every year.

7.9 CZECH REPUBLIC

SÚJB currently has 82 inspectors and 47 technical and administrative support staff. Thirty-nine inspectors are inspectors of nuclear safety (7 of them are directly located on the NPP sites), 40 of radiation protection (30 of them are located in Regional Centres) and 3 inspectors are engaged in the field of emergency preparedness. Chairman of the *SÚJB* plays a role of chief inspector. All inspectors have to be a university graduate. In addition, inspectors of nuclear safety must have at least 3 years experience in the nuclear field, from this at least 6 months at a nuclear facility, and inspectors of radiation protection at least 3 years experience in the field of radiation protection or application of ionising radiation sources and from it at least 1 year of experience in specific institutions. In addition, all inspectors have to go through specialised training courses and pass a special examination. Training and qualification requirements are indicated in *SÚJB* Internal Instruction, "Qualification and Professional Training for Inspectors of *SÚJB"*.

Inspectors report information to the Headquarters office. The inspectors authority derives particularly from Act No. 18/1997. Major authorities of the inspectors given by acts are as follows:

- Inspectors are authorised to enter into buildings where controlled activities are carried out, or where controlled equipment, objects and materials are located, and to demand necessary documents and information,
- In case of deviations from approved documentation, especially from Limits and Conditions of safe operation, they are authorised to stipulate the time limit until which the Responsible Organisation shall develop necessary measures, as well as the schedule for remedying such deviations,
- If these deviations jeopardise nuclear safety or radiation protection, inspectors can impose upon the Responsible Organisation that the necessary measures are taken immediately,
- Inspectors are authorised to order that technical audits, checks or tests of equipment, machines or the systems are performed, if that is necessary to verify nuclear safety,
- Inspectors are authorised to check on the professional competence of the selected personnel, especially on the proficiency in Limits and Conditions, and selected operating procedures,
- If an operator does not submit to such check or fails to succeed, inspectors can revoke the person's license for the job and transmit the case for final decision to the officer who originally granted the license.

7.10 FINLAND

STUK has a staff of approximately 70 professionals working in the field of nuclear energy. The expertise of *STUK* covers all the essential areas needed in the safety control of the use of nuclear energy. The average experience of the staff is about 15 years. Basic educational level of the inspectors of *STUK* is: approximately 23 % engineers, 59 % graduate engineers (diploma) or a corresponding degree, and 18 % with a higher degree. There are training policies and guidelines for the training of inspectors. An annual training programme is established for the staff. *STUK* also has close connections with foreign regulatory bodies for exchanging information on important safety issues.

The organisation of *STUK* is described in Chart 2, Annex I. The organisation of the department of Nuclear Reactor Regulation is in Chart 3, Annex I. The distribution into different offices has been made on the basis of technical specialities. An Office of Human and Organisational Factors (3 persons) was established to develop appropriate functional methods to oversight the licensees' organisation and personnel activities. The office also co-ordinates the research activities on the effects of organisational and human factors on safety as well as event investigations, and develops methods to assess safety culture. Recommendations to improve the regulatory control methods based on research results are also presented within the scope of work.

STUK has abilities to contract for research projects and expert services as needed. The main technical support organisation for *STUK* is the Technical Research Centre of Finland (VTT), where there are about 150 experts in the field of nuclear energy. Also other organisations are available for *STUK* (e.g. universities and other expert organisations). *STUK* has had an independent Advisory Committee on Nuclear Safety since 1988.

Until now there has been no special difficulties to recruit experts having needed skills and technical expertise. However, in the future the situation may be more difficult pending to the age of the majority of the current staff and the attractiveness of the field of the use of nuclear energy.

7.11 FRANCE

The inspectors are high level engineers recruited from two sources mainly :

- civil servants from administrative technical bodies (75 %),
- engineers from the CEA (25 %), with extensive practical experience in nuclear business,

These inspectors are located either in Fontenay-aux-Roses near PARIS (*DSIN*), or in the 9 “nuclear” regions (*DRIRE*s plus BCCN in Dijon); there are no resident site inspectors.

Basically, the *DRIRE* inspectors perform plant dedicated activities, and the *DSIN* inspectors rather deal with generic issues, and licensing activities.

There are about 120 of them altogether, who have full power to enter any plant, even without notice (like for unannounced inspections).

The main French specific feature is the technical expertise which is provided by some 350 engineers belonging to the IPSN : they make many safety assessments, for the *DSIN* and other advisory groups, and also assist the *DRIRE* inspectors (inspection, shutdown activities for PWRs, and other activities).

About one third of the inspectors are nominated as “senior” inspectors, following a full set of prescribed training sessions (which last about 18 months), participation in inspections, emergency drills, etc, and an oral interview by a standing 'adhoc' committee. These “senior” inspectors can then conduct any type of inspection.

7.12 GERMANY

For the regulatory inspection programme both the personnel of the regulatory authorities (within *Bund* and *Länder*) as well as their assigned experts have to be taken into account. Thus, the requested numbers for Annex IV cannot be given. On average, a total manpower of approx. 30 to 40 man years per nuclear power plant unit each year is spent for inspection and supervision.

Within the regulatory body of a state (*Land*) approx. 5 to 10 man years per nuclear power plant unit and year are spent for inspection and supervision. Typically one to three inspectors are in charge of inspections regarding nuclear safety of one nuclear power plant unit. Inspection regarding, e.g. radiation protection, often is delegated to subordinate governmental agencies. In addition, supervision for industrial safety and environmental matters as legally required for all types of industrial activities is carried out by other competent agencies.

In general, for all supervisory and inspection programmes independent experts are contracted by the *Länder* authorities for examination of reports, reported events, calculations, technical specifications, safety assessments for modifications and for conducting or assessing in-service-inspections. In most cases, the Technische Überwachungsvereine (TÜV's) are contracted as expert organisations. There are several TÜV-Organisations in Germany, historically assigned to and working mainly in the individual federal *Länder*. Recent developments go for the formation of larger organisations (holdings, Ltd. Corporates) serving the needs of several *Länder*. Including non-nuclear inspection programmes (e.g. for cranes, fire protection, pressure vessels, etc.), which are also carried out by TÜV-personnel, the total manpower for supervision sums up to the above mentioned 30 to 40 man years per nuclear power plant unit each year. This does not, however, include safety assessments and expertises in the course of PSRs as well as for safety relevant modifications, for which a licence is required.

During refuelling outages, the presence of regulatory inspection personnel and experts at the plant is increased. On average, about 30 experts performing inspections and recurrent tests are constantly present at the site during the outage.

The inspectors of the regulatory authority are in possession of university degree (e.g. engineering, physics, chemical engineering) and have several years of practical experience in industry, research centres, with technical expert organisations or in licensing bodies. Personnel of technical expert organisations (TÜV), who are contracted as experts hold university degrees in technical fields or technical engineering degrees. For special inspections, e.g., pressure vessel inspection according to the Pressure Vessel Regulation Ordinance, state authorised and licensed inspectors are assigned, also within the TÜV organisations. The inspectors are trained in professional courses, symposia, workshops, simulator training courses and, as guests, during actual operation of nuclear facilities, and by exchange of experience.

Legal provisions guarantee that the inspectors authorised by the supervisory authorities, as well as experts consulted by them, have access to the nuclear installations, and can carry out necessary examinations and request pertinent information.

7.13 HUNGARY

The total manpower of *HAEA NSD* is 44, technical staff members of total are 38. Basic graduation requirements of technical staff is technical university or college level degree.

At selection of applicant to the technical staff graduation level, working practices and experiences, knowledge of foreign languages are considered.

Generally the training procedure of newcomers depends on their graduation, working practices and experiences.

Newcomers applied by *NSD* directly after being graduated have to participate in entire basic training courses organised by NPP training department for their newcomers and have to obtain practices and experiences within real circumstances together with the operational staff of the NPP. Each newcomer has to pass two exams.

First of exams qualifies candidates on public administration skills:

- legal background of public administration,
- governmental procedures.

Second of exams qualifies candidates in inspector skills:

- legal background of *NSD* and its activities,
- safety codes,
- standards,
- general safety questions,
- knowledge in licensing and control.

Retraining programs widely cover international, national and *NSD* organised training courses on advanced inspector skills, for examples:

- specific safety questions,
- knowledge in using of PSA,
- safety culture,
- experiences of occurrences, etc.

Comprehensive training procedures are revised periodically. On-the-job training methodologies are just being developed.

7.14 ITALY

Within *ANPA*, the duties of Regulatory Body are carried out by the Department of Nuclear Safety and Radiation Protection.

At present, about 60 specialists belong to the Department of which 26 acting also as inspectors.

In the area of health protection, the inspectors have the authority to impose direct economic penalties via fines (for violations).The inspectors are based at *ANPA* H.Q. and carry out periodic visits to the nuclear site.

7.15 JAPAN

The number of staffs who are engaged in nuclear safety regulation activities is about 270, including those in administration department in the ANIS (including 100 Inspectors for Safety Management of Nuclear Installations and Senior Specialists for Nuclear Emergency Preparedness assigned to the municipality located nuclear facilities). The staffs who are engaged in nuclear safety regulation activities in the STPB of *MEXT*, are about 70 (including 11 Inspectors for Safety Management of Nuclear Installations and Senior Specialists for Nuclear Emergency Preparedness assigned to the municipality located nuclear facilities).

The staffs that are engaged in nuclear safety regulation must inherently be familiar to expertise especially in nuclear engineering. To improve their capability, they shall be educated and trained stepwise through their carrier depending on the experiences and the feature of the facilities.

Additionally, experts have been exchanged or detached in the framework of bilateral cooperation with countries with nuclear facilities and multinational cooperation (IAEA, OECD/NEA), through which necessary information on safety regulation and safety technologies have been provided or collected.

7.16 KAZAKHSTAN

Basic education level of the inspectors of *KAEA* is an engineer with an institute diploma.

All inspectors have additional of 3 to 4 years minimal relevant experience in the atomic industry or otherwise. For inspectors, a competence profile is specified, individualised training programmes are provided and once every 3 years they are examined.

There is one resident inspector of the *KAEA* on each nuclear installation. About 15 persons overall, are involved in inspection activities of the *KAEA*.

7.17 REPUBLIC OF KOREA

There are approximately 206 inspectors in the *KINS* Head Office. In addition, the *KINS* has 8 resident inspectors for the 16 power reactors presently licensed to operate and for 4 power reactors being constructed. All inspectors are University graduates and most have a PhD or Masters degree. Also most inspectors have over 5 to 10 years experience in the nuclear field and inspectors receive various kinds of training that would be required for regulatory inspections periodically.

7.18 MEXICO

CNSNS personnel are qualified in several of the engineering and scientific disciplines that are needed to provide an effective review and assessment function of quality assurance, outage maintenance, operations, tests, radiation protection, fuel and the core safety issues involving NPPs and other nuclear and radioactive waste facilities.

The training and qualification for inspection competencies has principally been done through initial training courses, on the job training and AIEA or USNRC training courses.

7.19 THE NETHERLANDS

The first-line inspector (generalist) has to have a bachelor degree or equivalent and minimal 3 or 4 years relevant experience in the industry or otherwise. The training programme consists of:

- a basic course in nuclear engineering (6 weeks).
- accompany the experienced inspectors on-the job (5 - 10 times).
- visit to a nuclear power plant in the neighbour countries (2 - 3 weeks).
- self-study
- internal training regarding the organisation of the regulatory body and its legal capabilities.

The second-line inspectors (specialist) must have a masters degree or equivalent and in addition to the training programme of the first-line inspectors, follow advanced courses in their specialism.

All inspectors have full access to the nuclear installations at all times to inspect, to gather information and to initiate corrective actions. Enforcement actions are taken by the headquarters.

7.20 PAKISTAN

PNRA currently has a staff of 12 inspectors in the headquarters and 4 inspectors at the regional offices for the supervision of nuclear power plant. More staff is due to be added shortly.

7.21 RUSSIA

From total quantity of Gosatomnadzor staff 1390 persons in the Central Office are engaged 175 persons. This number does not include the staff of Scientific and Engineering Centre of Gosatomnadzor for Nuclear and Radiation Safety (SEC NRS) – 300 persons.

The Gosatomnadzor has for activity, important for safety of NPP, 6 inspectors in the Central Office and nearly 95 inspectors in five regional offices. Approximately 50% of them are site inspectors for 29 Operating NPP Units.

Normally inspectors graduate High School and have experience in industry. For each inspector are provided individualised training programmes depending on their background and experience.

Number of site inspectors on NPP is equal to the number of units on the plant plus a head of the Department of Inspections (Site Inspection).

Regional inspections perform most part of the licensing procedures and co-ordinate the activities of site inspections.

7.22 SLOVAK REPUBLIC

44 inspectors are included in the Nuclear Regulatory Authority of the Slovak Republic, 5 of them are directly located at the NPP sites. All inspectors are university graduates. They have at least 9 years of experience in the areas related to design, construction, commissioning, operation, decommissioning, research or manufacturing of nuclear facilities, their components and systems. In addition, the inspectors have to complete a special professional programme on the laws, standards, regulations, and methods of inspections including practical and professional training on-site. For the purpose of the execution of state supervision it is required:

- fulfilment of the prescribed qualification requirements,
- successful verification of the professional capabilities to perform working activities,
- certificate on acquisition of the professional capabilities to perform specific activities,
- additional professional preparation (courses and training to fulfil the work requirements and qualification upgrading).

7.23 SLOVENIA

Entry qualifications of the inspectors are university degree in engineering or science and 5 years of relevant experience. Additionally, inspectors are trained in Slovenian legislature and administrative procedures, nuclear technology, nuclear and radiation safety, simulator training, and on-the-job training with foreign inspectors.

The practice is, although this is not required by regulations, that all new inspectors pass the basic nuclear technology course of 9 weeks followed by 8 week Westinghouse technology course (NPP Krsko is a 2 loop Westinghouse PWR design), which is organised at the US NRC training centre in accordance with bilateral agreement between SNSA and US NRC. Special attention is devoted to regular training and retraining of inspectors through courses, workshops, and meetings. Since 2000 NPP Krsko full-scope simulator is also used in the training.

The legislation gives the inspectors full power to perform inspections. He can stop operation of the plant in case safety is jeopardised.

7.24 SOUTH AFRICA

Inspectors are selected according to individual competency which encompasses their experience, specialist knowledge, training and qualifications within their area of expertise. Examiners are usually ex-plant licensed operators with extensive knowledge of the plant, systems and the training simulator. All staff are trained and examined in licence compliance requirements, risk philosophy, PRA and inspection system management. Training is supplemented with visits to overseas plants, IAEA courses and regulatory interchanges with other countries. Inspectors have specific authorities granted by the legislation which allows them to enter plant areas, access documents and, under certain circumstances, initiate stoppage of activities.

7.25 SPAIN

To obtain access to Technical Body positions, a University degree is required in Engineering or Scientific fields. Furthermore, as civil servants, all people have to pass different examinations on nuclear safety, radiation protection and regulation matters. Once the tests have been successfully passed, they have to spend three months of practices in a department of the CSN before to be definitely accepted.

As there is not any separation between evaluation and inspection staff, training is not only inspection specific. Courses are given for different specialities. General courses helpful for inspection activities such as; Radiation Protection, Quality Assurance, Simulator Courses, NPP components, etc., are provided.

Senior Resident Inspectors (two per site) are selected among the *CSN* staff with sufficient experience (more than 5 years). There are 12 inspectors assigned to nuclear power plants under operation plus about 120 specialists for conducting nuclear inspections. One resident inspector has been assigned also to Vandellos I (nuclear power plant under decommissioning at this moment).

A training programme for inspection activities has been approved by the *CSN* in 2000. This plan covers training for new inspectors and refreshing courses for all inspectors. The programme contains general and specific courses, according to the position of the inspectors in the organisation. The general course is an overall overview of nuclear regulations, *CSN* inspection plan and procedures, quality assurance techniques, general code of good practices and conduct for inspectors and it is valuable for any facilities and activities inspected by the *CSN*. The specific courses are related to different specialities in nuclear safety or radiation protection and shall be prepared case by case in order to update the knowledge of inspectors in matters as fuel inspections, in-service inspections and materials, operational training in full-scale simulators and so on. Following the refreshing general courses will be mandatory for all inspectors in a period of about 3 years.

7.26 SWEDEN

The Inspectors are engineers within different fields (electrical, mechanical. etc.), some of who have masters degrees. *SKI* tries to recruit personnel with extensive plant and/or control room experience.

For the inspectors, a competence profile is specified. Individualised training programmes are provided depending on the inspectors background and experience. The programmes include such elements as: Plant and system knowledge. Engineering and nuclear safety. Inspection and investigation techniques. Legal aspects, etc.

In *SKI's* department of inspection, there are over 15 Inspectors. For special and team inspections, specialists from other departments in *SKI* may be utilised. Persons responsible for inspecting nuclear installations have full powers in the performance of their duty as regards access to buildings and documents, questioning of those in charge and making recommendations.

7.27 SWITZERLAND

The inspection personnel belong to *HSK* as the governmental organisation, and also to private organisations (e.g., for mechanical components, civil structures, and some for radiation monitoring). The *HSK* does not have people, who are full time inspectors. Supervising duties are carried out by different sections. The Co-ordination and Inspection Section has the duty to co-ordinate inspection activities. Each site has a site inspector who is a member of this section. About 70 persons are overall involved in inspection activities of the *HSK*. They include some 20 persons from private organisations.

Inspectors and regulators in the *HSK* are identical. Typical qualification is a BS or MS degree and several years of experience in nuclear or non-nuclear industries. Supplemental training in reactor technology and safety is provided in the first year.

7.28 UNITED KINGDOM

Inspectors are all technically or professionally qualified. Typically they hold chartered engineer or equivalent status and have suitable experience in an appropriate field. Internal training programmes cover legal and other activities to ensure that an Inspector is competent to inspect and enforce legislation.

NII currently has 158 Inspectors and 92 administrative support staff. Fifty-six (56) Inspectors are engaged in site inspection duties, 71 Specialist Inspectors, 8 in project management and 23 in strategy and other related duties. There are also a number of inspectors located elsewhere in HSE providing advice on policy matters. *NII* is currently (October 2001) recruiting to fill 24 Inspectors posts. By the end of 2001 *NII* expects to have filled 13 of the posts. Taking account of this and resignations and retirements, the number of inspectors projected to be in post by 31 December 2001 is 163.

Every Inspector has wide enforcement powers including, if needed, the power to immediately prohibit an unsafe activity. Normally, enforcement powers are only used following consultation with senior inspectors. Inspectors are solely responsible for the assessment of the quality of the sites, and common standards arise from guidance, from joint inspections and through discussions with other Inspectors. *NII* does not employ non-inspectorial technical or professional staff. Outside experts or specialists are rarely contracted by *NII* to perform inspections but are sometimes contracted to provide assistance or advice on particular assessment issues.

The Health and Safety Commission also has a group of nuclear experts, called the Nuclear Safety Advisory Committee (NuSAC), which provides advice to the Health and Safety Commission and Government Ministers on matters which may be referred to it or it has decided to take an interest in. NII makes presentations to ACSNI and considers its advice.

7.29 UNITED STATES

The NRC has 144 resident inspectors for the 104 power reactors currently licensed to operate. This number includes Brown’s Ferry Unit 1, which has no fuel loaded and requires Commission approval to restart. Additionally, there are inspectors in the four regional offices which execute a portion of the inspection program. On a case-by-case basis (usually for design related inspections) contractor personnel with specialised expertise may be used. Direct inspection effort in FY 2000 was approximately 168,000 hours or 1630 hours per reactor site.

NRC Inspection Manual, Chapter 1245, “Light-Water Reactor Inspection Program - Operations Phase” establishes training and qualification requirements for inspectors. To supplement their experience, NRC inspectors complete reactor systems courses at the NRC Technical Training Centre, which includes experience in operating and responding to events on plant simulators. NRC inspectors report information to the regional and headquarters offices. Commitments by licensees to specific courses of action are confirmed in writing by NRC Regional Administrators. Orders to licensees requiring specific actions or changes to licensee conditions must be issued by NRC headquarters.

REFERENCES

The following references are provided as a contact for obtaining further information or details about the inspection practices within the contributing countries.

(NOTE: Addresses, phone numbers and names provided in this section represents current information, ***as of 31st October 2001***. Since this information is subject to changes due to re-organisations, advancements, etc., the reader should take these occurrences into account.)

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Nuclear Convention Report Reference:	www.arn.gov.ar

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AUSTRALIA

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Regulatory Authority Website Address:	http://www.***AVN***.be / http://www.fanc.fgov.be
Nuclear Convention Report Reference:	http://www.***AVN***.be/PAGES/UK/DOCU/NSC/nsc.htm

CANADA

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Nuclear Convention Report Reference:	http://www.sujb.cz

FINLAND

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Regulatory Authority Website Address:	http://www.stuk.fi
Nuclear Convention Report Reference:	STUK-B-YTO 210, October 2001 http://www.stuk.fi

FRANCE

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Regulatory Authority Website Address:	http://www.asn.gouv.fr
Nuclear Convention Report Reference:	French Report for the first review meeting on the contracting parties to the convention on nuclear safety (September 1998)

GERMANY

Regulatory Authority	Direct Contact
Bundesministerium für Umwelt Naturschutz und Reaktorsicherheit ***(BMU)*** Federal Ministry for Environment, Nature Conservation and Nuclear Safety Abteilung RS Postfach 12 06 29 53048 Bonn Tel: +49 228 305 0 Fax: +49 228 305 2899 Bundesamt für Strahlenschutz ***(BfS)*** Federal Office for Radiation Protection Fachbereich KT Postfach 10 01 49 38201 Salzgitter Tel: +49 5341 885 0 Fax: +49 5341 885 885	Dr. H. Klonk, Head of Division KT 2.1 Plant Status NPP Bundesamt für Strahlenschutz ***(BfS)*** Federal Office for Radiation Protection Postbox 10 01 49 38201 Salzgitter Tel: +49 5341 885 860 Fax: +49 5341 885 885 e-mail: hklonk@bfs.de
Regulatory Authority Website Address:	BMU: http://www.bmu.de
	BfS: http://www.bfs.de
Nuclear Convention Report Reference:	http://www.bfs.de/berichte

HUNGARY

Regulatory Authority	Direct Contact
Hungarian Atomic Energy Authority ***(HAEA)*** Nuclear Safety Directorate (NSD) Margit krt. 85 114 Pf. 676 H-1539 Budapest Tel: +361 355 0619 Fax: +361 355 1591	Mr. Gyula Fichtinger Department for Licensing Nuclear Safety Directorate (NSD) Margit krt. 85 114 Pf. 676 H-1539 Budapest Tel: +361 355 0619 Fax: +361 355 1591 e-mail: fichtinger@haea.gov.hu
Regulatory Authority Website Address:	http://www.haea.gov.hu
Nuclear Convention Report Reference:	http://www.haea.gov.hu

ITALY

Regulatory Authority	Direct Contact
Agenzia Nazionale per la Protezione dell'Ambiente (ANPA) Via Vitaliano Brancati, 48 I - 00144 Roma Tel: +39 06 50071 Fax: +39 06 5013429 or +39 06 5007 2916	Dr. Francesco Paolo Michetti National Agency for the Environmental Protection (ANPA) Nuclear & Radiological Risk Department Via Vitaliano Brancati, 48 I - 00144 Rome Tel: +39 06 5007 2030 Fax: +39 06 5007 2941 e-mail: fpmichetti@anpa.it
Regulatory Authority Website Address:	http://www.aicq.it/anpa

JAPAN

Regulatory Authority	Direct Contact
Office of International Affairs Agency for Nuclear and Industrial Safety (ANIS) Ministry of Economy, Trade and Industry (METI) 1-3-1 Kasumigaseki, Chiyoda-ku Tokyo 100-8986 Tel: +81 3 3501 1087 Fax: +81 3 3580 8434 Nuclear Safety Division Ministry of Education, Culture, Sports, Science and Technology (MEXT) 2-2-1 Kasumigaseki, Chiyoda-ku Tokyo 100-8966 Tel: +81 3 3581 2598 Fax: +81 3 3581 2487	Mr. Masanori Hirota, Director for Office of International Affairs Agency for Nuclear and Industrial Safety (ANIS) Ministry of Economy, Trade and Industry (METI) 1-3-1 Kasumigaseki, Chiyoda-ku Tokyo 100-8986 Tel: +81 3 3501 1087 Fax: +81 3 3580 8434 Mr. F. Kumamoto, Deputy Director The Nuclear Safety Technology Center (NUSTEC) 5-1-3-101 Hakusan, Bunkyo-ku Tokyo 112-8604 Tel: +81 3 3814 7482 Fax: +81 3 3813 4630

KAZAKHSTAN

Regulatory Authority	Direct Contact
Atomic Energy Agency of the Republic of KAZAKHSTAN *(KAEA)* 480013 Almaty Republic Sq. 13, Tel: +7 3272 634 885 Fax: +7 3272 633 356	Mr. Sergey Krechetov, Deputy Director General, Head of Nuclear Safety Division Atomic Energy Agency of the Republic of KAZAKHSTAN *(KAEA)* 480013 Almaty Republic Sq. 13, Tel: +7 3272 633 844 Fax: +7 3272 637 613

REPUBLIC OF KOREA

Regulatory Authority	Direct Contact
Korea Institute of Nuclear Safety ***(KINS)*** P.O. Box 114, Yusong Taejon 305-600 Tel: +82 42 868 0025 Fax: +82 42 861 2496	Korea Institute of Nuclear Safety ***(KINS)*** P.O. Box 114, Yusong Taejon 305-600 Tel: +82 42 868 0025 Fax: +82 42 861 2496
Regulatory Authority Website Address:	http://www.kins.re.kr

MEXICO

Regulatory Authority	Direct Contact
Comision Nacional de Seguridad Nuclear (*CNSNS*) Dr. Barragán No. 779 Col. Vertiz Narvarte CP 03020, México D.F. Tel: +50 95 32 00 Fax: +50 95 32 93	Mr. Luis Miguel Gutierrez Ruiz Comision Nacional de Seguidad Nuclear (*CNSNS*) Dr. Barragán 779-3 piso Col. Vertiz Narvarte CP. 03020 Mexico D.F. Tel: +50 9532 36 Fax: +50 95 32 93 e-mail: gsn1@servidor.unam.mx
Regulatory Authority Website Address:	

THE NETHERLANDS

Regulatory Authority	Direct Contact
Ministerie van Volkshuisvesting Ruimtelijke Ordening en Milieubeheer (VROM) Inspectie Milieuhygiëne Nuclear Safety Department (KFD) Rijnstraat 8 P.O. Box 20951 2500 EZ Den Haag Tel: +31 70 339 3939	Mr. E.C. des Bouvrie Ministerie van VROM Afdeling IMH-KFD Rijnstraat 8 P.O. Box 20951 2500 EZ Den Haag Tel: +31 70 339 4334 Fax: +31 70 339 1887 e-mail: kees.desbouvrie@minvrom.nl
Regulatory Authority Website Address:	http://www.minbuza.nl
Nuclear Convention Report Reference:	http://www.minbuza.nl

PAKISTAN

Regulatory Authority	Direct Contact
Pakistan Nuclear Regulatory Authority (PNRA) P.O. No. 1912, Islamabad Tel: +92 51 9204417 Fax: +92 51 9204112	Dr. J. A. Hashimi, Director General, PNRA P.O. No. 1912, Islamabad Tel: +92 51 9204417 Fax: +92 51 9204112

RUSSIA

Regulatory Authority	Direct Contact
Federal Nuclear and Radiation Safety Authority of Russia (Gosatomnadzor of Russia) 34, Taganskaya 109147 Moscow Tel: +7 095 911 6453 Fax: +7 095 912 4041	Mr. Gennady Poltarakov North-European District Gosatomnadzor of Russia Inspection on Leningrad NPP Leningrad Region, 188540 Tel: +7 81269 65073 Fax: +7 81269 22316 e-mail: gan-pgi@laes.sbor.ru
Regulatory Authority Website Address:	http://www.gan.ru
Nuclear Convention Report Reference:	National Report of Russian Federation to Convention on Nuclear Safety

SLOVAK REPUBLIC

Regulatory Authority	Direct Contact
Nuclear Regulatory Authority of the Slovak Republic *(ÚJD SR)* Bajkalská 27, P.O. Box 24 820 07 Bratislava Tel: +42 2 5342 1032 Fax: +42 2 5342 10 15	Mr. Peter Uhrík, Director Nuclear Regulatory Authority of the Slovak Republic *(ÚJD SR)* Okruzná 5 918 64 Trnava Tel: +42 33 599 11 42 Fax: +42 33 550 15 30
Regulatory Authority Website Address:	http://www.ujd.gov.sk
Nuclear Convention Report Reference:	http://www.ujd.gov.sk (Chapter on Safety of Nuclear Installations)

SLOVENIA

Regulatory Authority	Direct Contact
Slovenian Nuclear Safety Administration *(SNSA)* Vojkova 59 1113 Ljubljana Tel: +386 1 472 1100 Fax: +386 1 472 1199	Mr. Marjan F. Levstek. Head, Section of Inspection Control Slovenian Nuclear Safety Administration *(SNSA)* Vojkova 59 1113 Ljubljana Tel: +386 1 472 1123 Fax: +386 1 472 1198 e-mail: marjan.levstek@@gov.si
Regulatory Authority Website Address:	http://www.gov.si/ursjv/
Nuclear Convention Report Reference:	http://www.gov.si/ursjv/si/por_pris/nacionalno_por.html

SOUTH AFRICA

Regulatory Authority	Direct Contact
National Nuclear Regulator (NNR) P O Box 7106 CENTURION 0046 South Africa Tel.: +27 12 674 7100 Fax: +27 12 674 7163	Dr T F Hill, Manager: Koeberg Project P.O. Box 46055 KERNKRAG Cape Town 7441 South Africa Tel: +27 21 553 9500 Fax: +27 21 553 2060
Regulatory Authority Website Address:	http://www.nnr.co.za
Nuclear Convention Report Reference:	http://www.nnr.co.za

SPAIN

Regulatory Authority	Direct Contact
Consejo de Seguridad Nuclear *(CSN)* Calle Justo Dorado, 11 28040 Madrid SPAIN Tel: +00 34 913460100 Fax: +00 34 913460588	Mr. Jesus Gil, Head of the Office of Inspection Consejo de Seguridad Nuclear *(CSN)* Calle Justo Dorado, 11 28040 Madrid SPAIN Tel: +00 34 913460152 Fax: +00 34 913460588 e-mail: jgh@csn.es
Regulatory Authority Website Address:	http://www.csn.es
Nuclear Convention Report Reference:	http://www.csn.es/publicaciones

SWEDEN

Regulatory Authority	Direct Contact
Swedish Nuclear Power Inspectorate *(SKI)* S-106 58 Stockholm Tel: +46 8 698 8400 Fax: +46 8 661 9086	Mr. Staffan Forsberg, Head Department of Inspection Swedish Nuclear Power Inspectorate *(SKI)* S-106 58 Stockholm Tel: +46 8 698 8431 Fax: +46 8 661 9086 e-mail: staffan@ski.se
Regulatory Authority Website Address:	http://www.ski.se

SWITZERLAND

Regulatory Authority	Direct Contact
Swiss Federal Nuclear Safety Inspectorate *(HSK)* CH-5232 Villigen-*HSK* Tel: +41 56 310 38 11 Fax: +41 56 310 39 07	Dr. Friedrich Kaufmann Swiss Federal Nuclear Safety Inspectorate *(HSK)* CH-5232 Villigen-*HSK* Tel: +41 56 310 39 04 Fax: +41 56 310 38 54 e-mail: friedrich.kaufmann@hsk.psi.ch
Regulatory Authority Website Address:	http://www.hsk.psi.ch
Nuclear Convention Report Reference:	http://www.hsk.psi.ch (publications)

UNITED KINGDOM

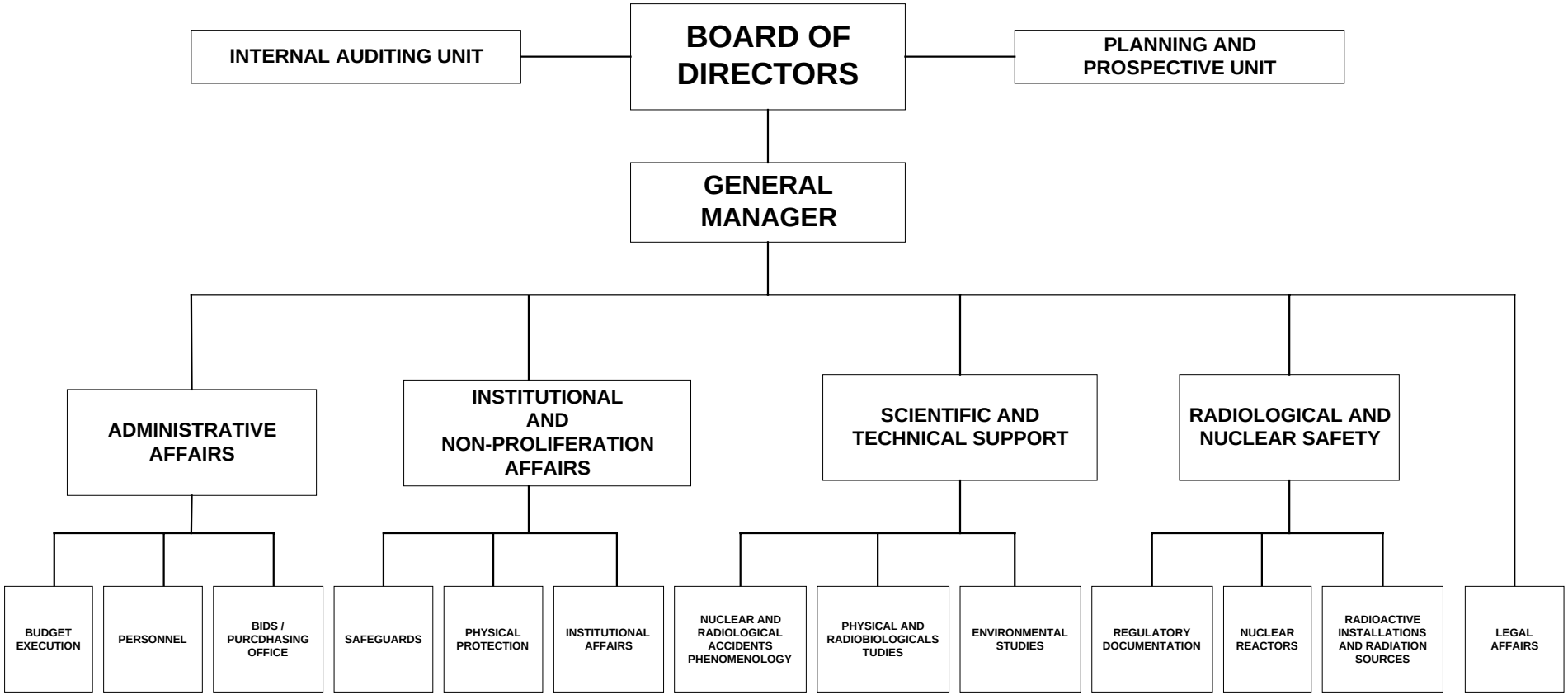
Regulatory Authority	Direct Contact
HM Nuclear Installations Inspectorate *(NII)* Rose Court 2 Southwark Bridge London SE1 9HS Tel: +44 171 717 6000 Fax: +44 171 717 6717	Mr. Paul Woodhouse, H.M. Superintending Inspector Health & Safety Executive *(HSE)* Nuclear Installations Inspectorate *(NII)* St. Peter's House Balliol Road Bootle, Merseyside L20 3LZ Tel: +44 151 951 3555 Fax: +44 151 951 4956 e-mail: paul.woodhouse@hse.gsi.gov.uk
Regulatory Authority Website Address:	http://www.hse.gov/uk/nsd/nsdhome/htm

UNITED STATES

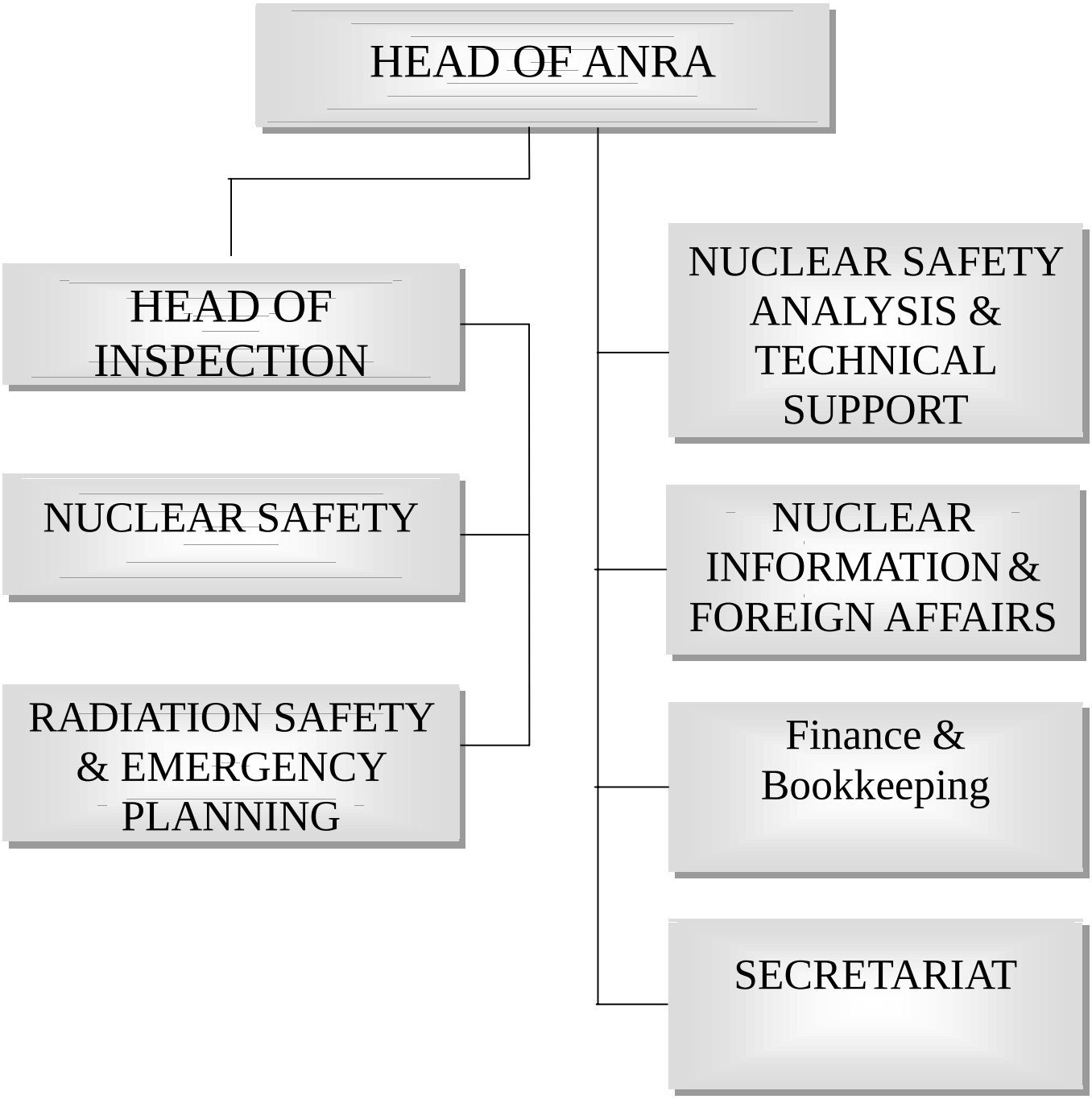
Regulatory Authority	Direct Contact
US Nuclear Regulatory Commission *(NRC)* Washington DC 20555 Tel: +1 301 415 7000 Fax: +1 301 415 2260	Mr. Douglas Coe, Inspection Program Branch US Nuclear Regulatory Commission *(NRC)* Washington DC 20555 Tel: +1 301 415 2040 Fax: +1 301 415 3313 e-mail: dhc@nrc.gov
Regulatory Authority Website Address:	http://www.nrc.gov

ANNEX I – REGULATORY AUTHORITY ORGANISATIONAL STRUCTURE

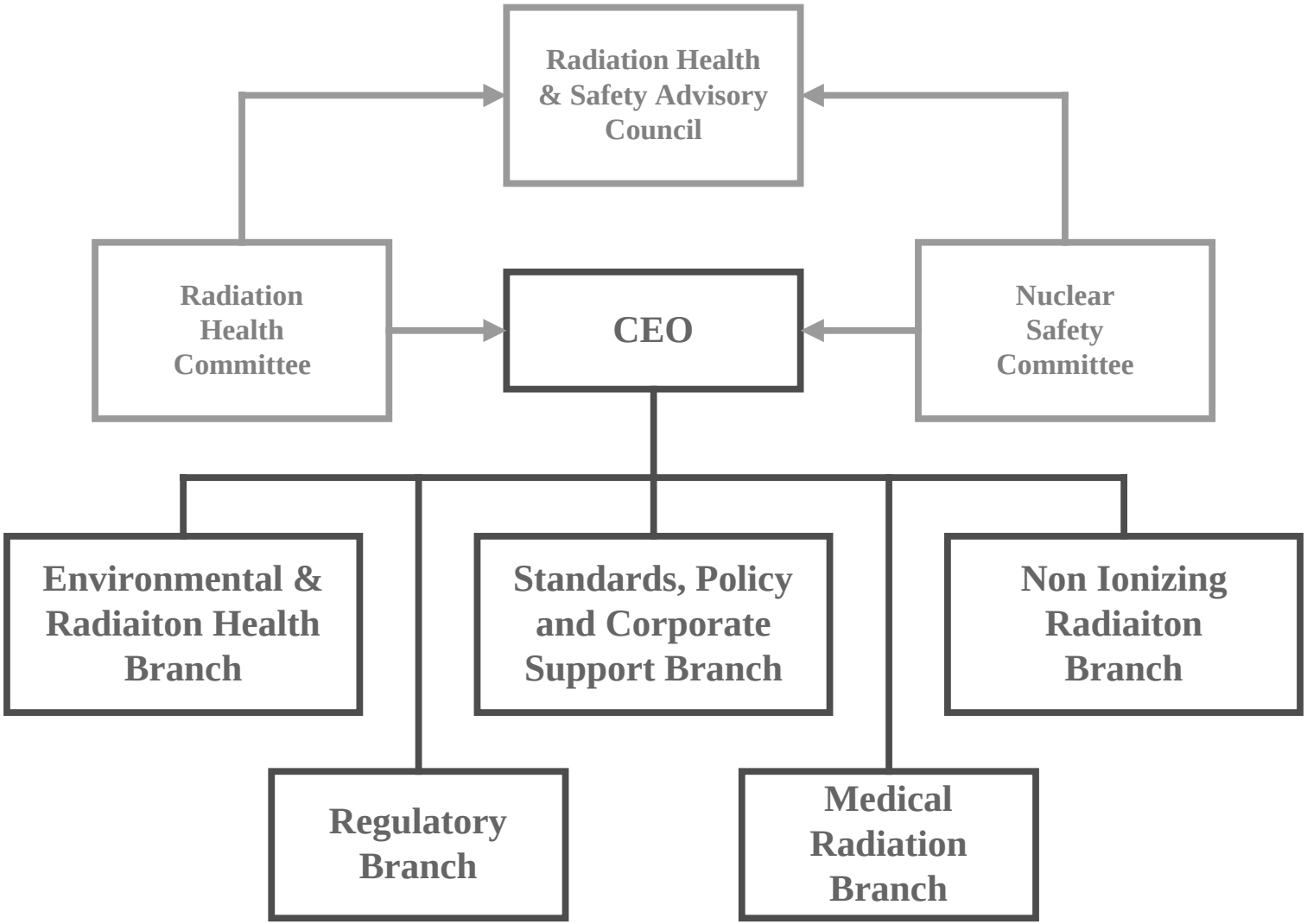
ARGENTINA
Auttoridad Regulatoria Nuclear



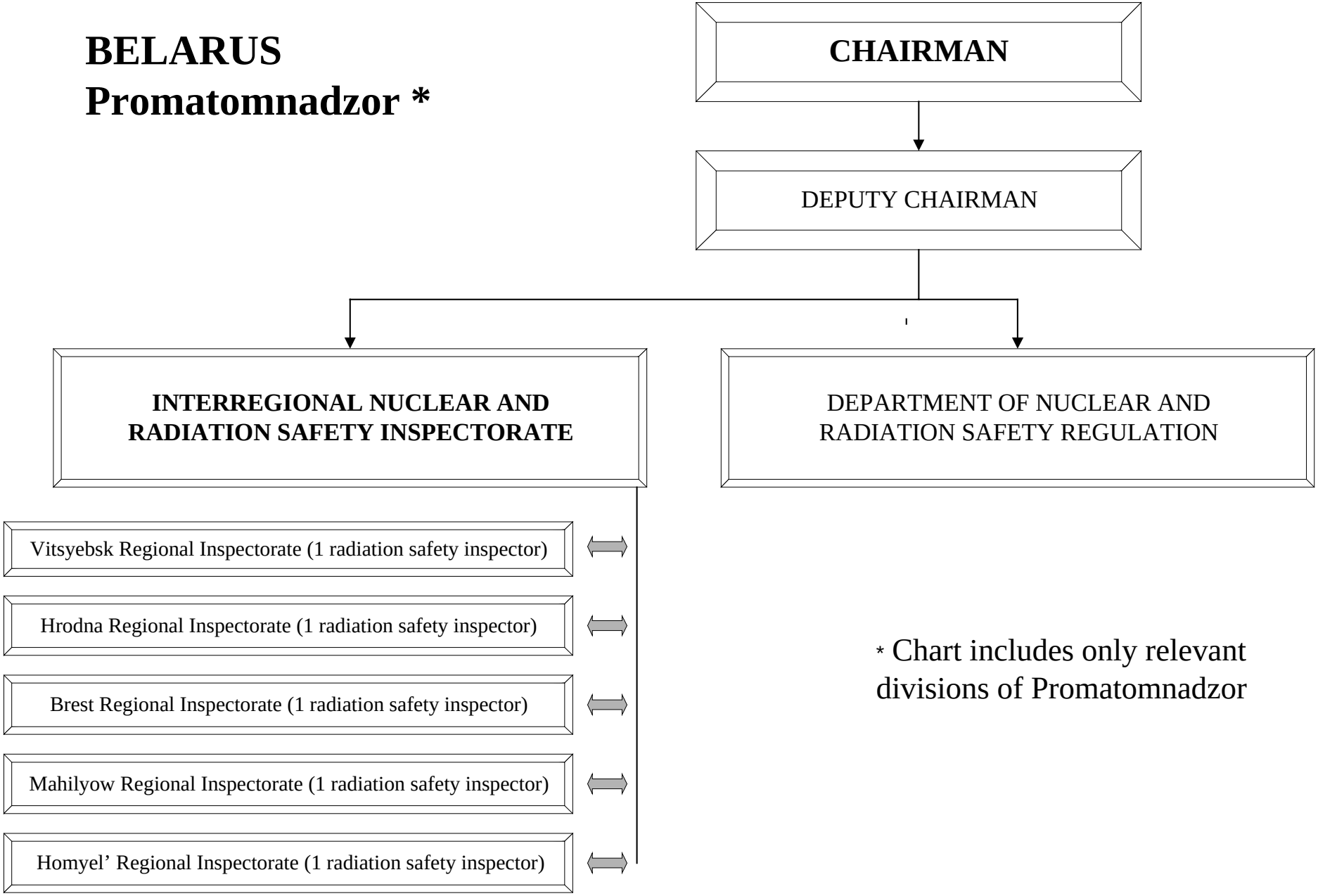
STRUCTURE OF ARMENIAN NUCLEAR REGULATORY AUTHORITY



Australian Radiation Protection & Nuclear Safety Agency (ARPANSA)

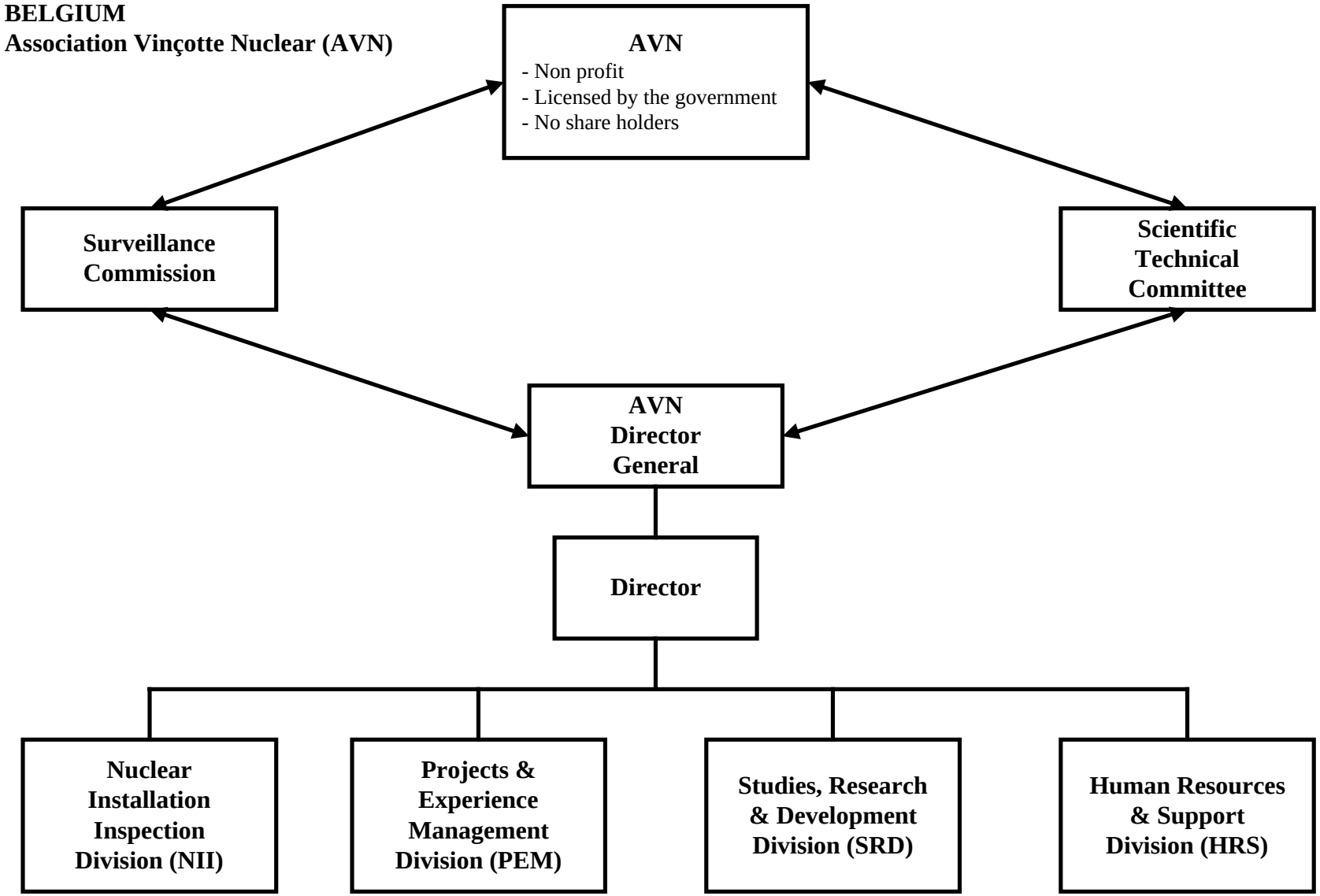


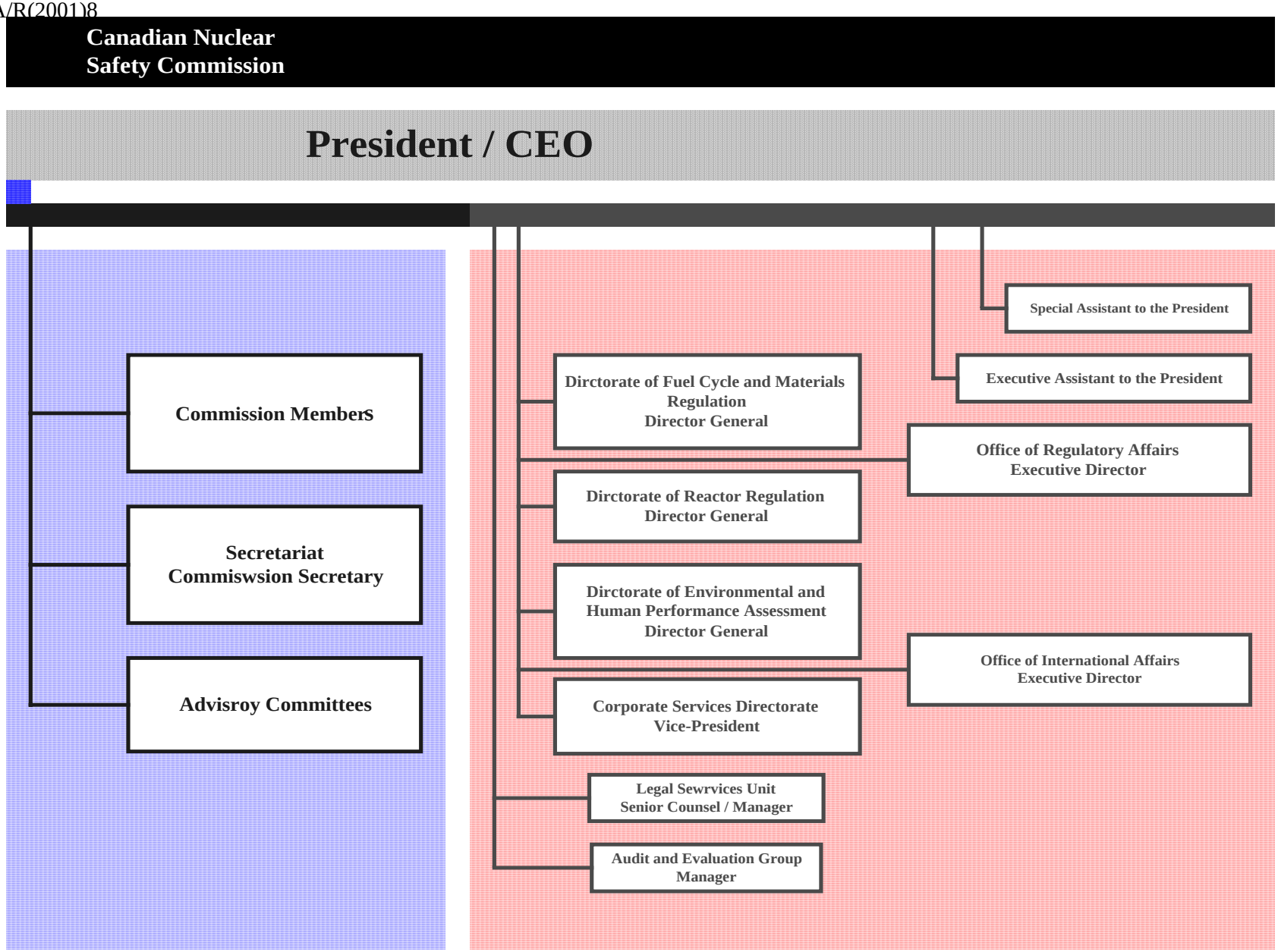
BELARUS
Promatomnadzor *



* Chart includes only relevant divisions of Promatomnadzor

BELGIUM
Association Vinçotte Nuclear (AVN)

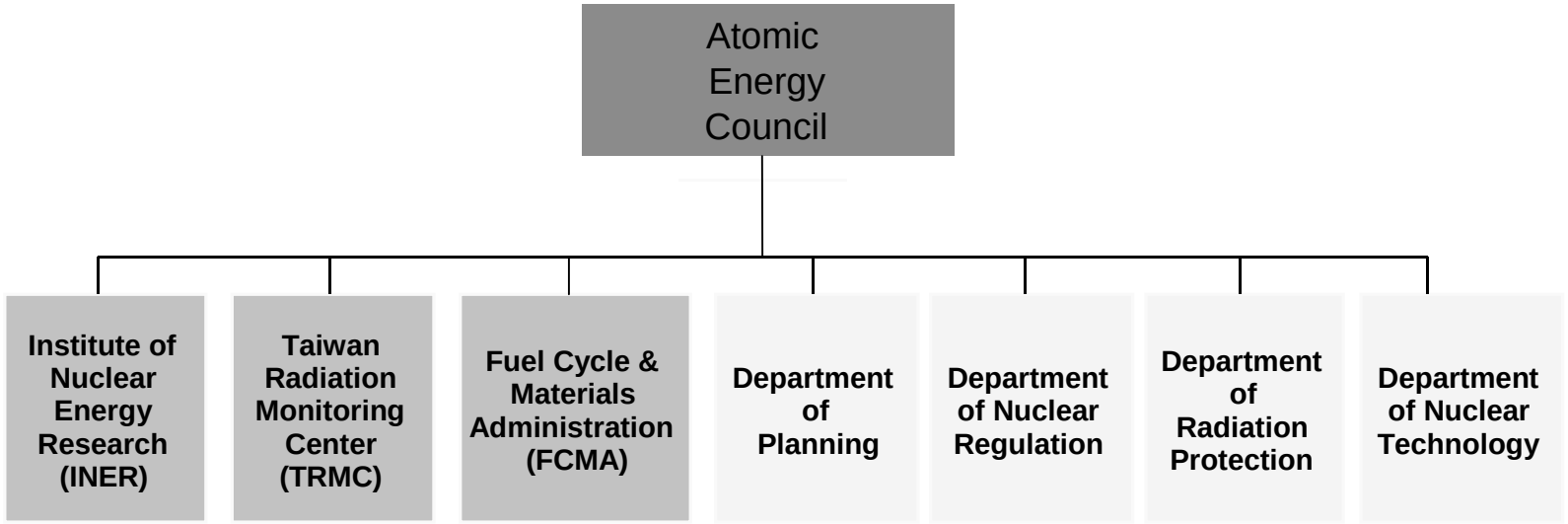



Canadian Nuclear
Safety Commission
President / CEO
Commission Members
Secretariat
Commiswsion Secretary
Advisroy Committees
Special Assistant to the President
Executive Assistant to the President
Dirctorate of Fuel Cycle and Materials Regulation
Director General
Office of Regulatory Affairs
Executive Director
Dirctorate of Reactor Regulation
Director General
Dirctorate of Environmental and Human Performance Assessment
Director General
Office of International Affairs
Executive Director
Corporate Services Directorate
Vice-President
Legal Sewrvices Unit
Senior Counsel / Manager
Audit and Evaluation Group
Manager

Peoples Republic of China
National NuclearSafety Adminsitration (NNSA)

Chinese Taipei

AEC Organizational Structure



ORGANIZATIONAL CHART OF THE STATE OFFICE FOR NUCLEAR SAFETY

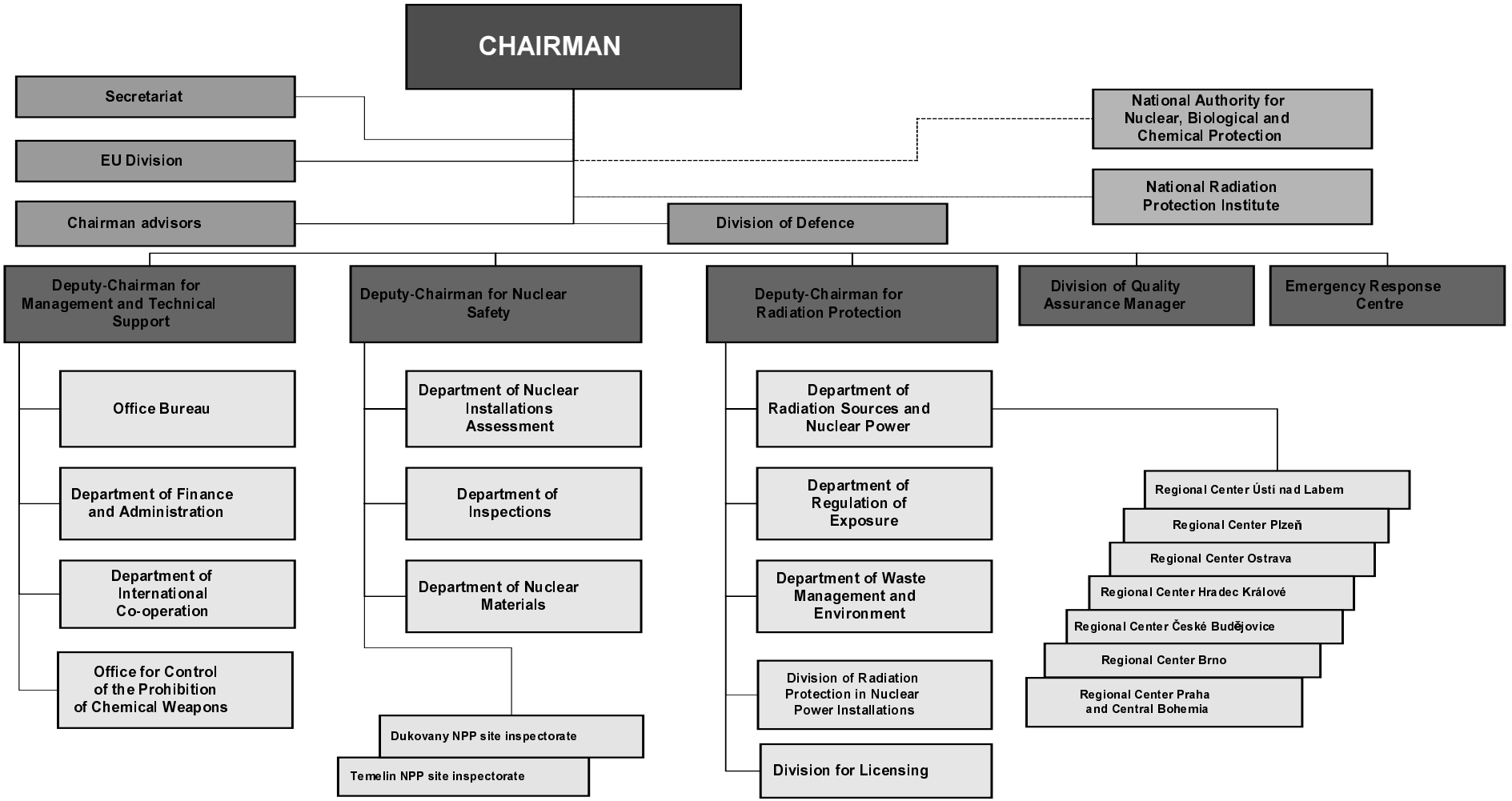
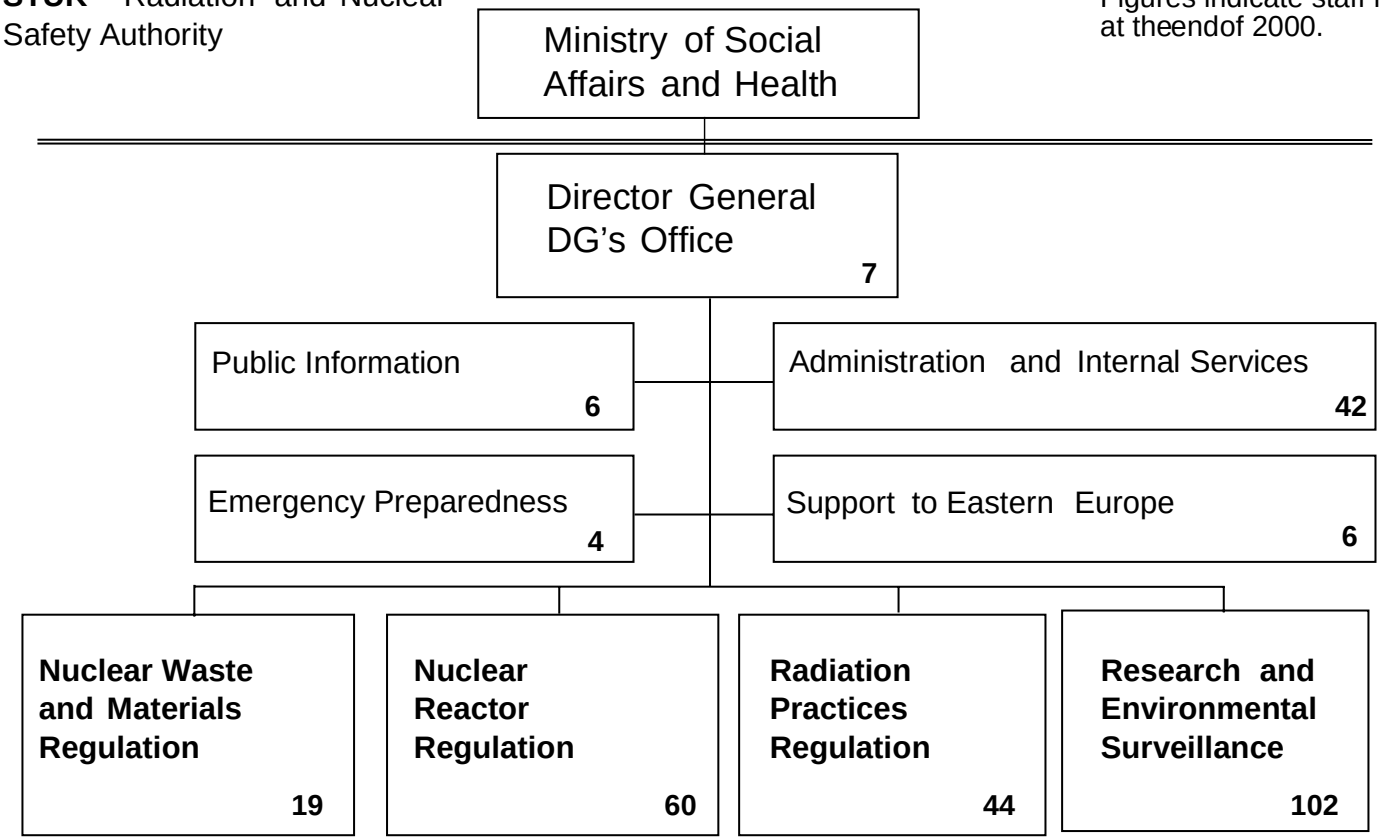


Chart 2, ANNEX I

FINLAND

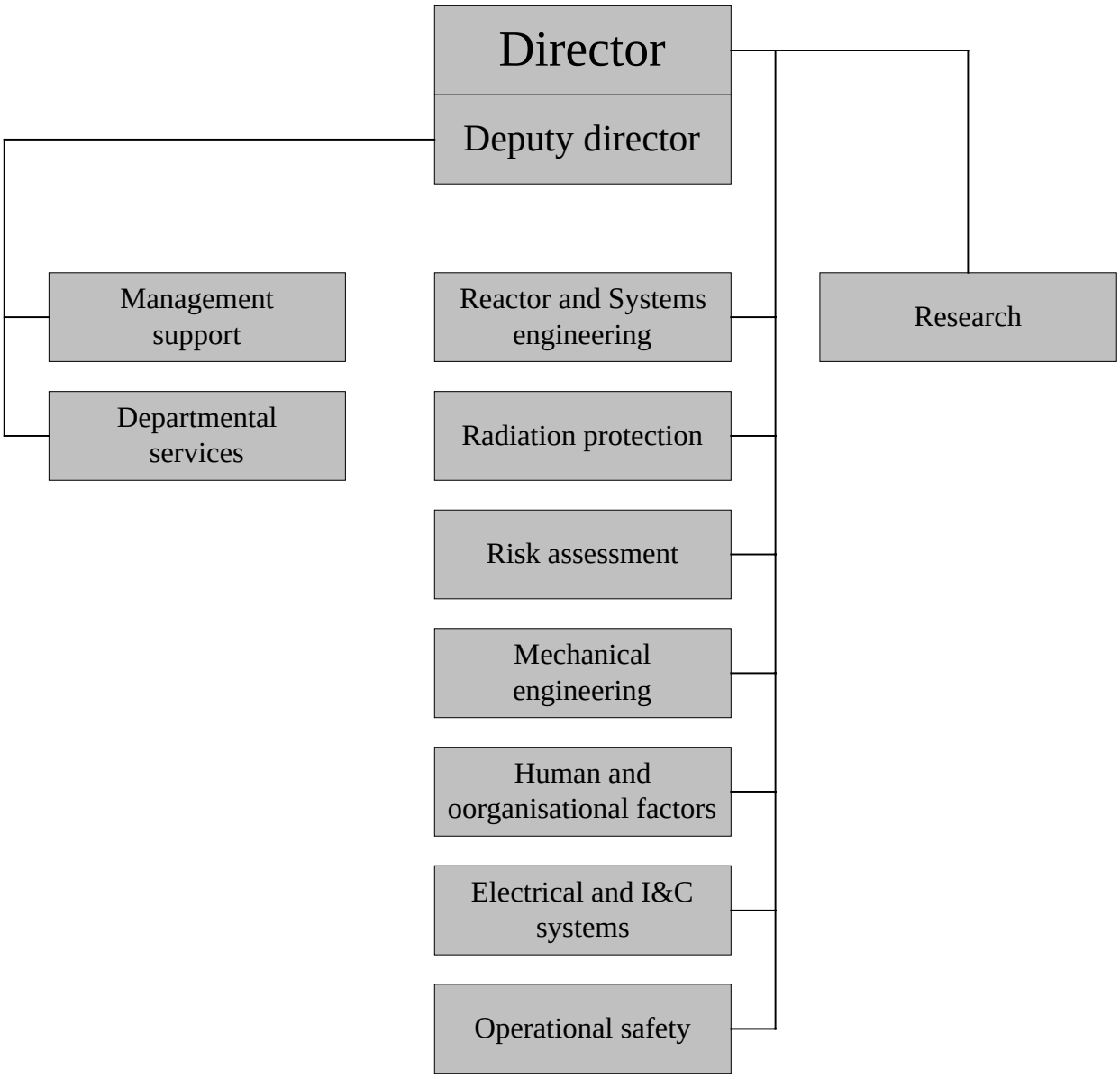
STUK - Radiation and Nuclear Safety Authority

Figures indicate staff num- at theendof 2000.

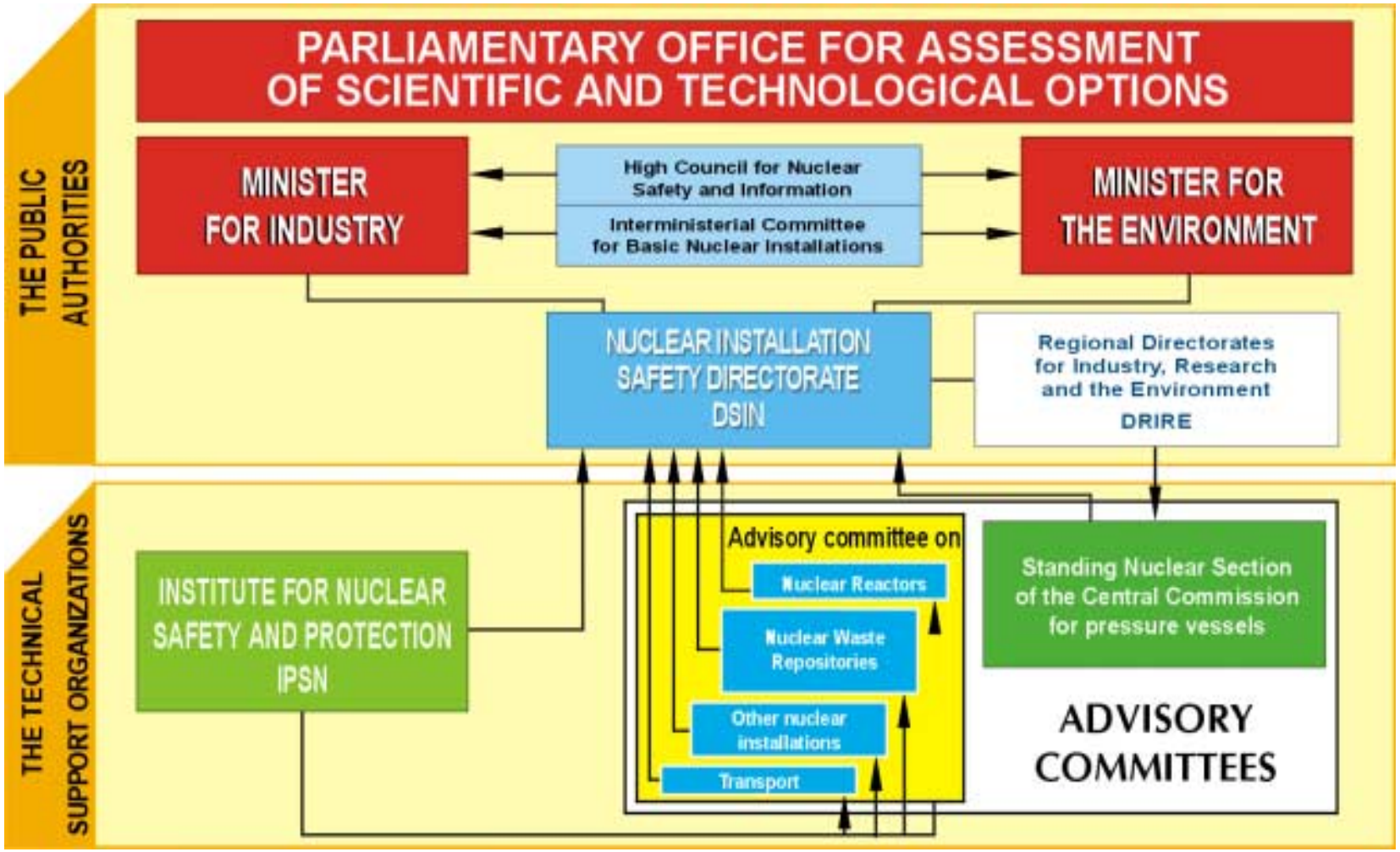


Finland (cont'd)

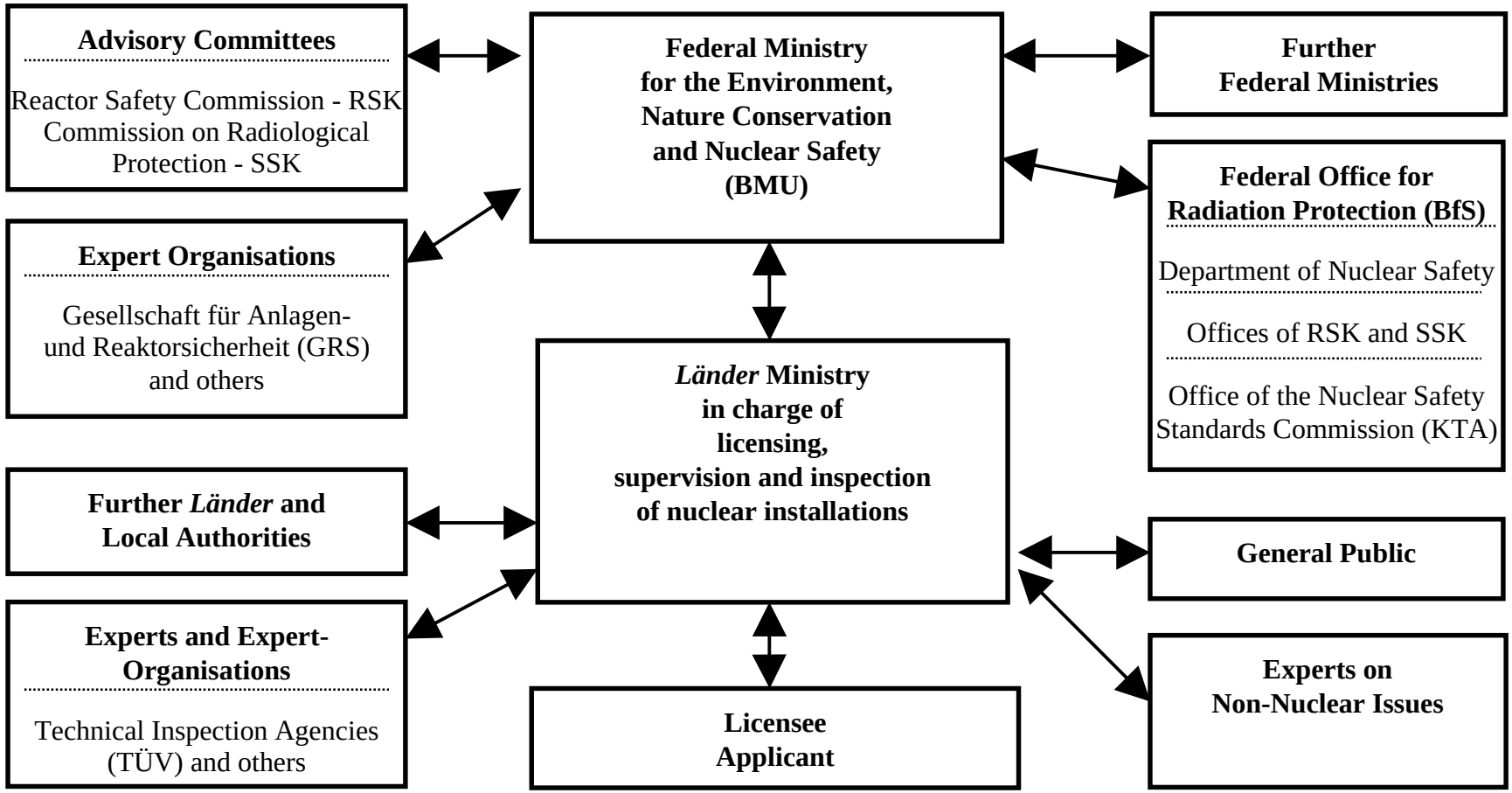
YTO
Nuclear Reactor Regulation
Organisation



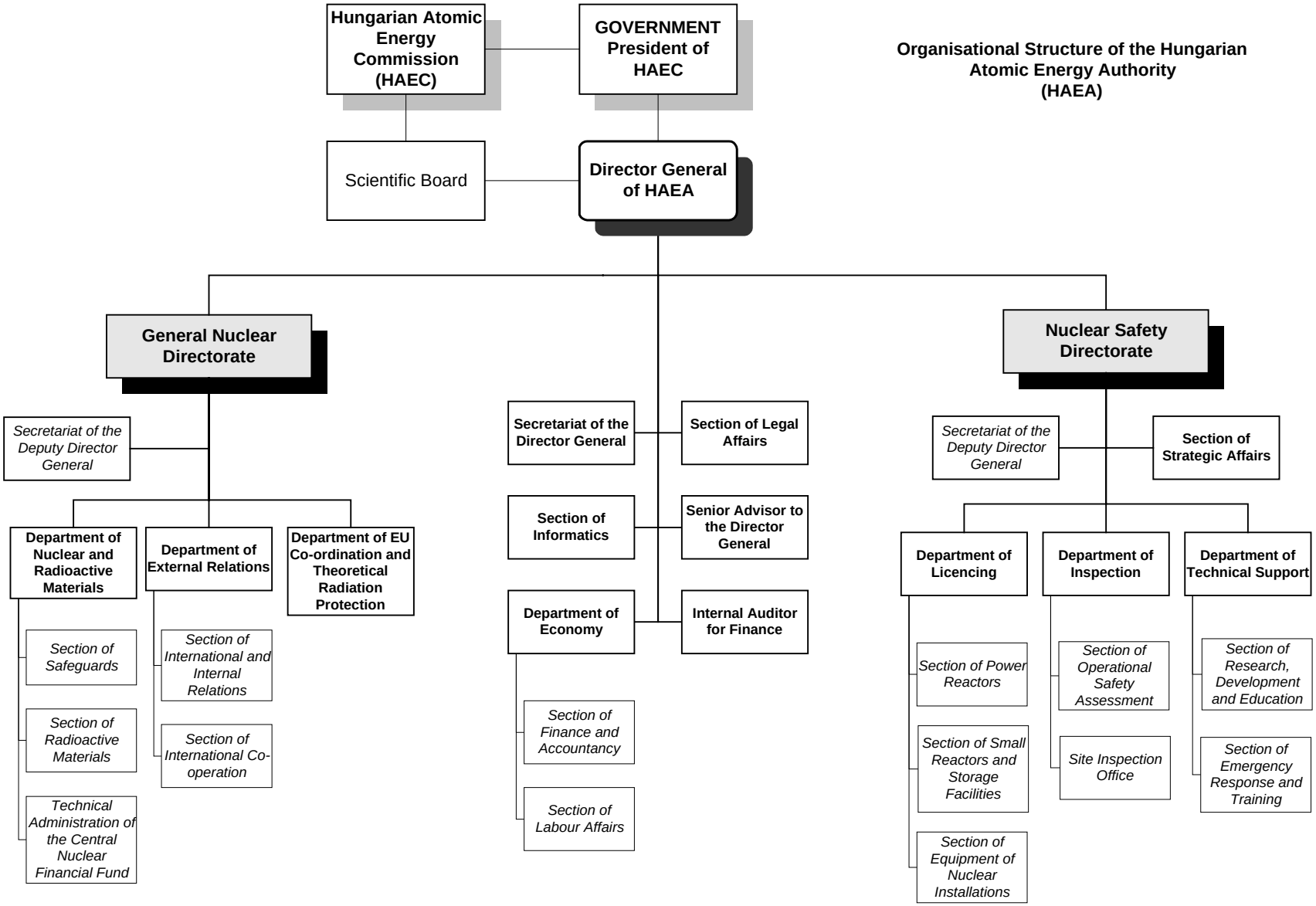
FRANCE


THE PUBLIC AUTHORITIES
PARLIAMENTARY OFFICE FOR ASSESSMENT OF SCIENTIFIC AND TECHNOLOGICAL OPTIONS
MINISTER FOR INDUSTRY
High Council for Nuclear Safety and Information
Interministerial Committee for Basic Nuclear Installations
MINISTER FOR THE ENVIRONMENT
NUCLEAR INSTALLATION SAFETY DIRECTORATE DSIN
Regional Directorates for Industry, Research and the Environment DRIRE
THE TECHNICAL SUPPORT ORGANIZATIONS
INSTITUTE FOR NUCLEAR SAFETY AND PROTECTION IPSN
Advisory committee on
Nuclear Reactors
Nuclear Waste Repositories
Other nuclear installations
Transport
Standing Nuclear Section of the Central Commission for pressure vessels
ADVISORY COMMITTEES

Participants of the Atomic Licensing Procedure Germany

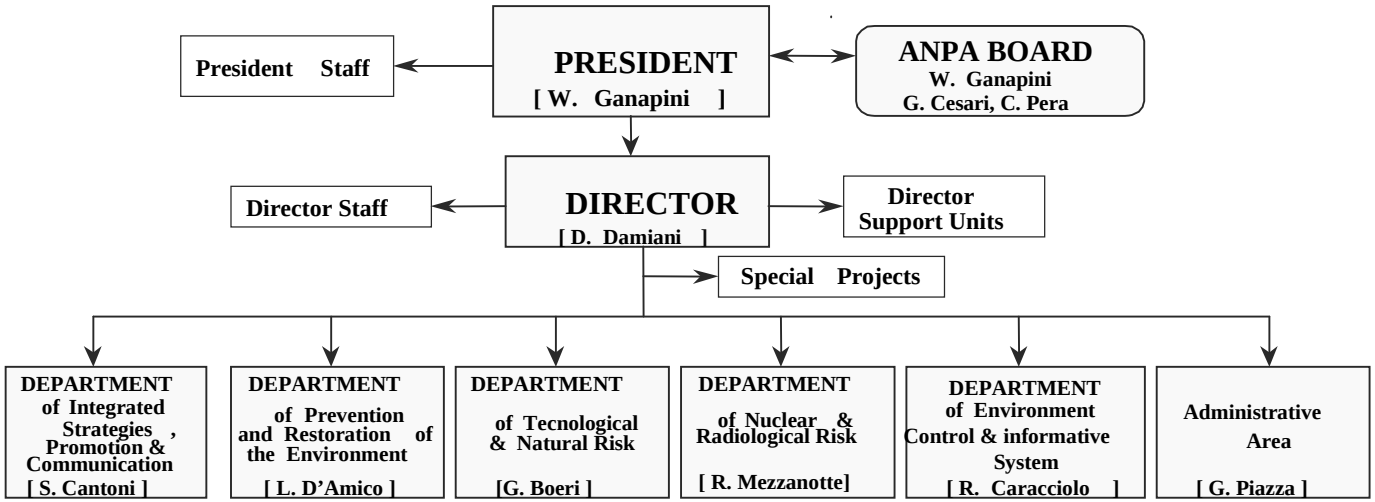


Organisational Structure of the Hungarian Atomic Energy Authority (HAEA)



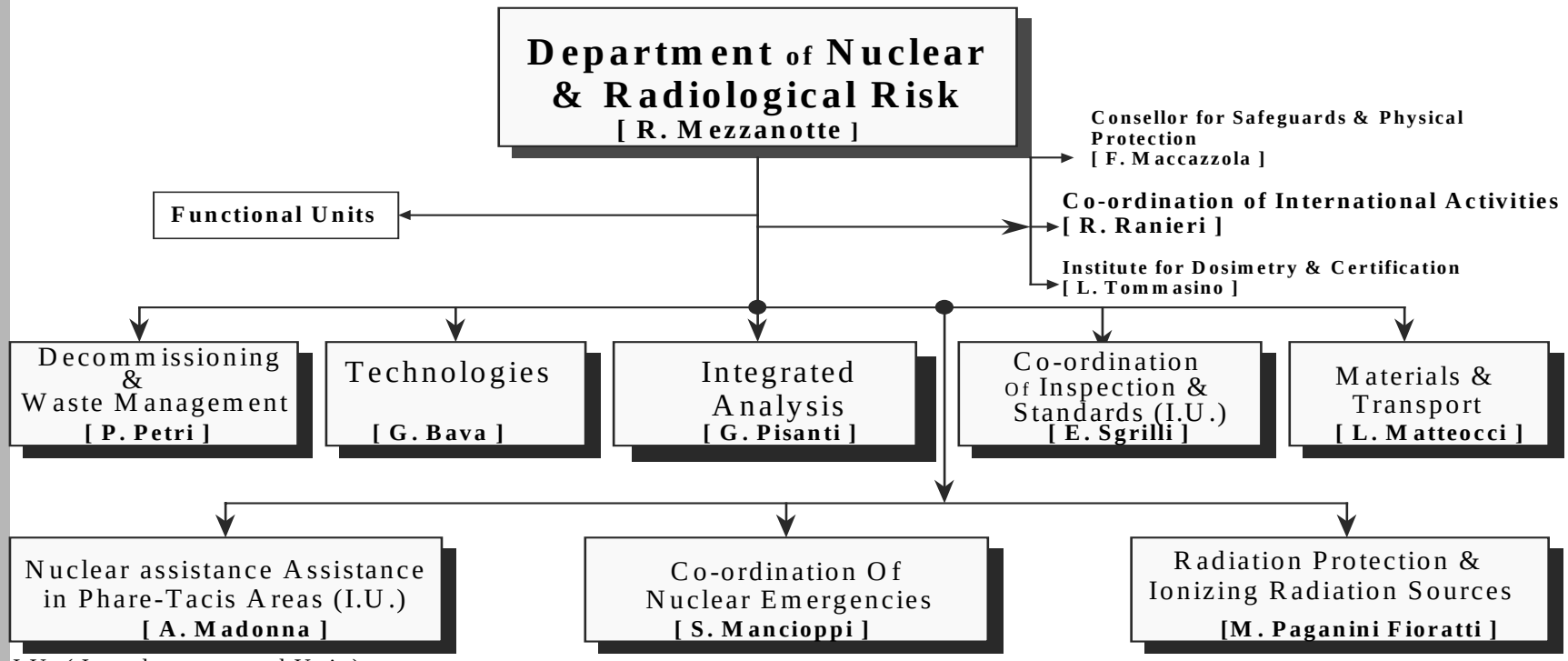
ANPA

Italy - Agenzia Nazionale per la Protezione dell'Ambiente



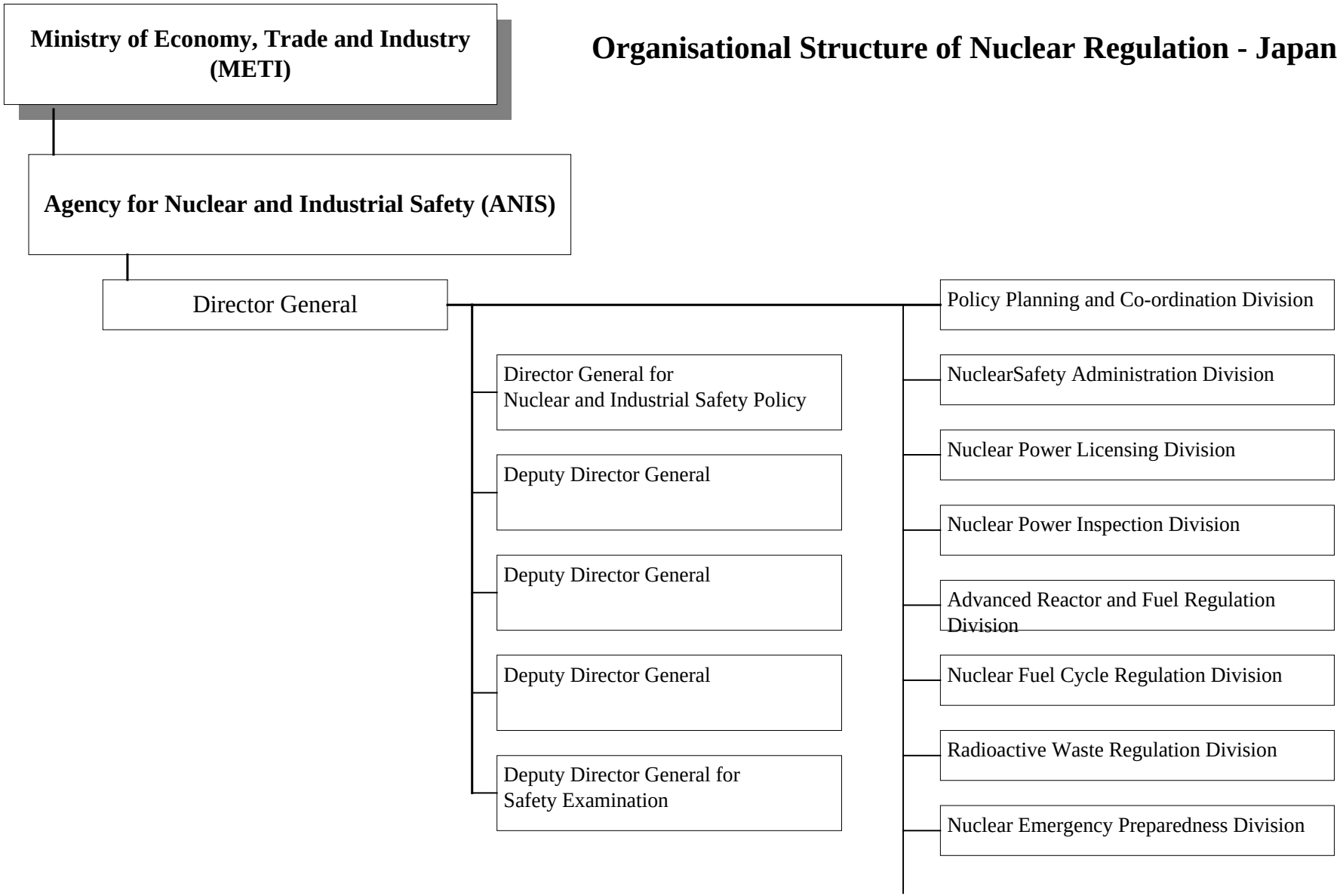
ANPA

DEPARTMENT OF NUCLEAR & RADIOLOGICAL RISK

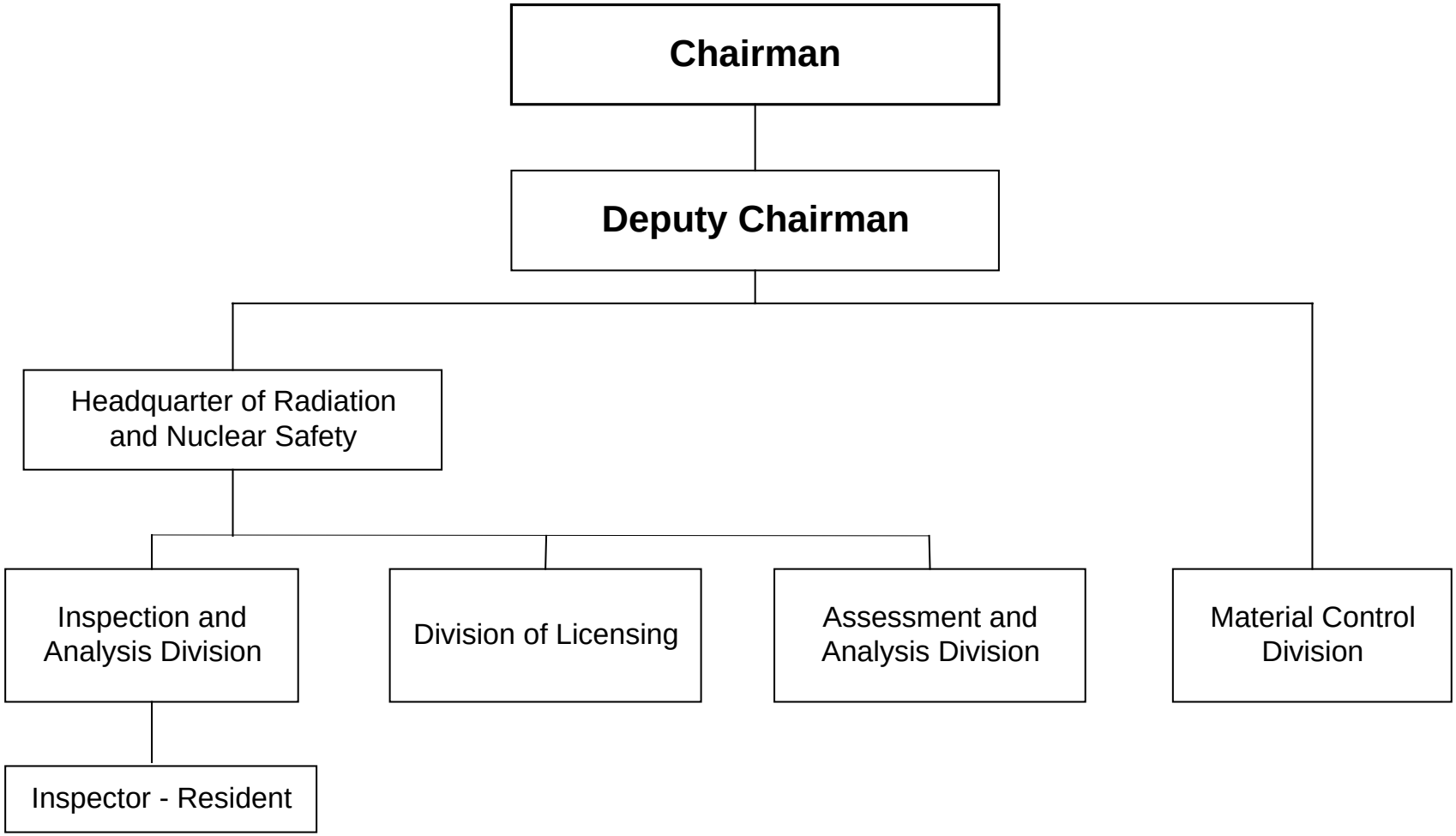


I.U. (Interdepartmental Unit)

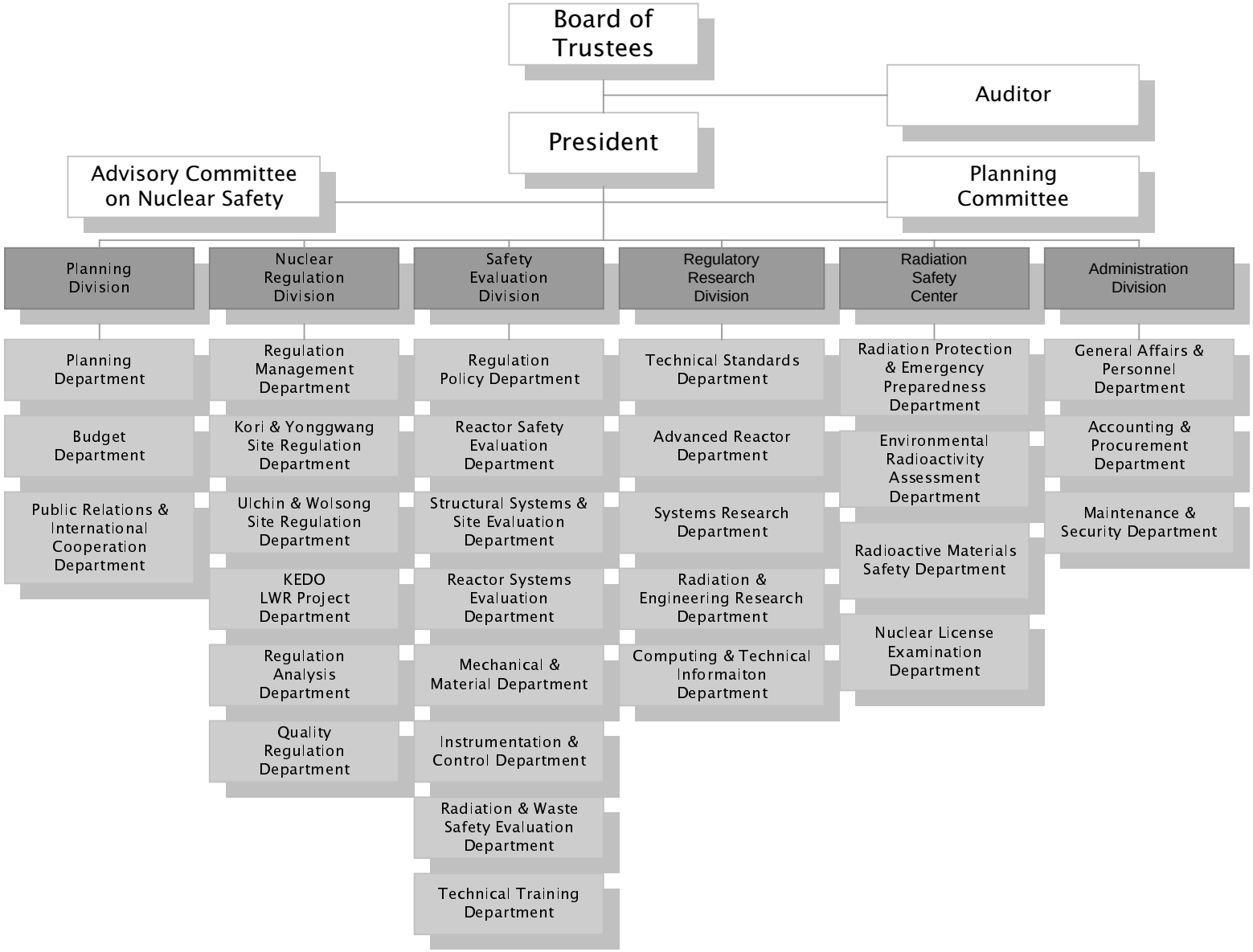
Organisational Structure of Nuclear Regulation - Japan



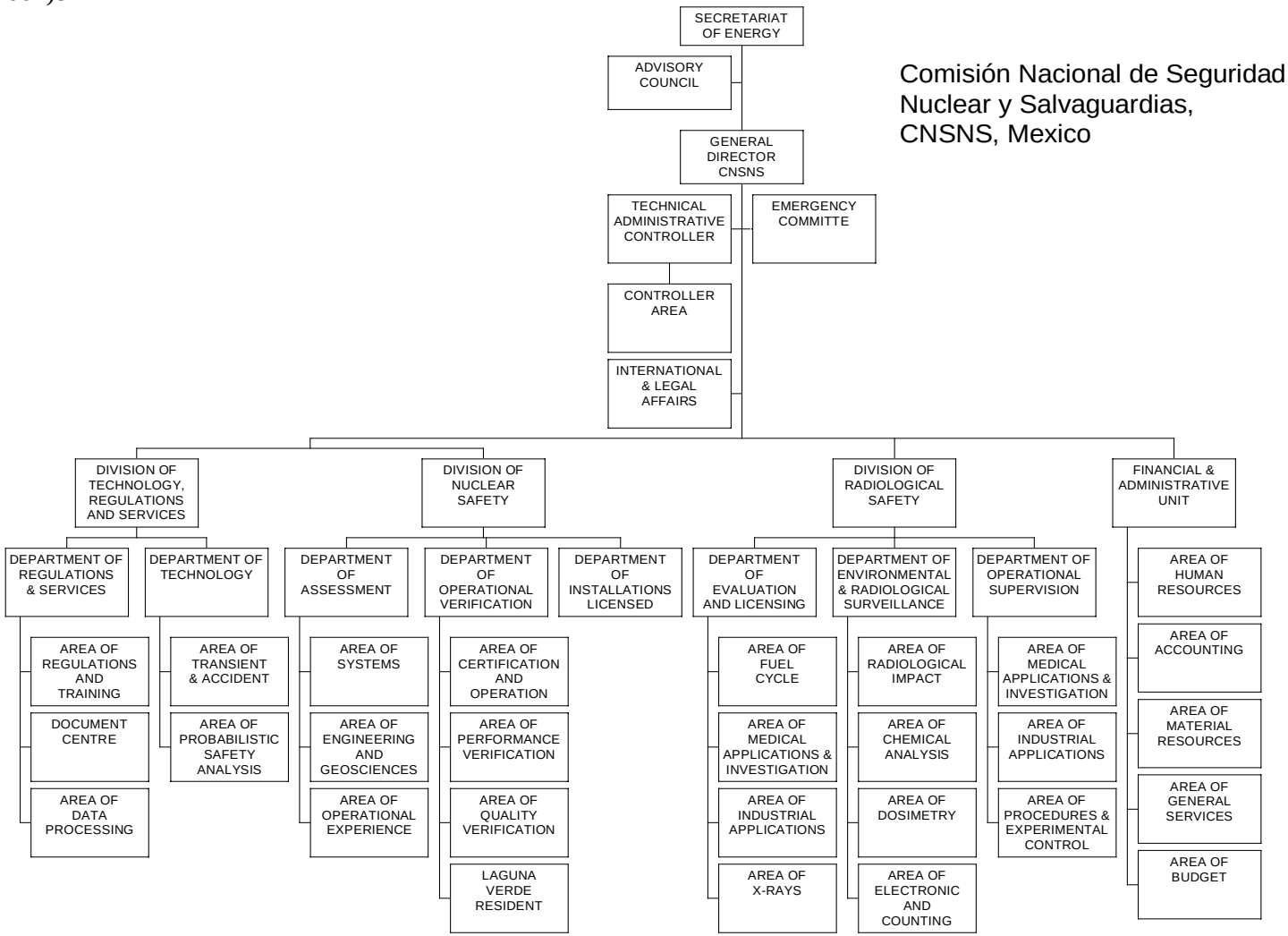
Kazakhstan Atomic Energy Committee (KAEC)



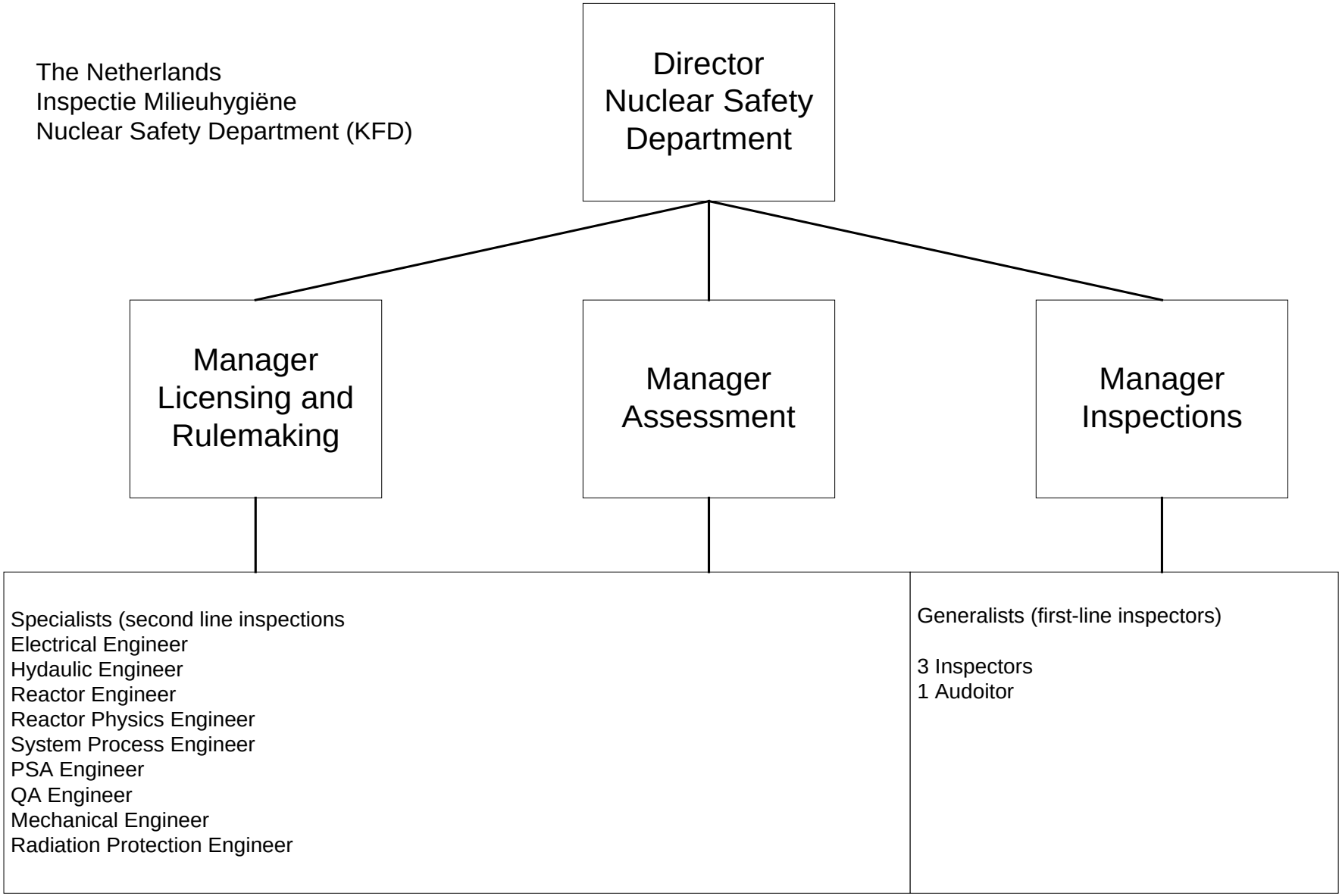
Korea Institute of Nuclear Safety (KINS)



Comisión Nacional de Seguridad Nuclear y Salvaguardias, CNSNS, Mexico

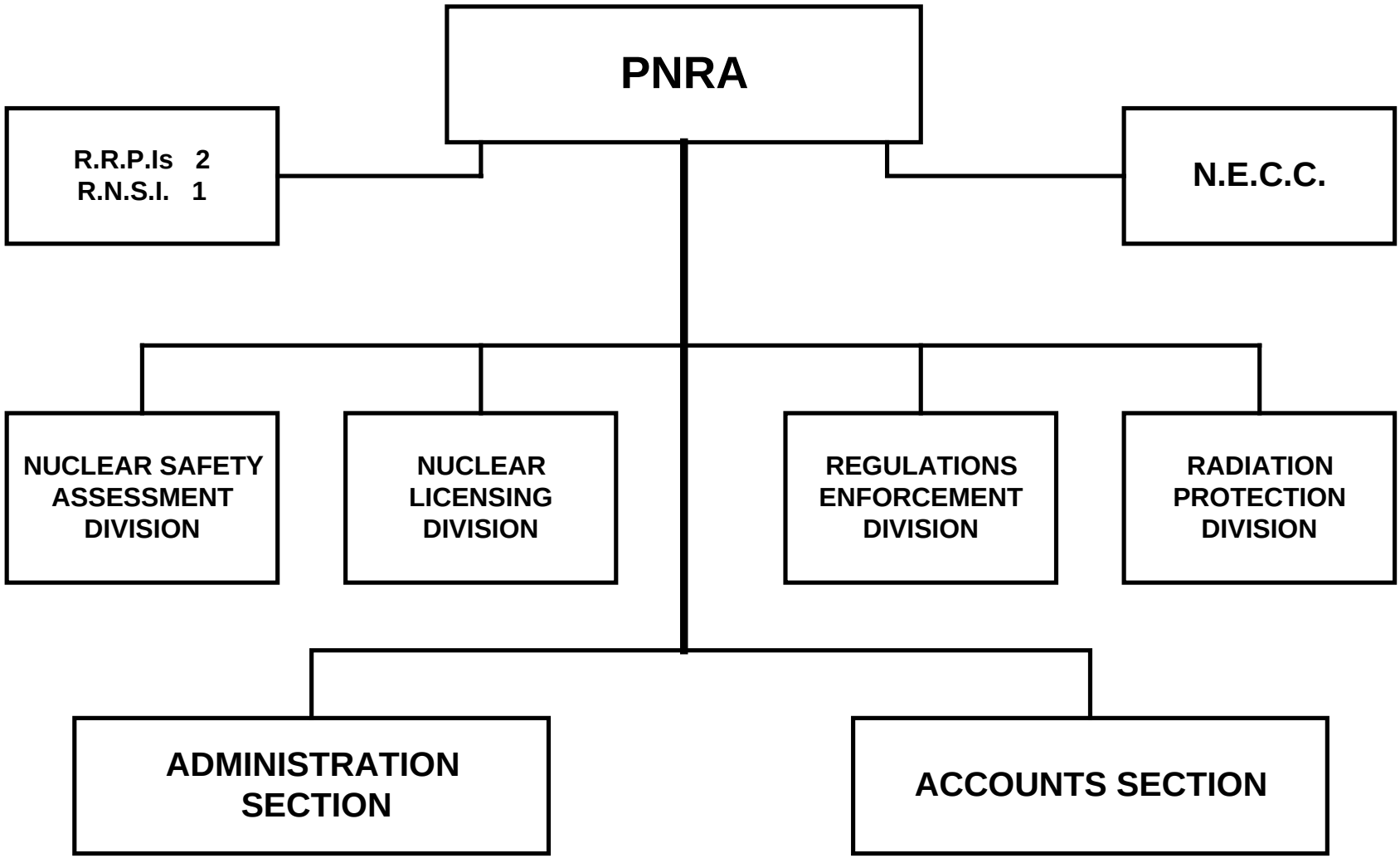


The Netherlands
Inspectie Milieuhygiëne
Nuclear Safety Department (KFD)

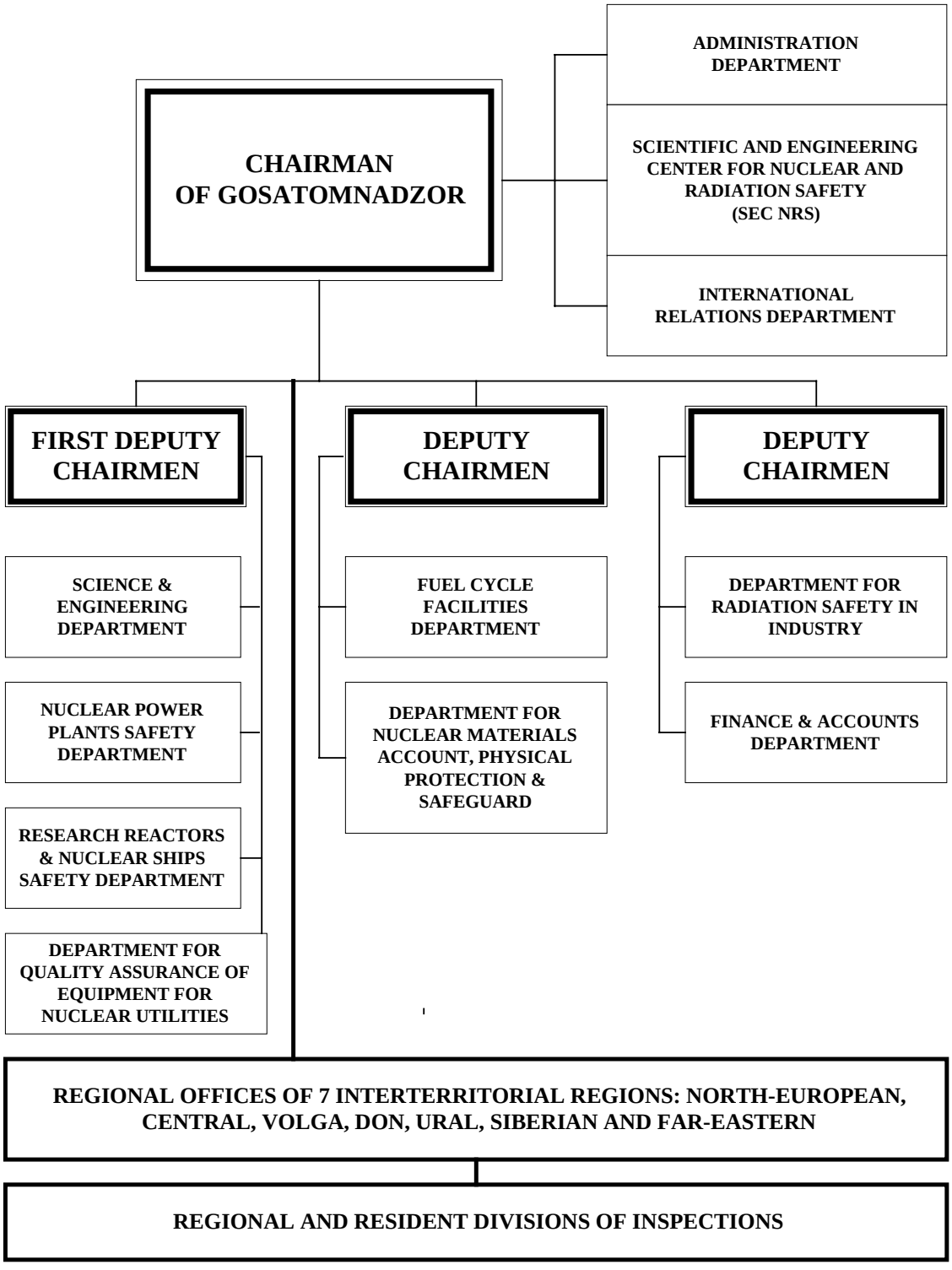


PAKISTAN

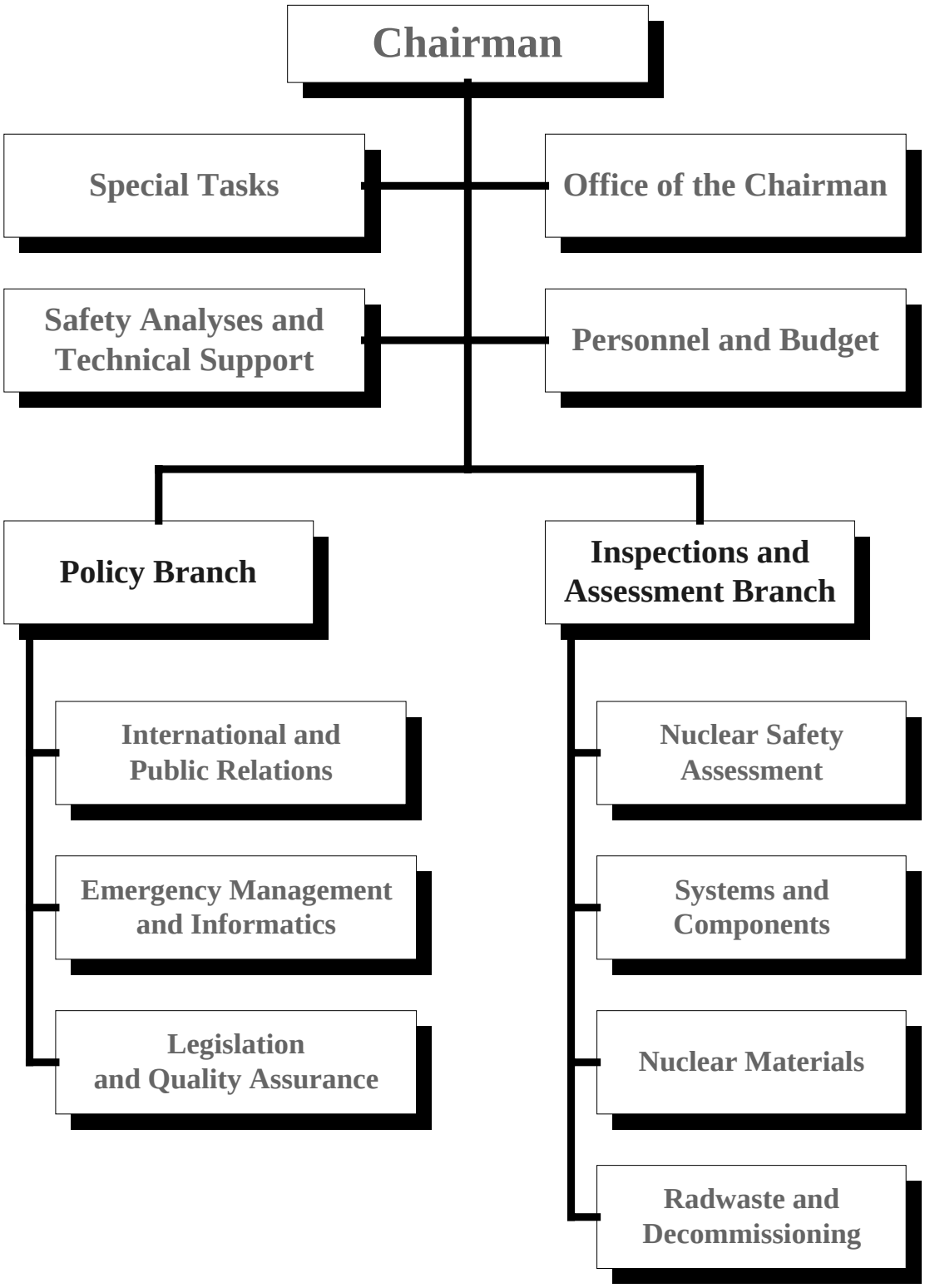
ORGANISATIONAL STRUCTURE OF DNSRP



RUSSIA
REGULATORY AUTHORITY ONNUCLEAR AND RADIATION SAFETY
GOSATOMNADZOR OF RUSSIA

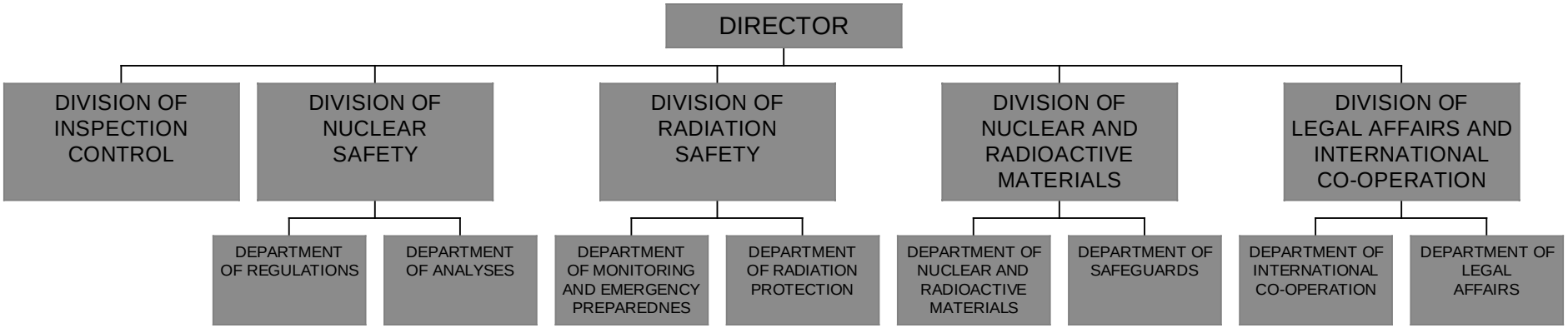


Nuclear Regulatory Authority of Slovak Republic (UJD)

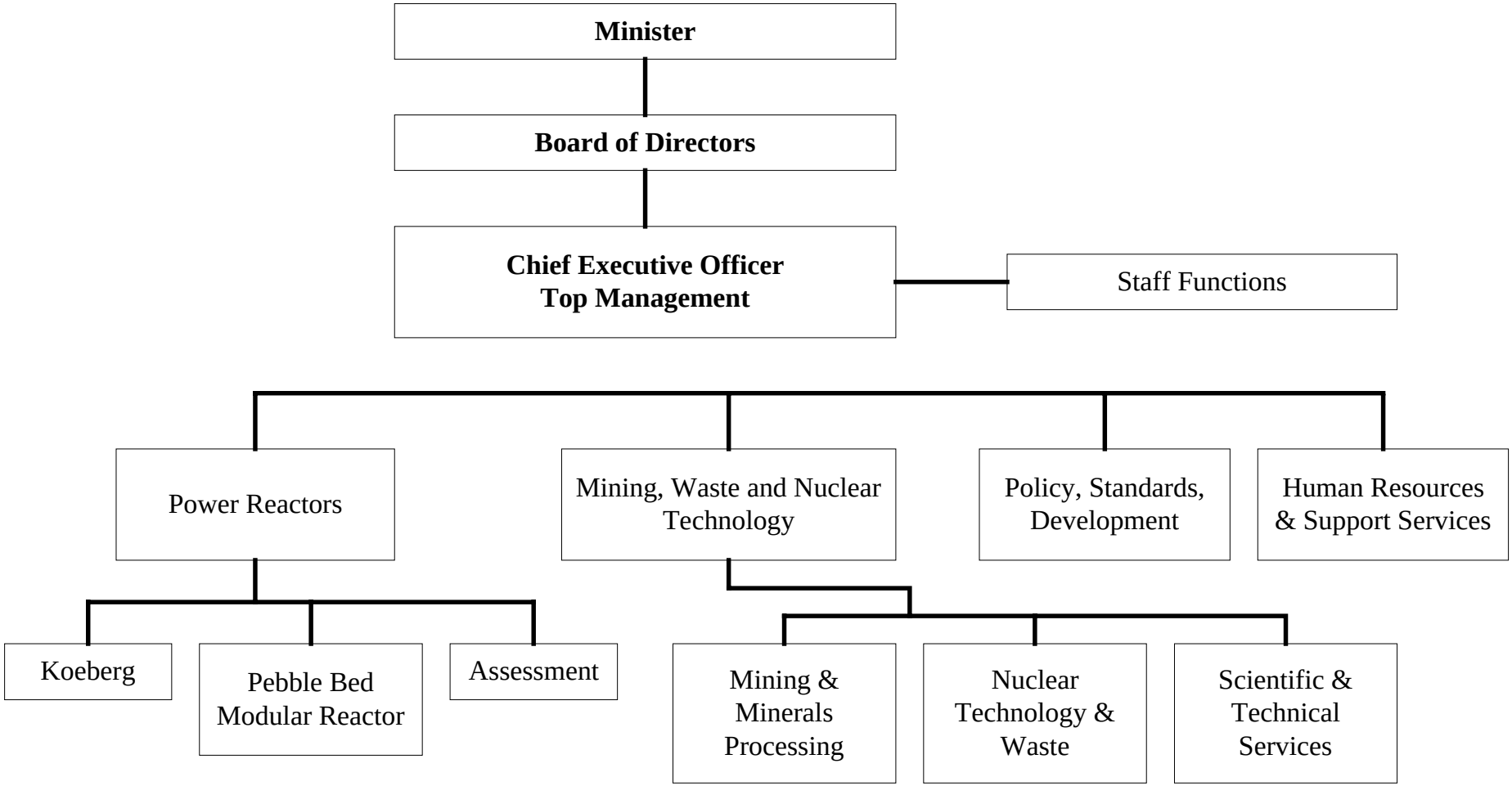


SLOVENIA

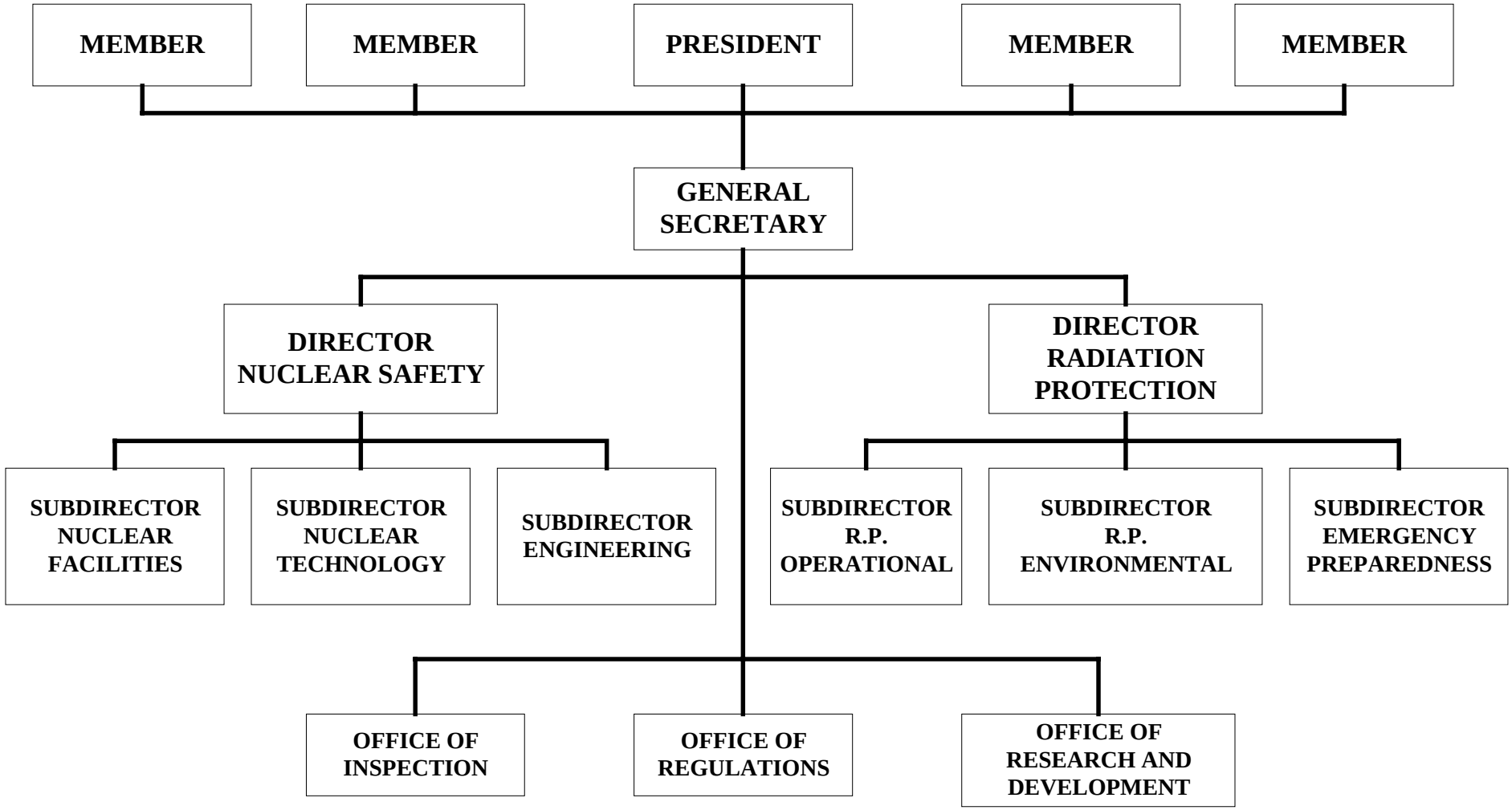
Slovenian Nuclear Safety Administration (SNSA)



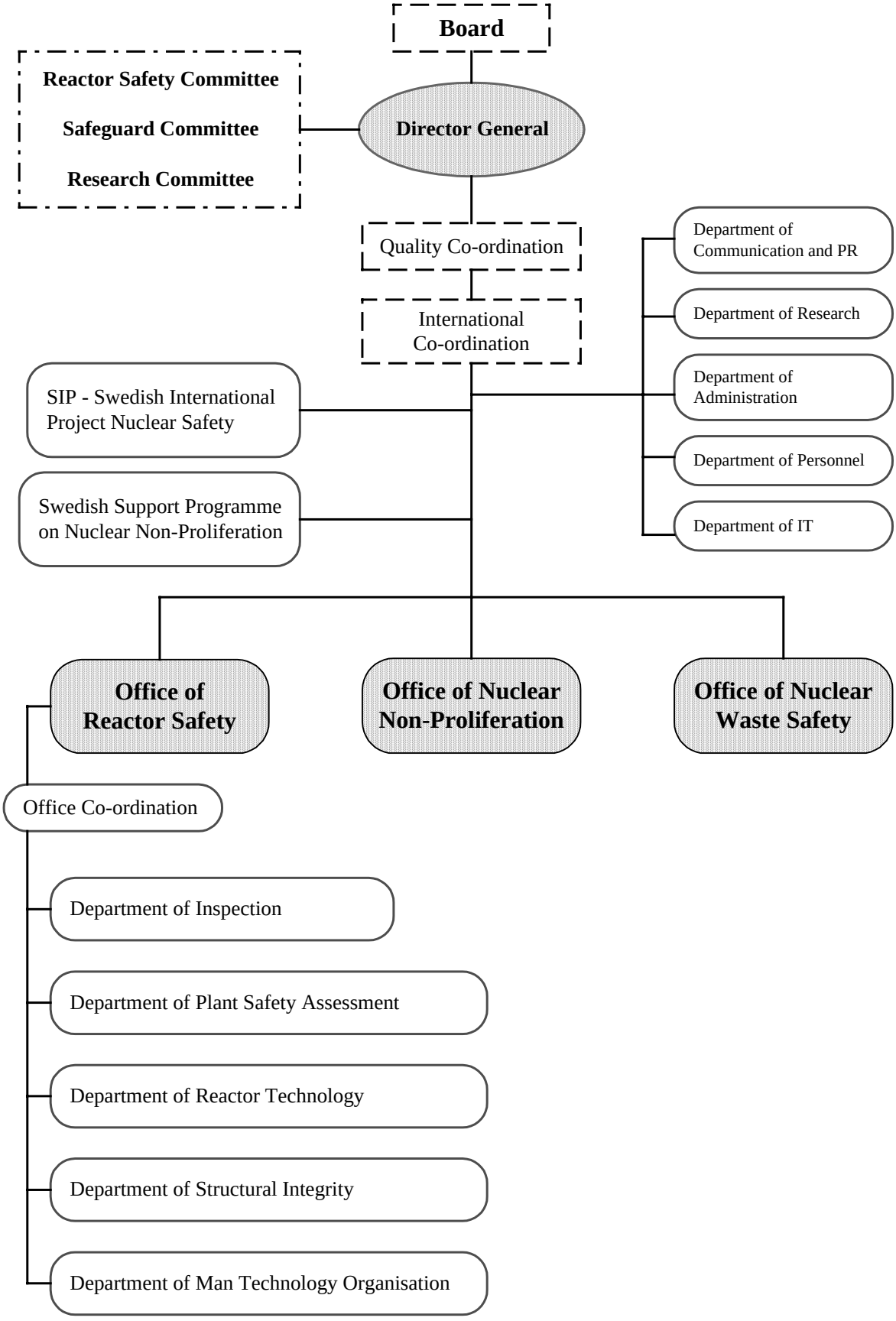
South Africa
NNR ORGANISATIONAL STRUCTURE



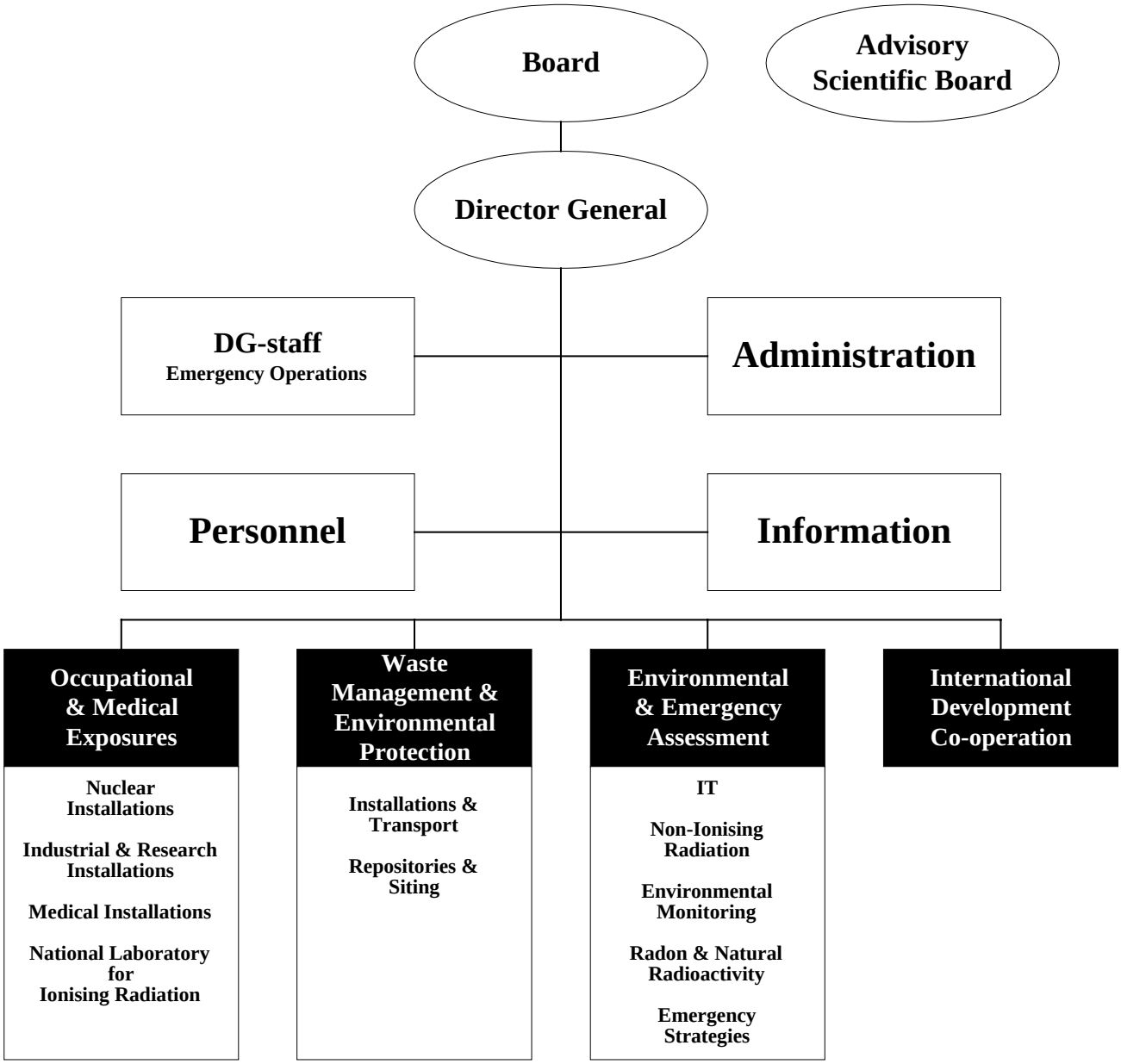
SPAIN - COSEJO DE SEGURIDAD NUCLEAR (CSN) / NUCLEAR SAFETY COUNCIL

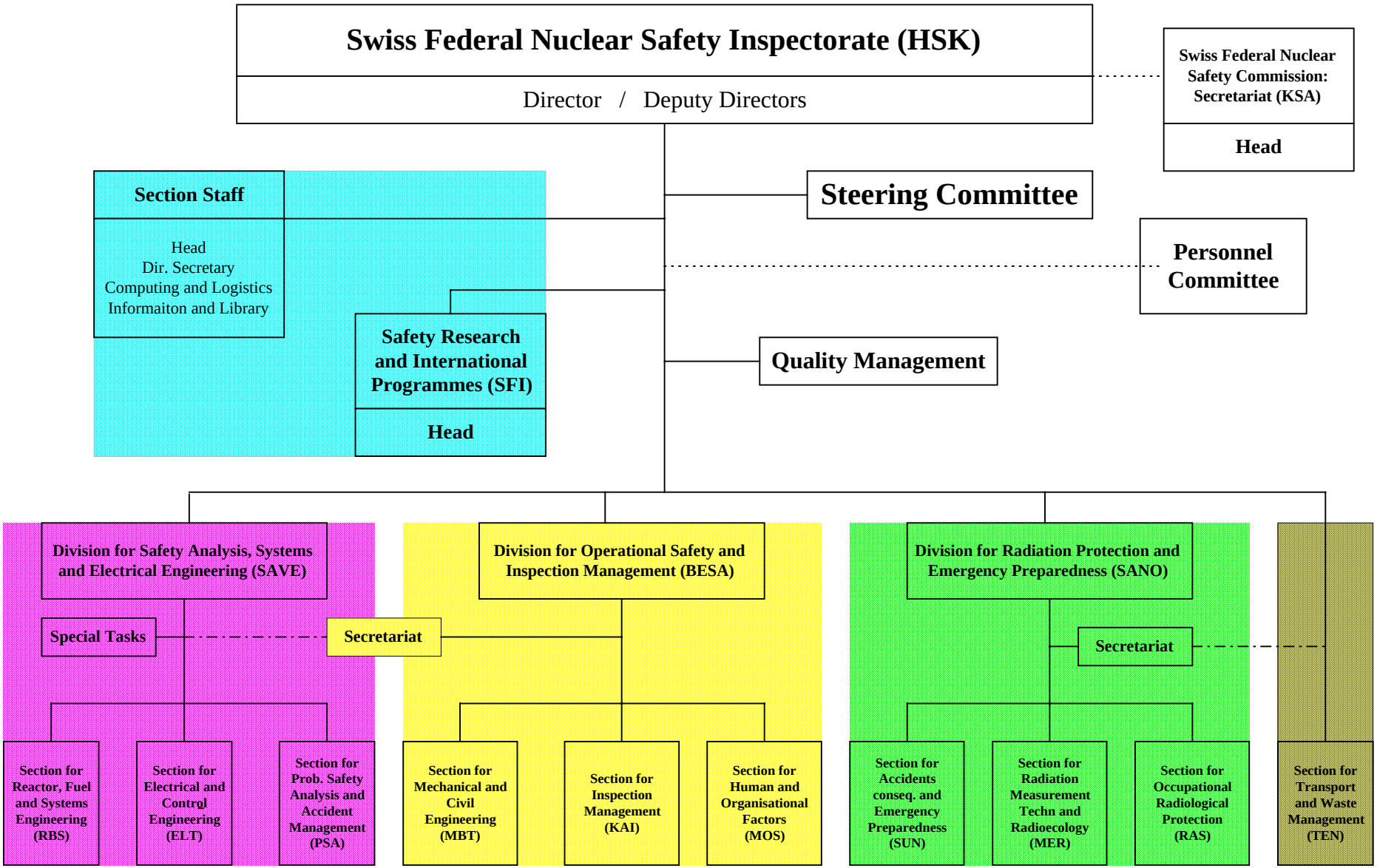


SWEDEN Swedish Nuclear Power Inspectorate (SKI)



SWEDEN (Cont'd.)
Swedish Radiation Protection Institute (SS))



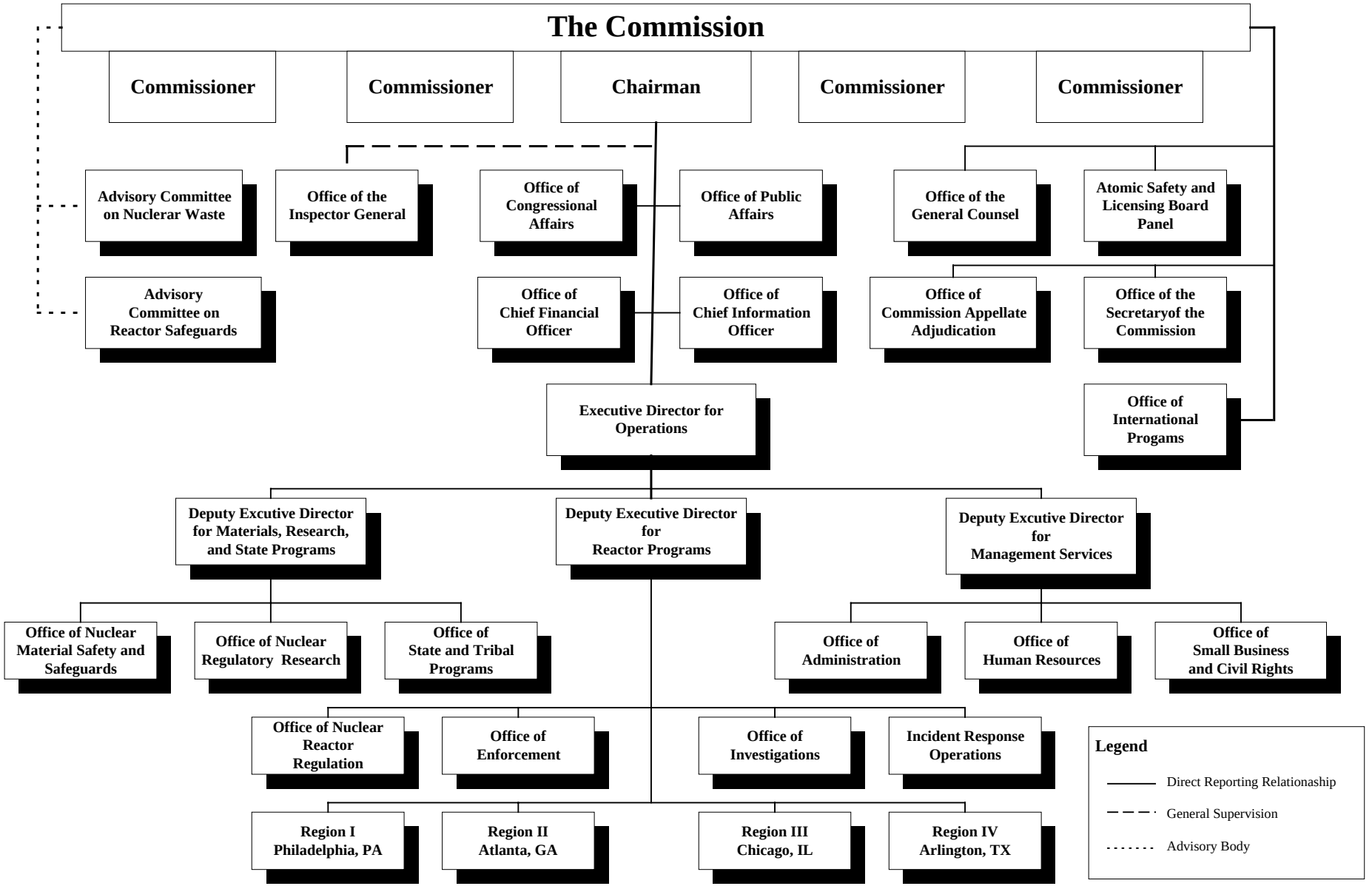

Swiss Federal Nuclear Safety Inspectorate (HSK)
Director / Deputy Directors
Swiss Federal Nuclear Safety Commission: Secretariat (KSA)
Head
Section Staff
Head
Dir. Secretary
Computing and Logistics
Informaiton and Library
Steering Committee
Personnel Committee
Safety Research and International Programmes (SFI)
Head
Quality Management
Division for Safety Analysis, Systems and Electrical Engineering (SAVE)
Special Tasks
Secretariat
Section for Reactor, Fuel and Systems Engineering (RBS)
Section for Electrical and Control Engineering (ELT)
Section for Prob. Safety Analysis and Accident Management (PSA)
Division for Operational Safety and Inspection Management (BESA)
Section for Mechanical and Civil Engineering (MBT)
Section for Inspection Management (KAI)
Section for Human and Organisational Factors (MOS)
Division for Radiation Protection and Emergency Preparedness (SANO)
Secretariat
Section for Accidents conseq. and Emergency Preparedness (SUN)
Section for Radiation Measurement Techn and Radioecology (MER)
Section for Occupational Radiological Protection (RAS)
Section for Transport and Waste Management (TEN)

Director's Office Secretariat

HM CHIEF INSPECTOR NUCLEAR INSTALLATIONS & DIRECTOR NUCLEAR SAFETY DIRECTORATE

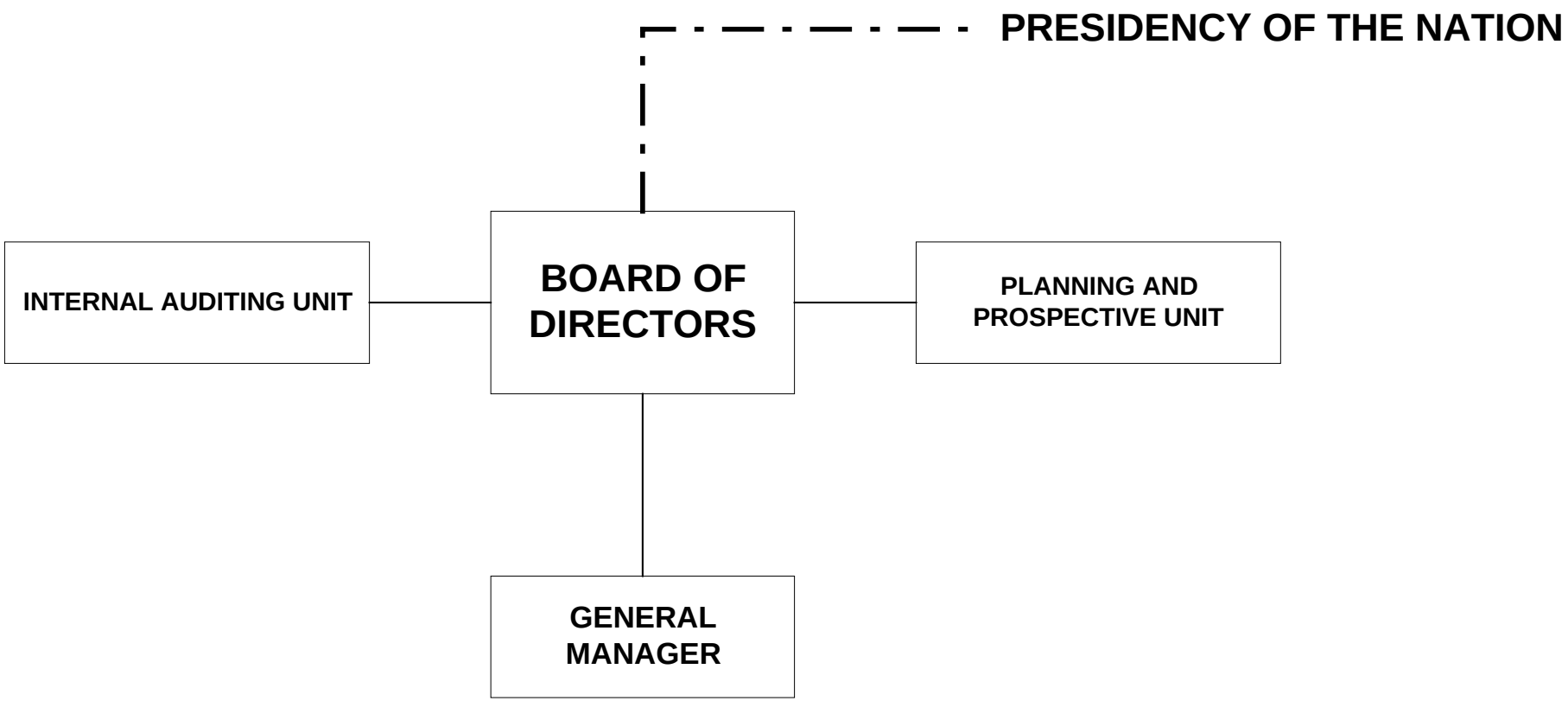
DIVISION 1 BRITISH ENERGY	DIVISION 2 BNFL	DIVISION 3 DEFENCE & UKAEA	DIVISION 4 RESEARCH & STRATEGY
Division Support Office	Division Support Office	Division Support Office	Division Support Office
1a Reactor Inspection	2a Reactor Inspection	3a Defence Sites	4a Nuclear Safety Research
1b Reactor Inspection	2b BNFL Plant Inspection	3b AWE Sites	4b Operational Strategy
1c Engineering Assessment	2c BNFL Projects	3c UKAEA Sites	4c Radioactive Waste & Decommissioning Strategy
1d Systems Assessment	2d Structural Integrity Assessment	3d Engineering Assessment	4d Directorate Business Systems
1e Nycomed Amersham, Research Reactors, Quality Management & Conventional Safety	2e Engineering Assessment	3e Systems Assessment	4e Finance & Planning
	2f Systems Assessment		4f Human Resources Management

United States Nuclear Regulatory Commission



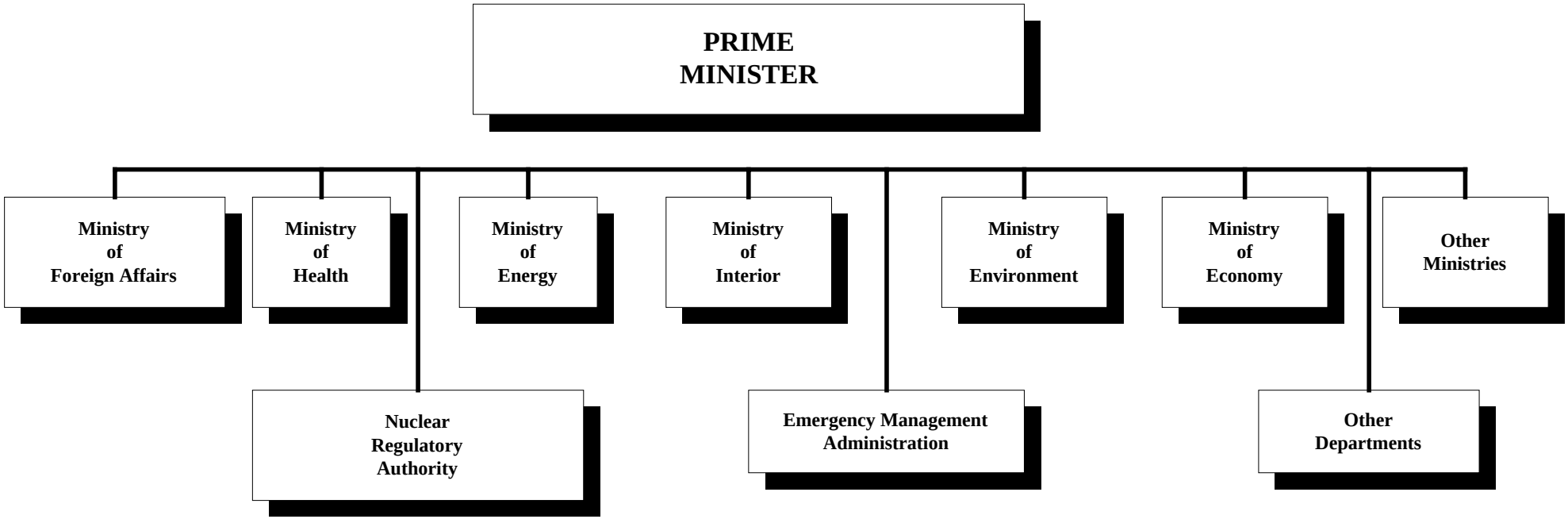
ANNEX II – GOVERNMENTAL ORGANISATIONAL STRUCTURES

ARGENTINA


PRESIDENCY OF THE NATION
INTERNAL AUDITING UNIT
BOARD OF DIRECTORS
PLANNING AND PROSPECTIVE UNIT
GENERAL MANAGER

ARMENIA

STATUS OF THE ANRA WITHIN THE STATE ADMNSTRATION

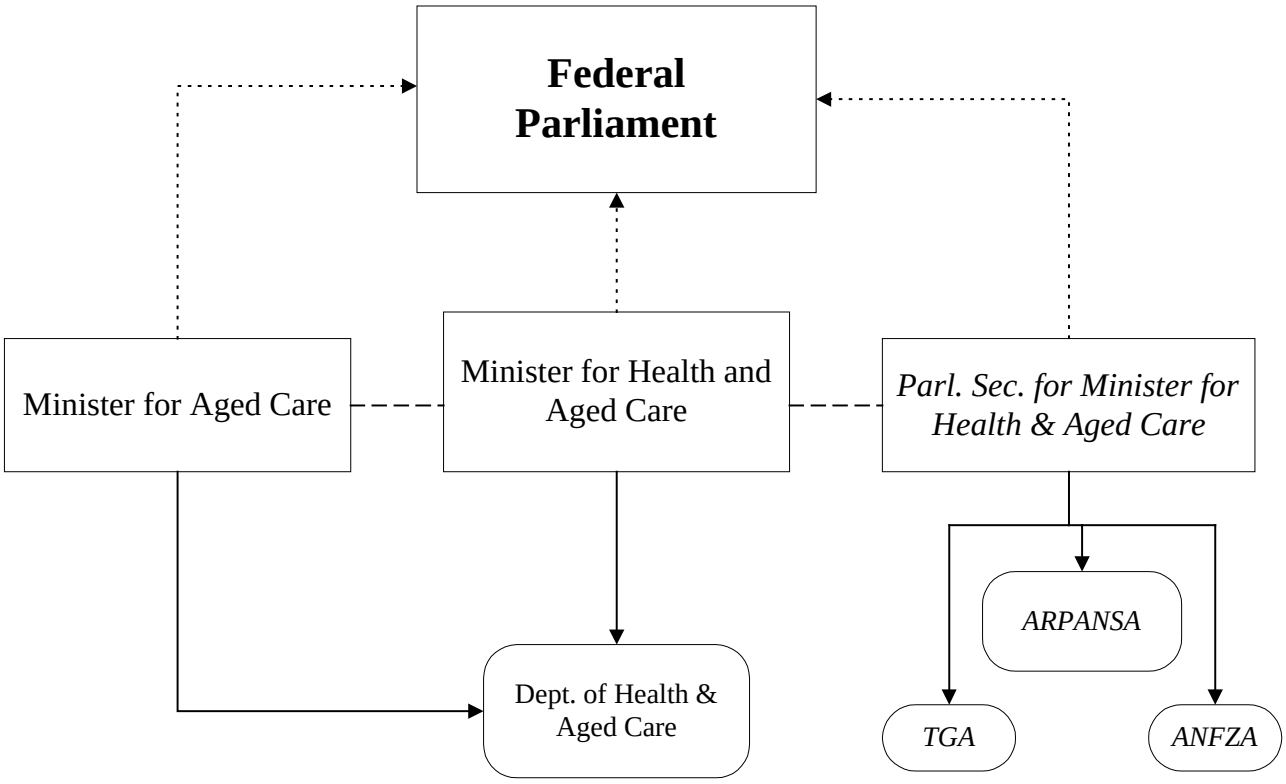


Australian Government Organisaitonal Structure

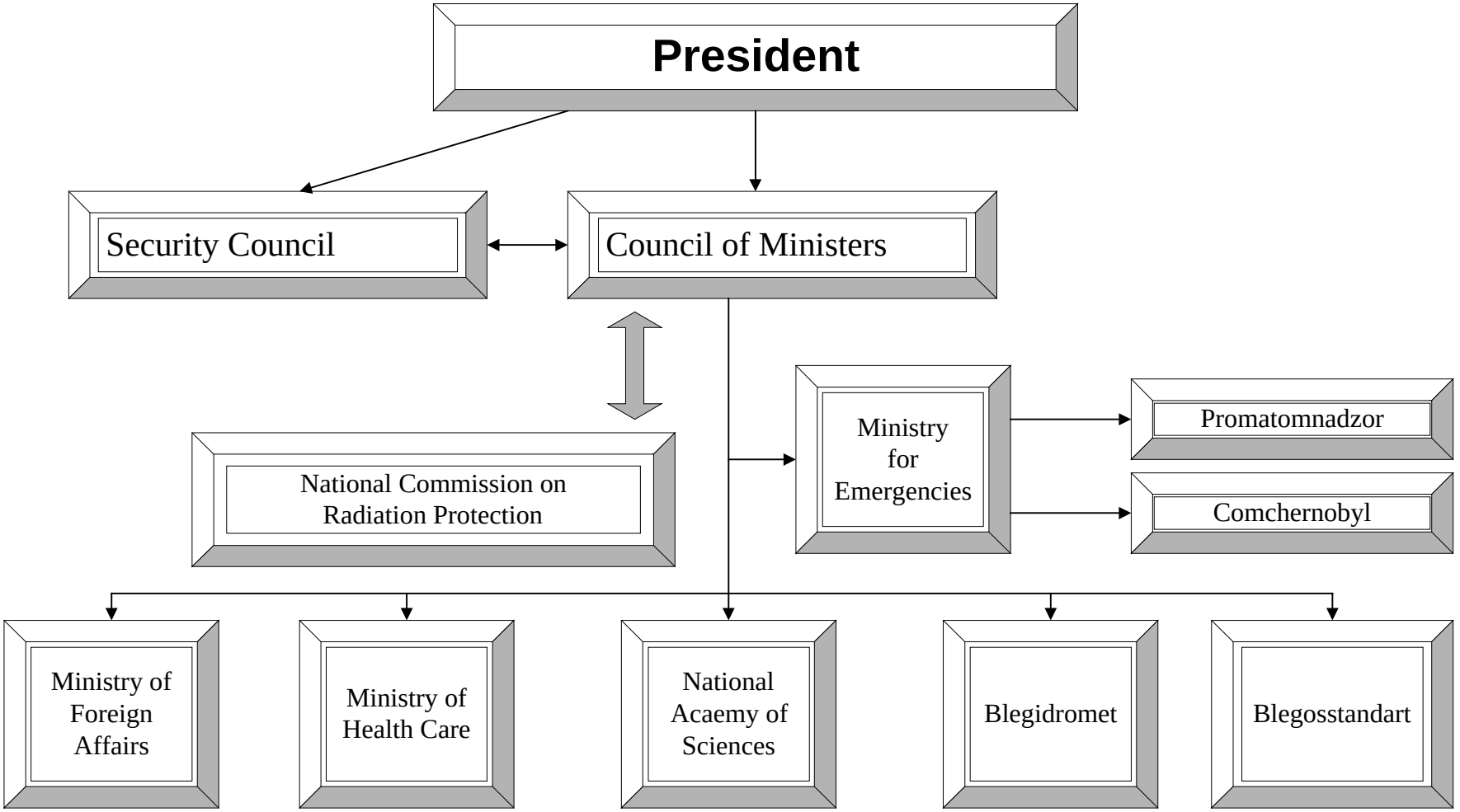
Key

.....	Ministers and Parlimentary Secretary separately responsible to Parliament
- - - - - - - - - - - -	Minister for Health and Aged care responsible for portfolio performance
———————	Department and agencies responsible to relevant Minister or the Parliamentary Secretary

Parl. Sec. means Parliamentary Secretary
ARPANSA means the Australian Radiation Protection and Nuclear Safety Agency
TGA means the Therapeutic Goods Administration
ANFZA means the Australian New Zealand Food Authority

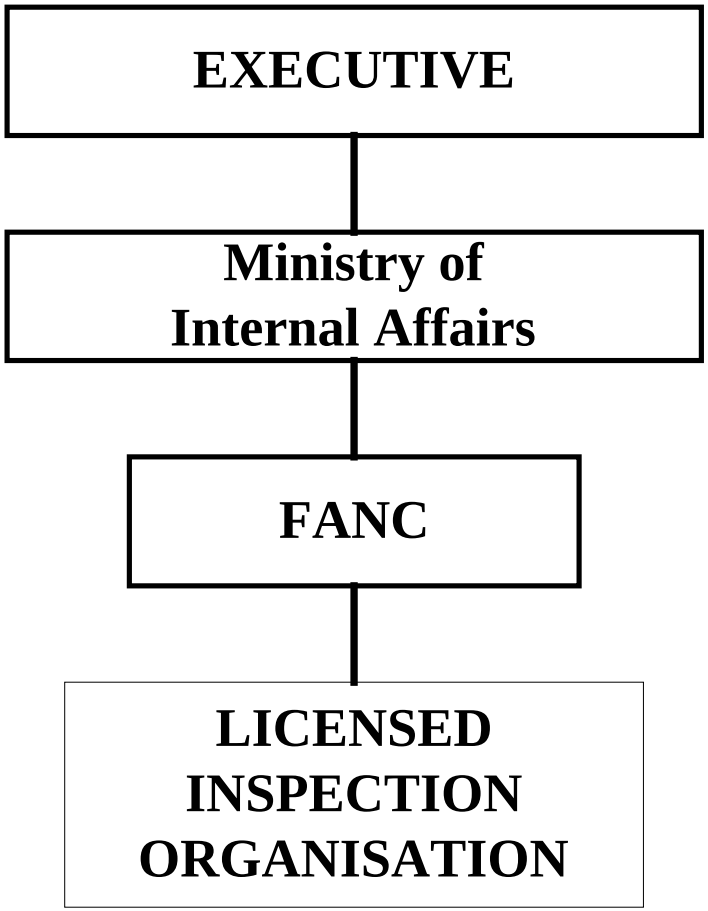


BELARUS

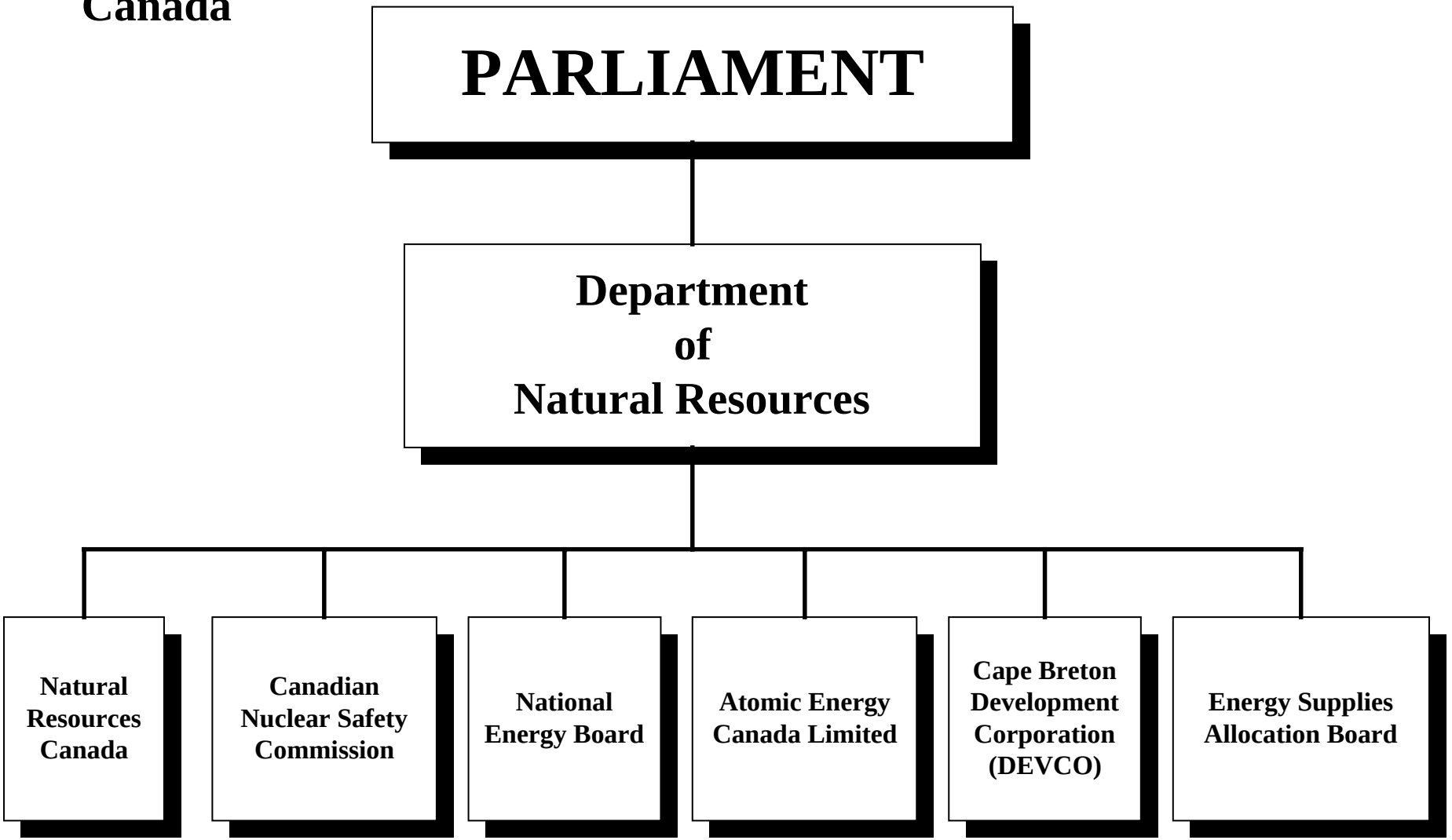

President
Security Council
Council of Ministers
National Commission on Radiation Protection
Ministry for Emergencies
Promatomnadzor
Comchernobyl
Ministry of Foreign Affairs
Ministry of Health Care
National Acaemy of Sciences
Blegidromet
Blegosstandart

BELGIUM

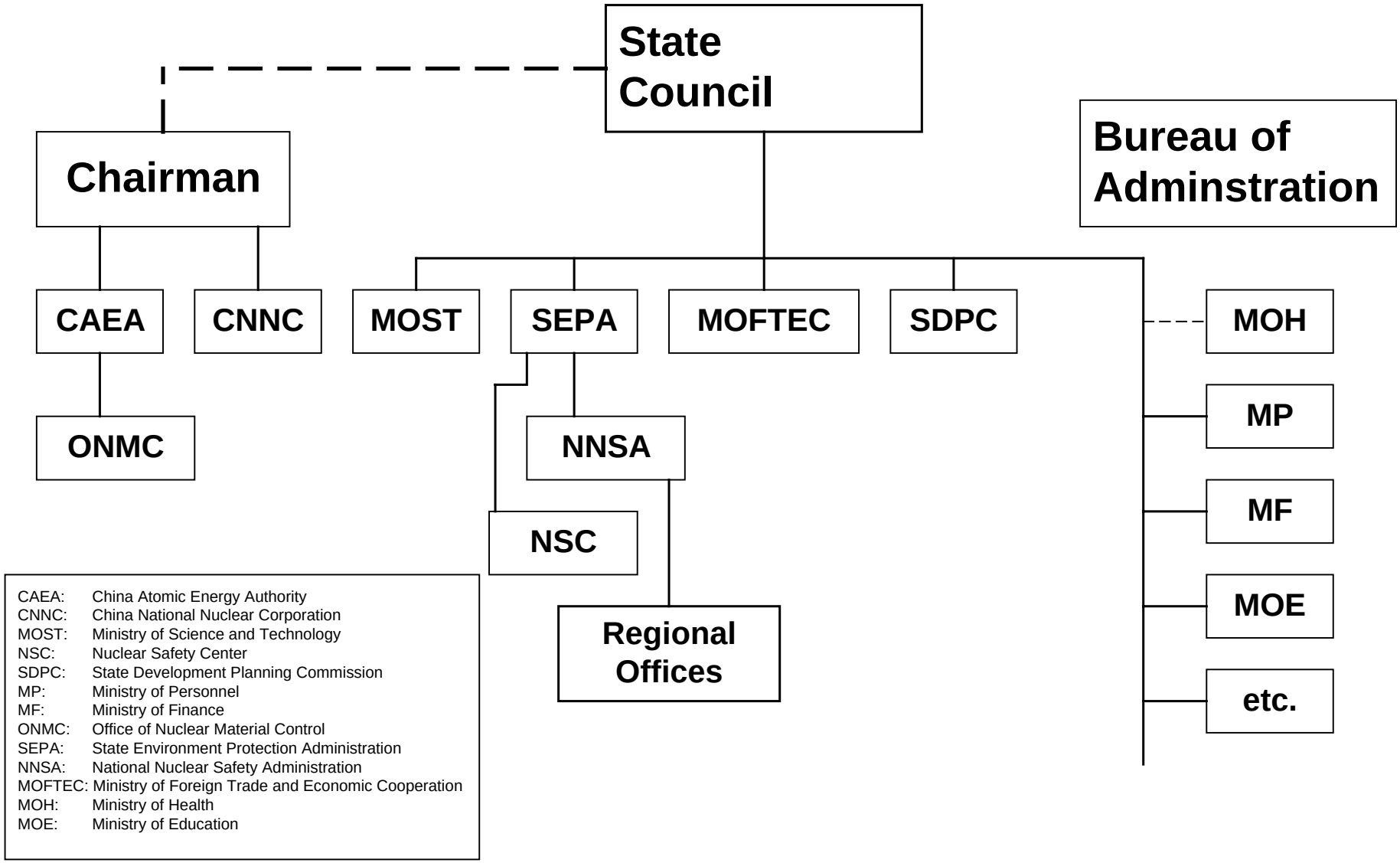
GOVERNMENT ORGANISATIONAL STRUCTURE



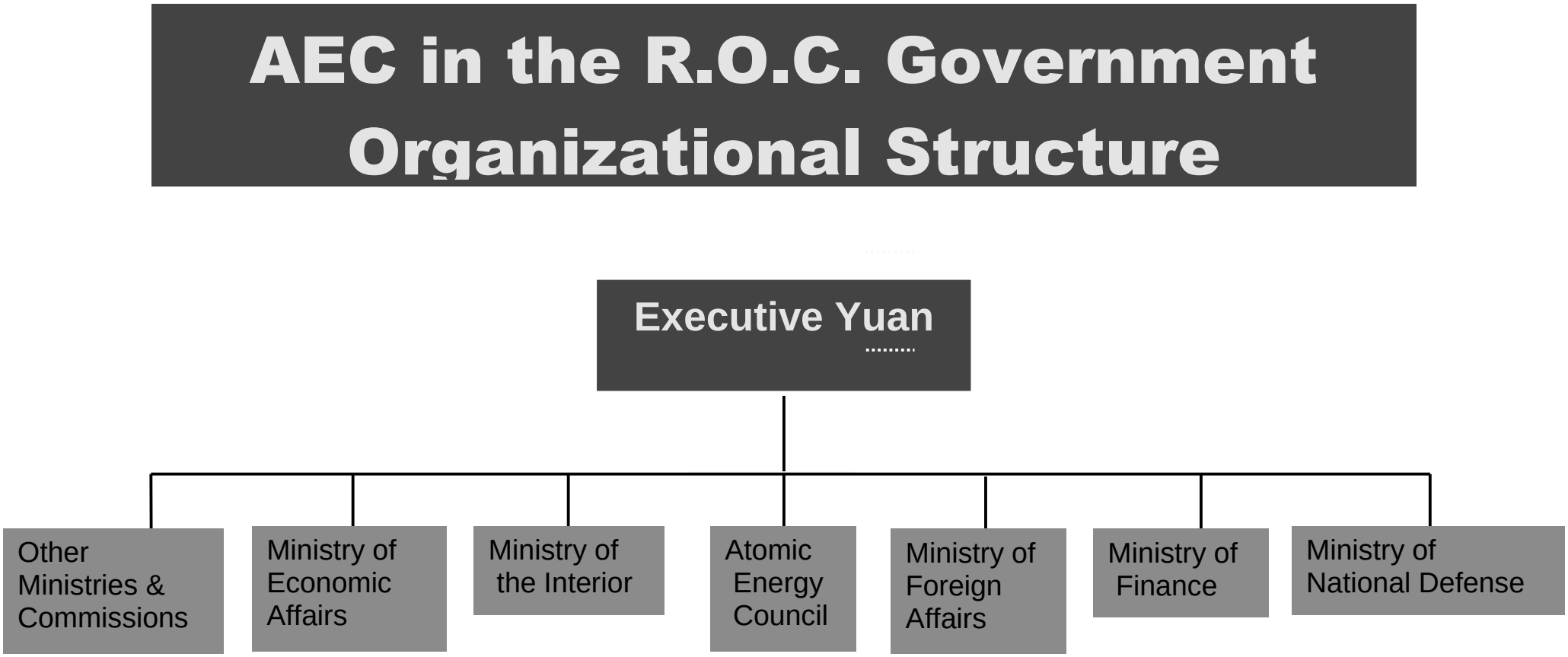
Canada


PARLIAMENT
Department of Natural Resources
Natural Resources Canada
Canadian Nuclear Safety Commission
National Energy Board
Atomic Energy Canada Limited
Cape Breton Development Corporation (DEVCO)
Energy Supplies Allocation Board

Governmental Organisation of Peoples Republic of China as it applies to the Safety of Nuclear Installations

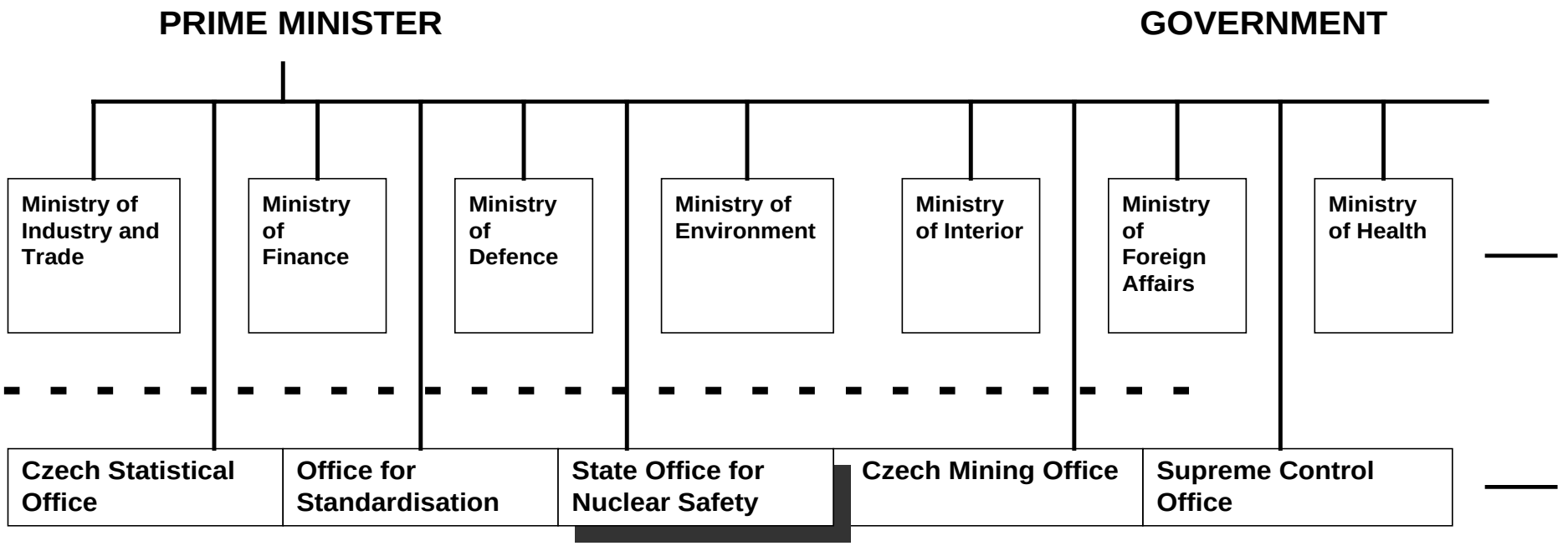


Chinese Taipei



CZECH REPUBLIC

Statute of the State Office for Nuclear Safety within the State Administration

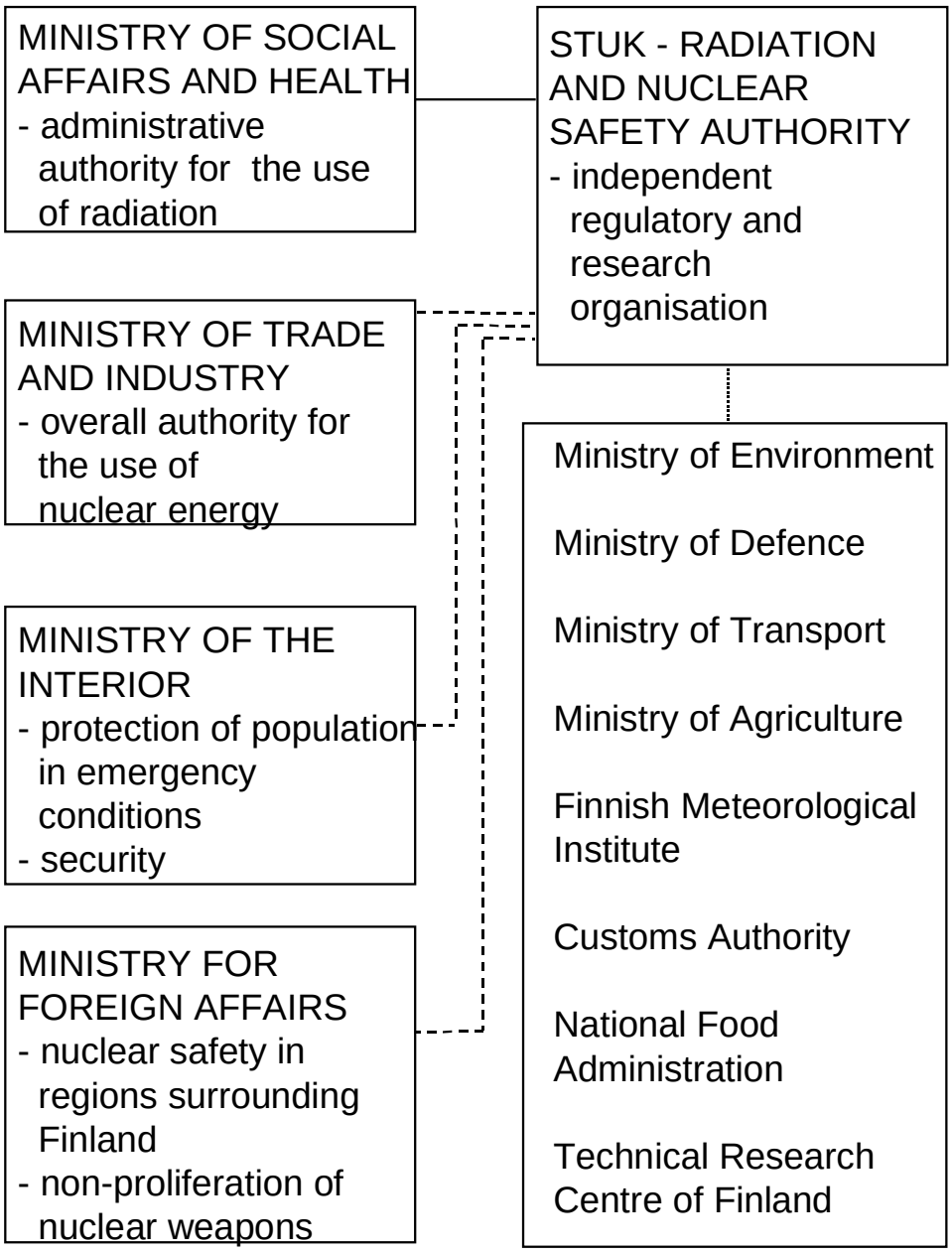


and remaining Central Agencies of the State Administration

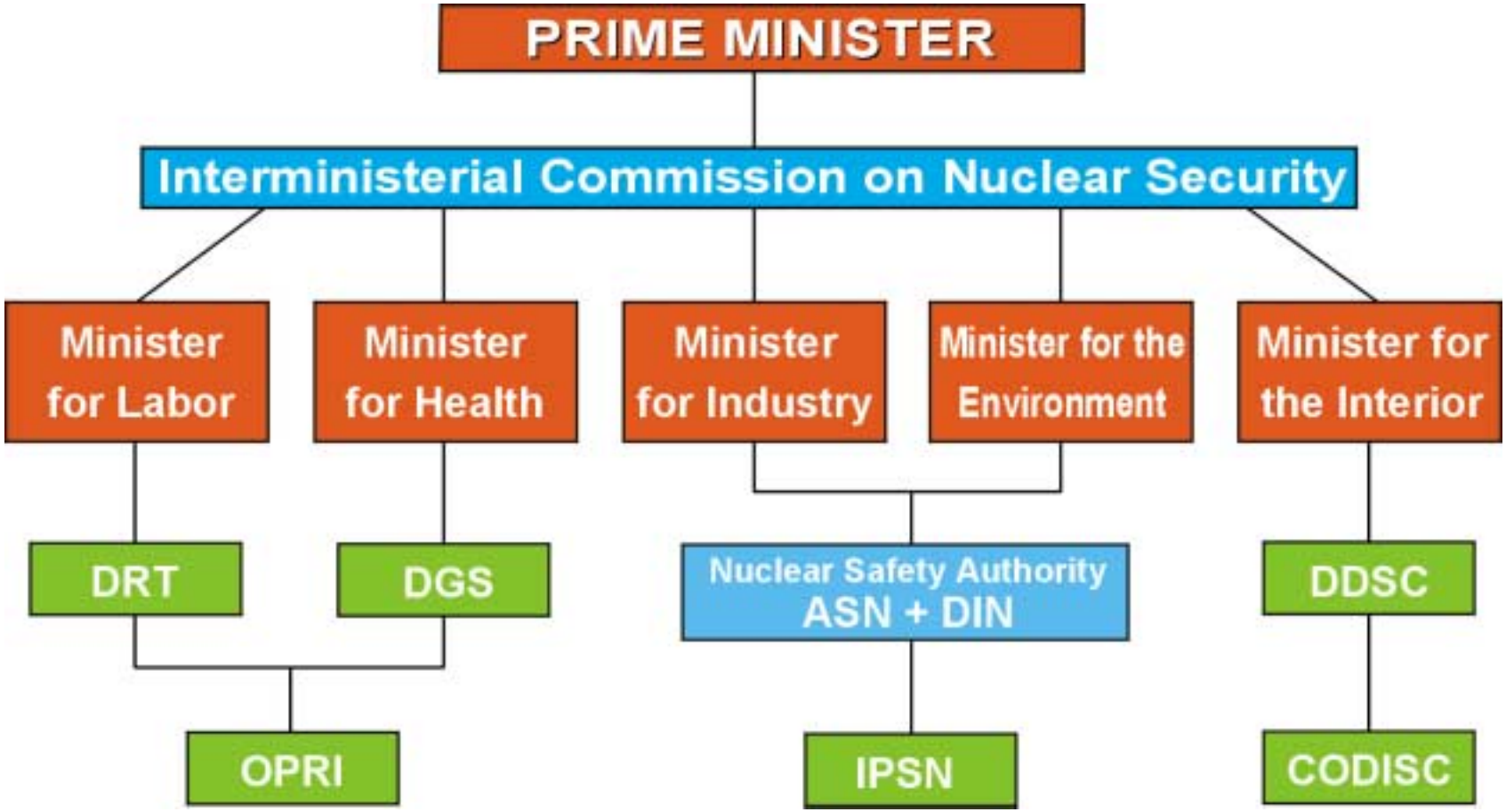
Chart 1, ANNEX II

FINLAND

Co-operation between STUK and Ministries and other governmental organisations

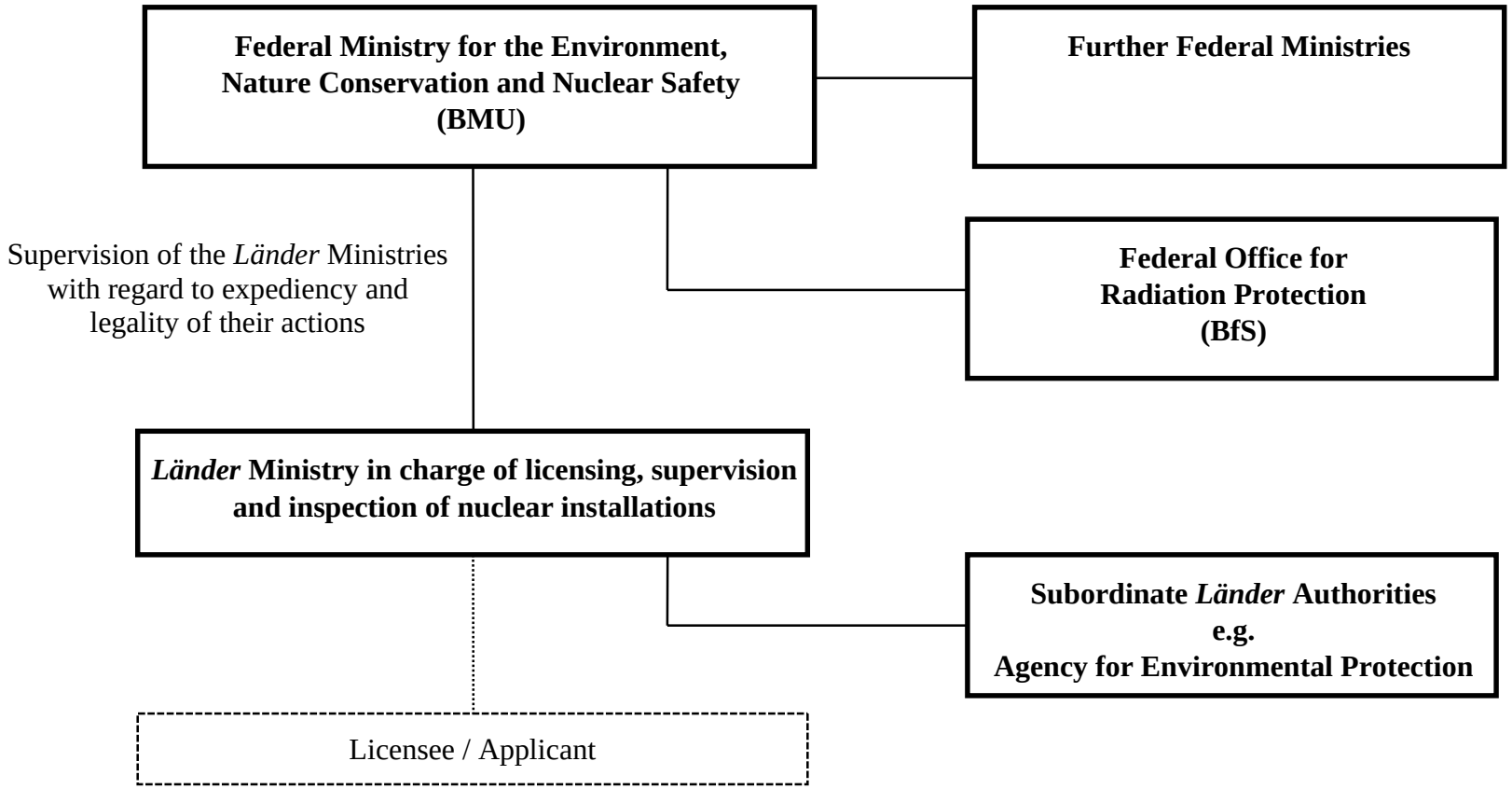


France

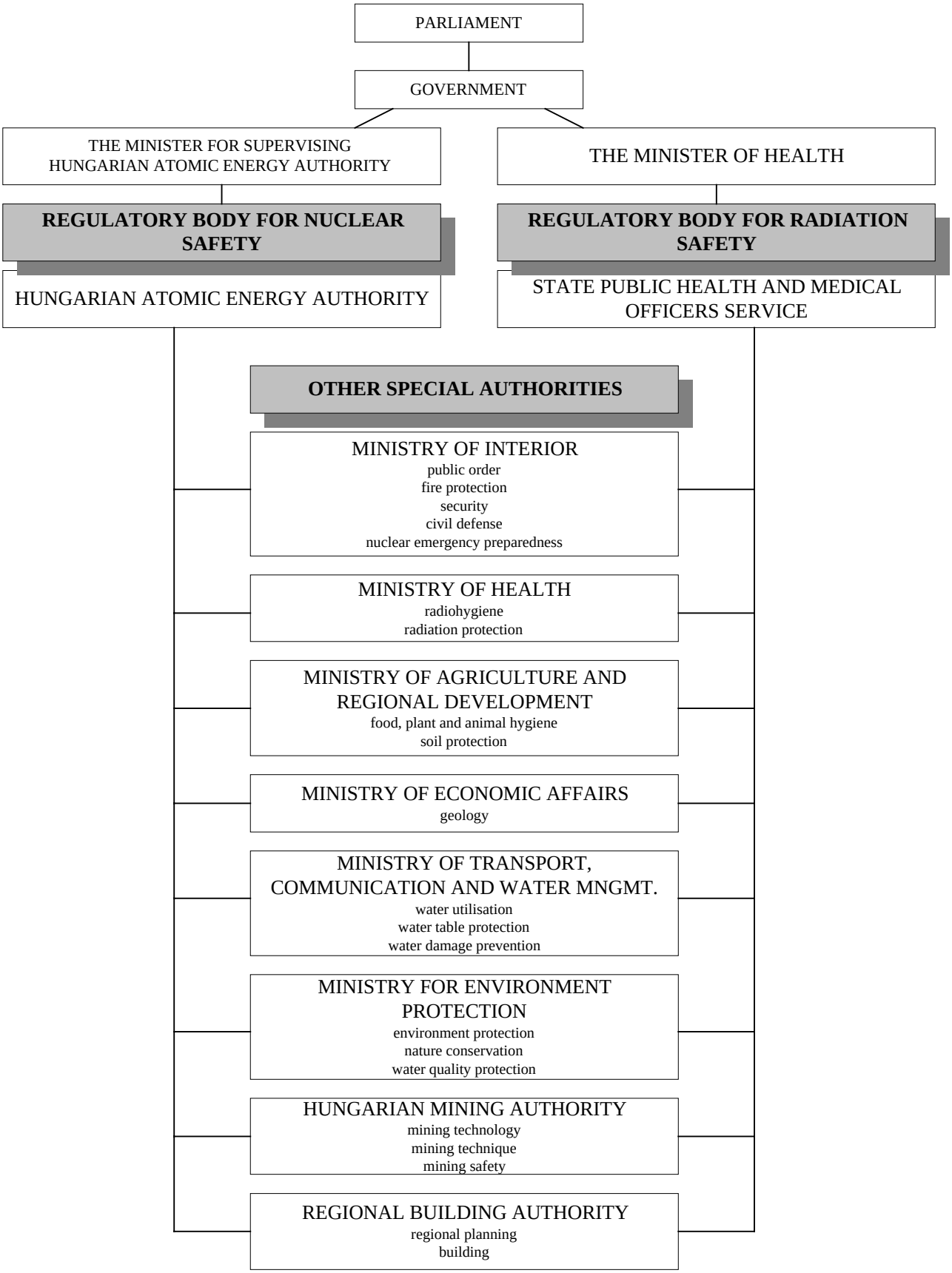

PRIME MINISTER
Interministerial Commission on Nuclear Security
Minister for Labor
Minister for Health
Minister for Industry
Minister for the Environment
Minister for the Interior
DRT
DGS
Nuclear Safety Authority
ASN + DIN
DDSC
OPRI
IPSN
CODISC

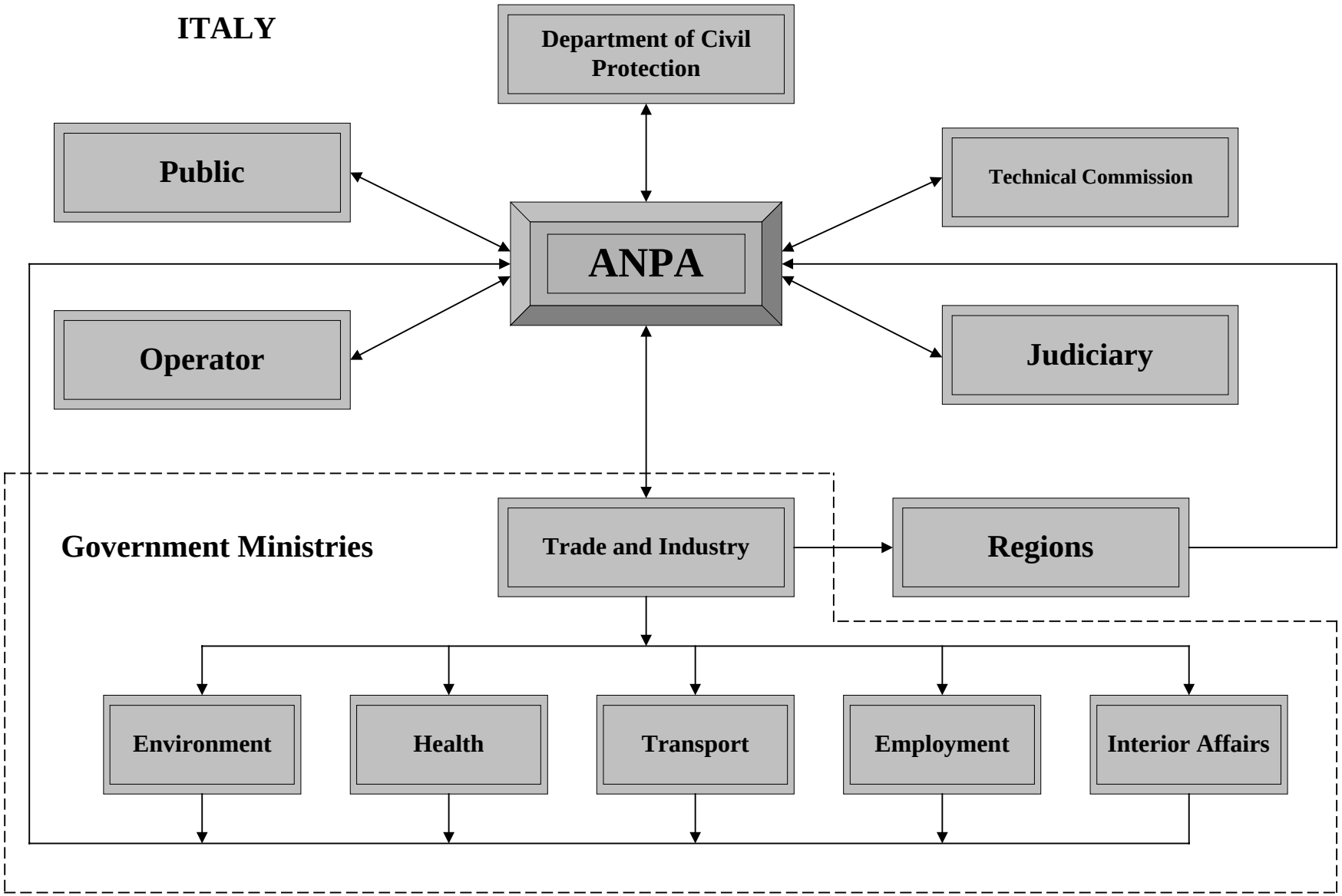
Governmental Organisational Structure Germany

Number of Federal States (*Länder*) in Germany: 16

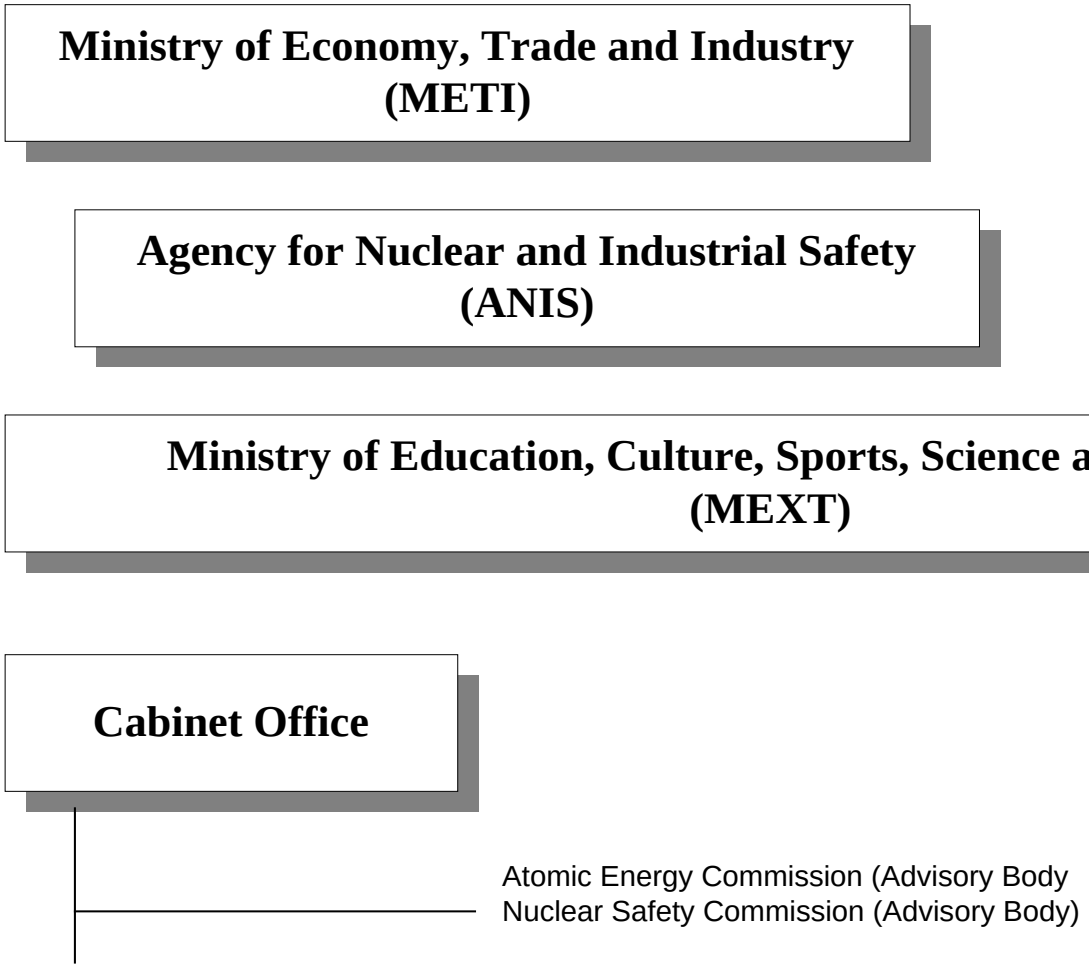


Regulatory and Control System for Peaceful Use of Nuclear Energy in Hungary

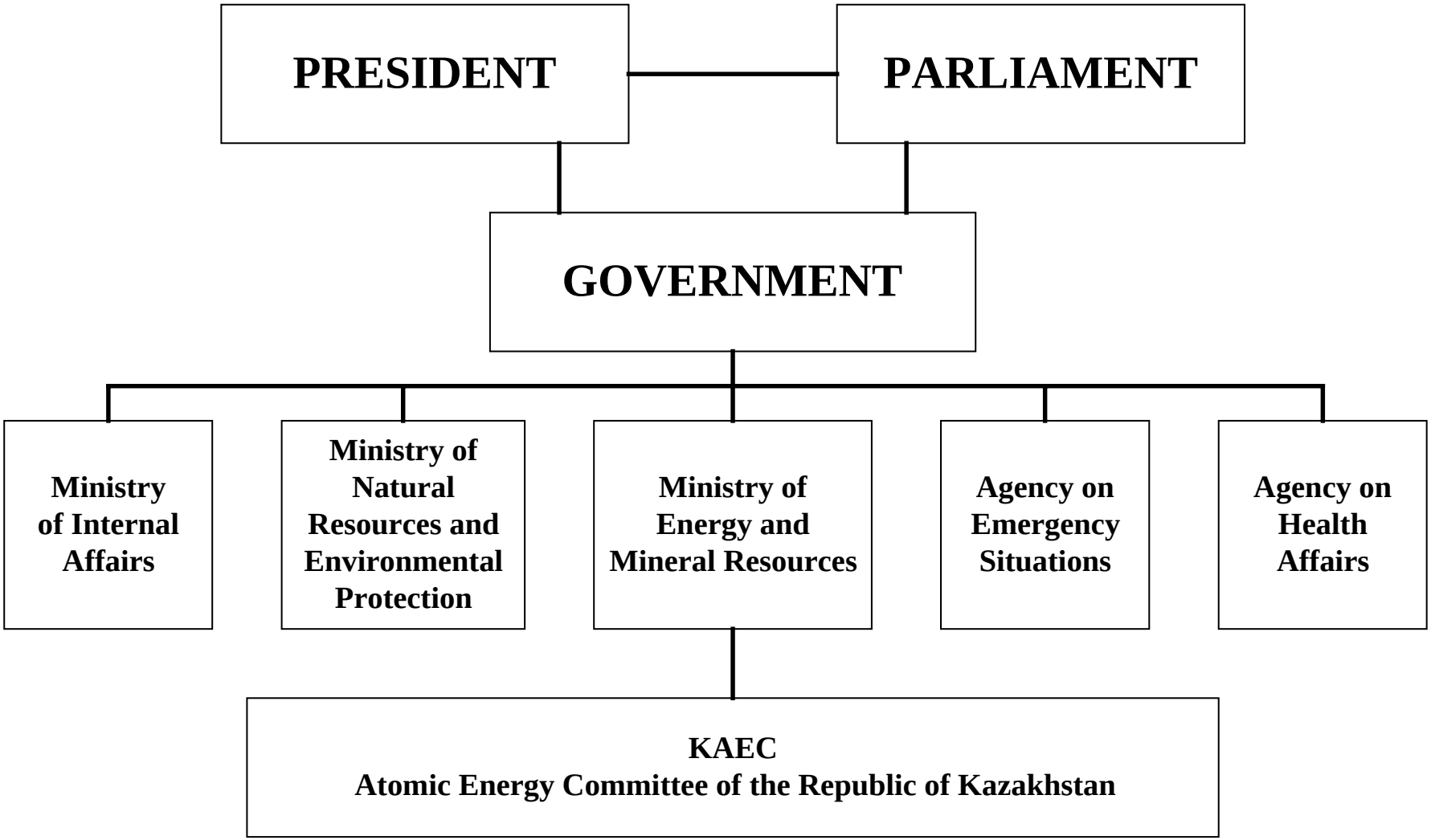



ITALY
Department of Civil Protection
Public
Technical Commission
ANPA
Operator
Judiciary
Government Ministries
Trade and Industry
Regions
Environment
Health
Transport
Employment
Interior Affairs

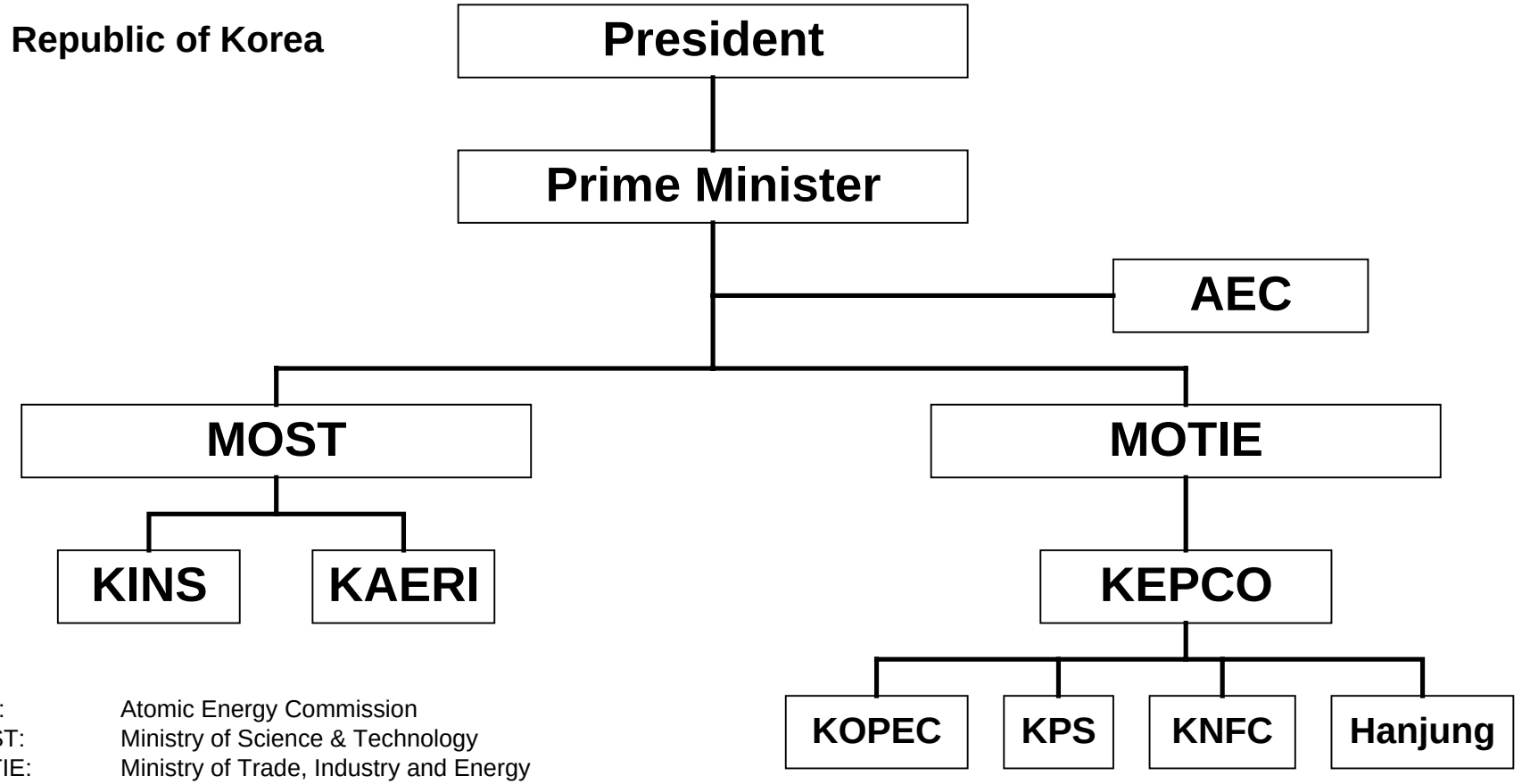
Governmental Organisational Structure - Japan



Kazakstan Governmental Organisational Structure

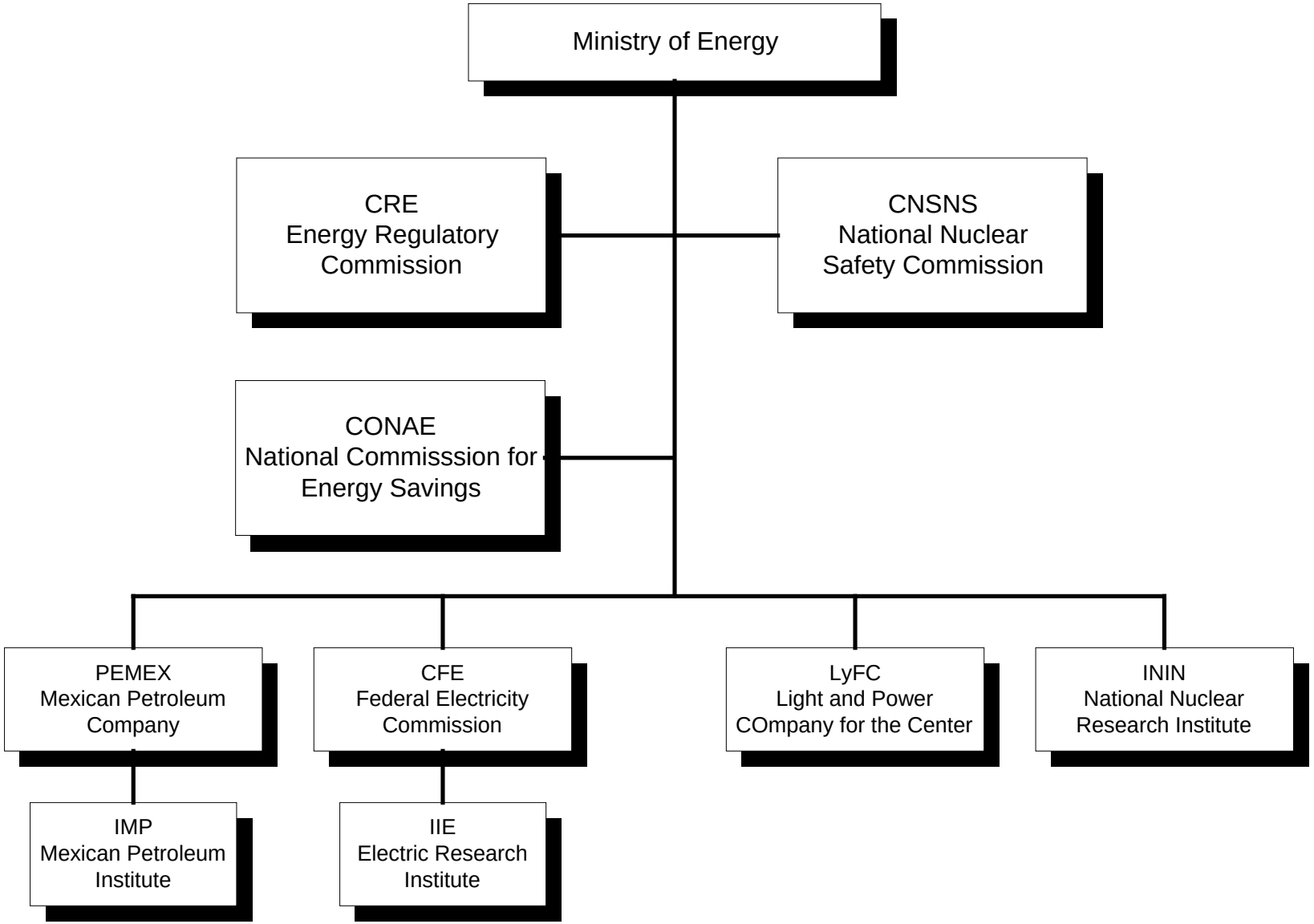


Republic of Korea

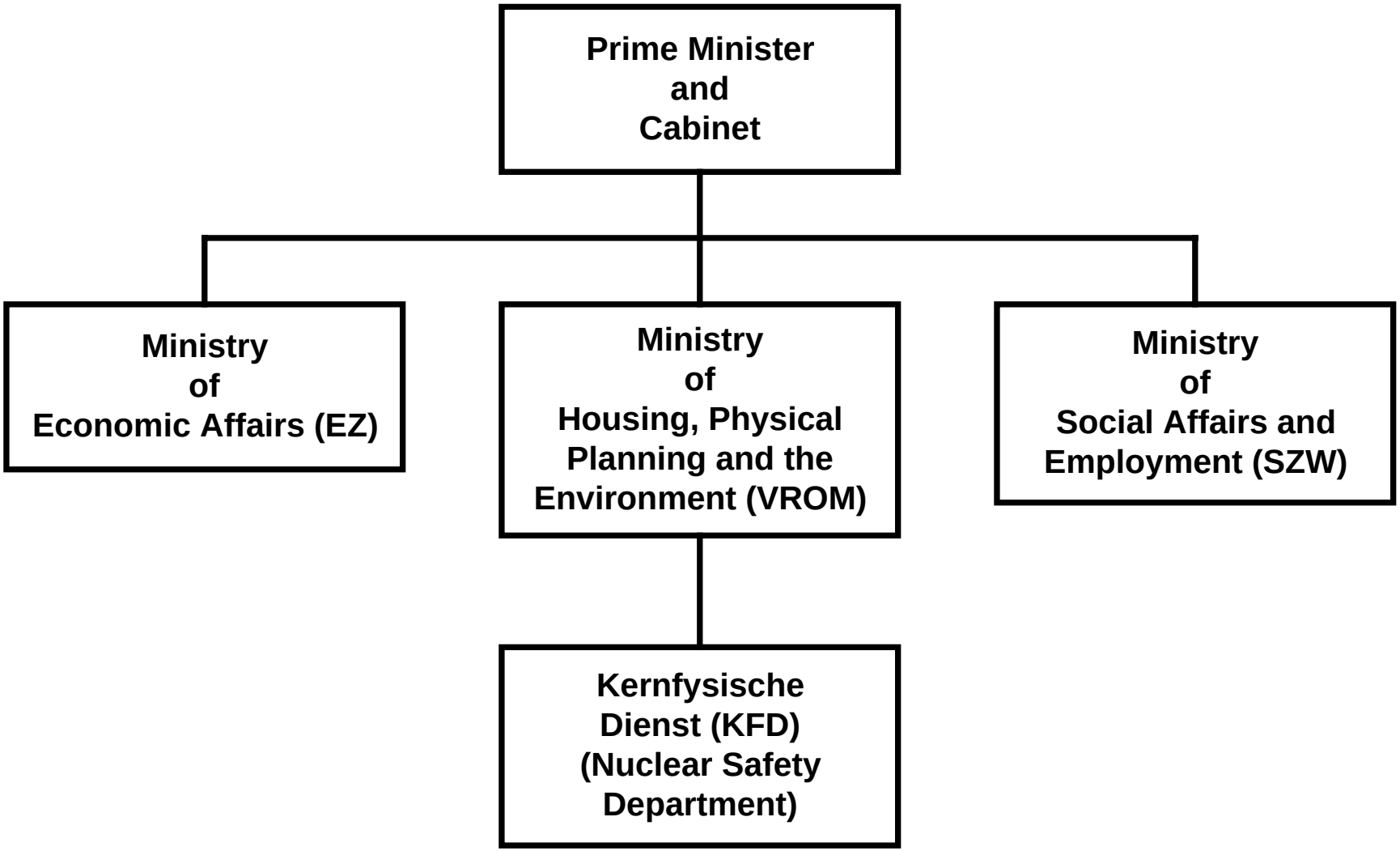


AEC: Atomic Energy Commission
MOST: Ministry of Science & Technology
MOTIE: Ministry of Trade, Industry and Energy
KINS: Korea Institute of Nuclear Safety
KAERI: Korea Atomic Energy Research Institute
KEPCO: Korea Electric Power Corporation
KOPEC: Korea Power Engineering Corporation
KPS: Korea Power Plant Services Company
KNFC: Korea Nuclear Fuel Company
Hanjung: Korea Heavy Industries & Construction Co. Ltd. (Previously called KHIC)

Mexican Governmental Organisational Structure

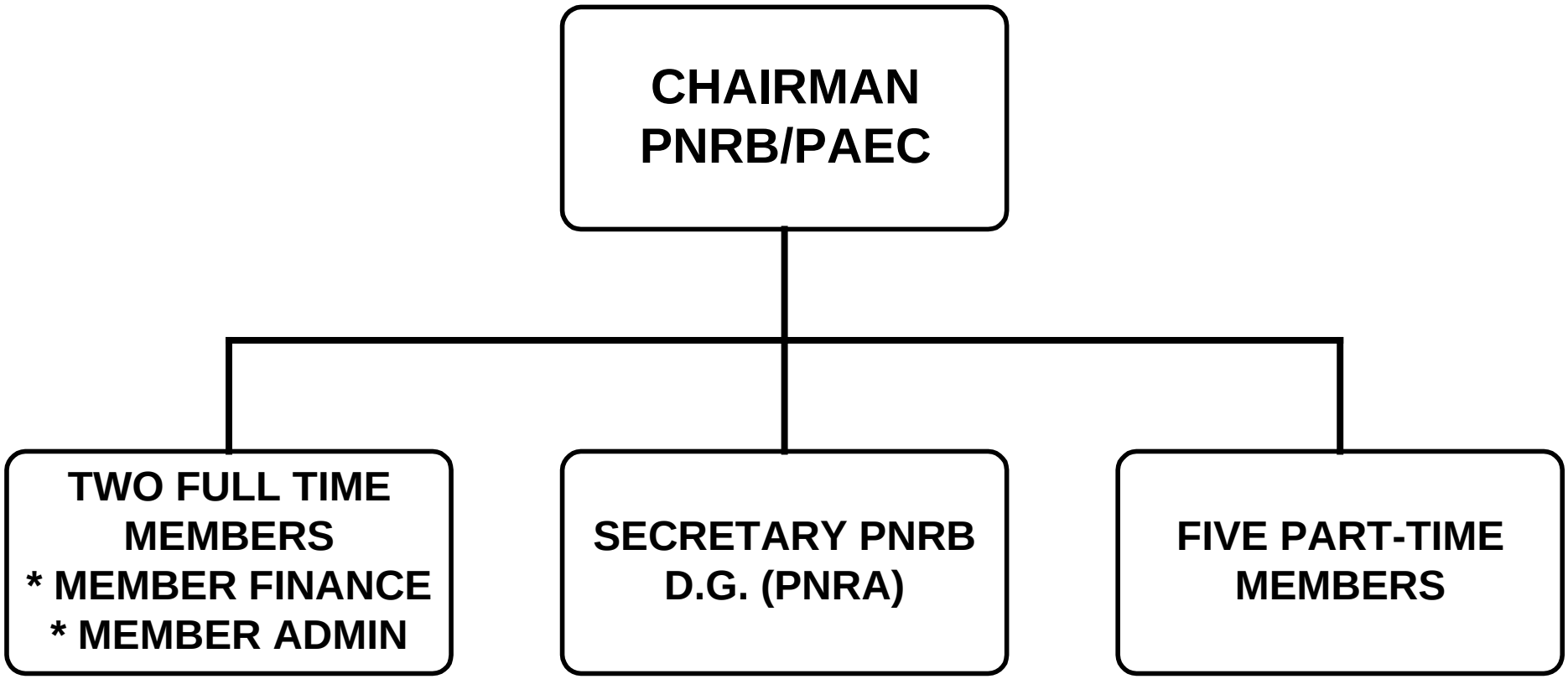


THE NETHERLANDS



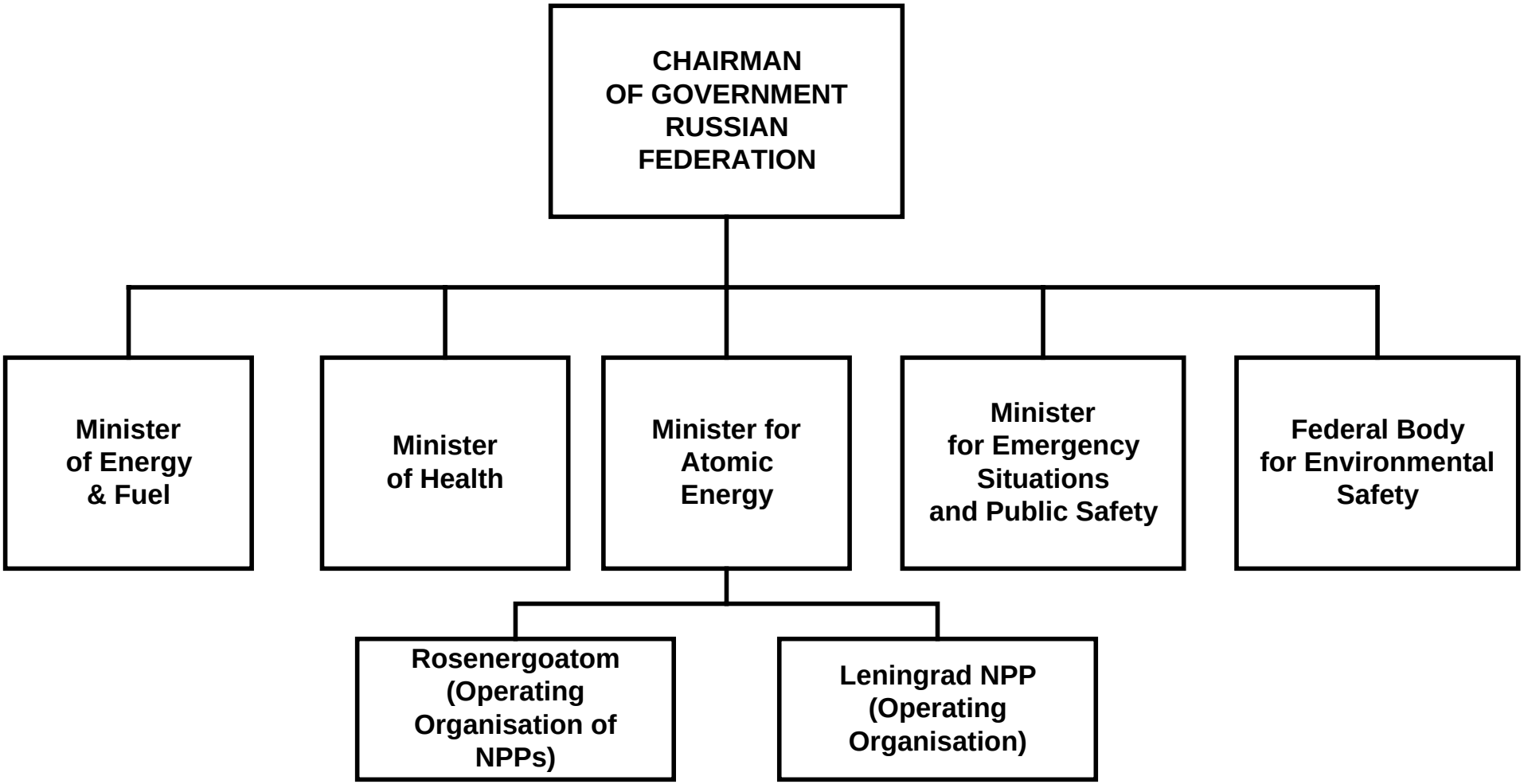
PAKISTAN

GOVERNMENTAL ORGANISATIONAL STRUCTURE (PNRB)



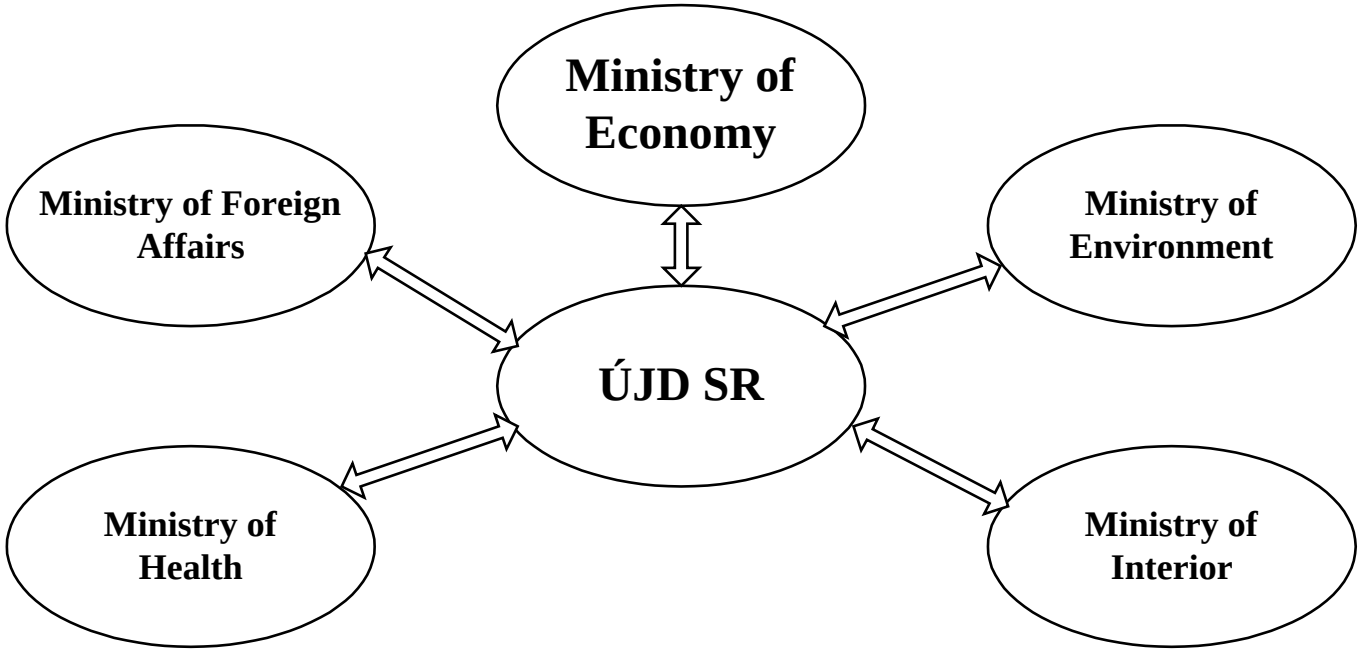
RUSSIA

GOVERNMENTAL ORGANISATIONAL STRUCTURE FOR NUCLEAR POWER PLANTS

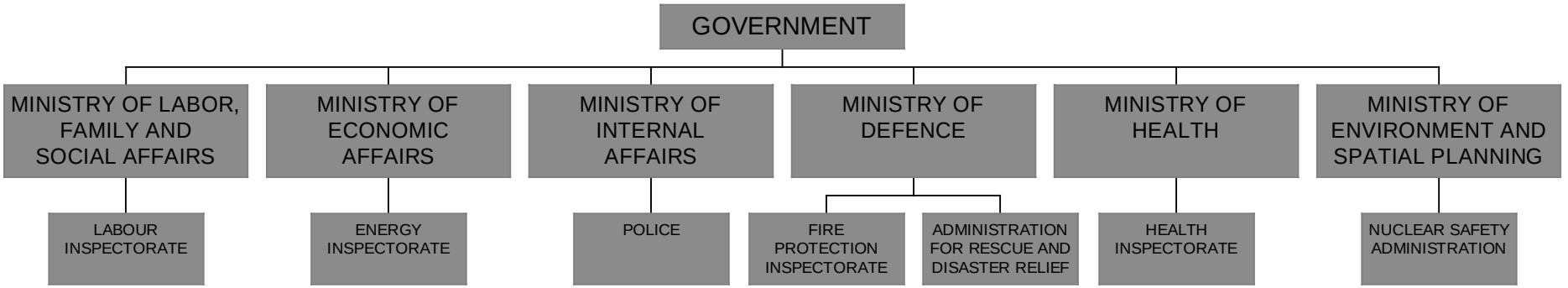


SLOVAK REPUBLIC

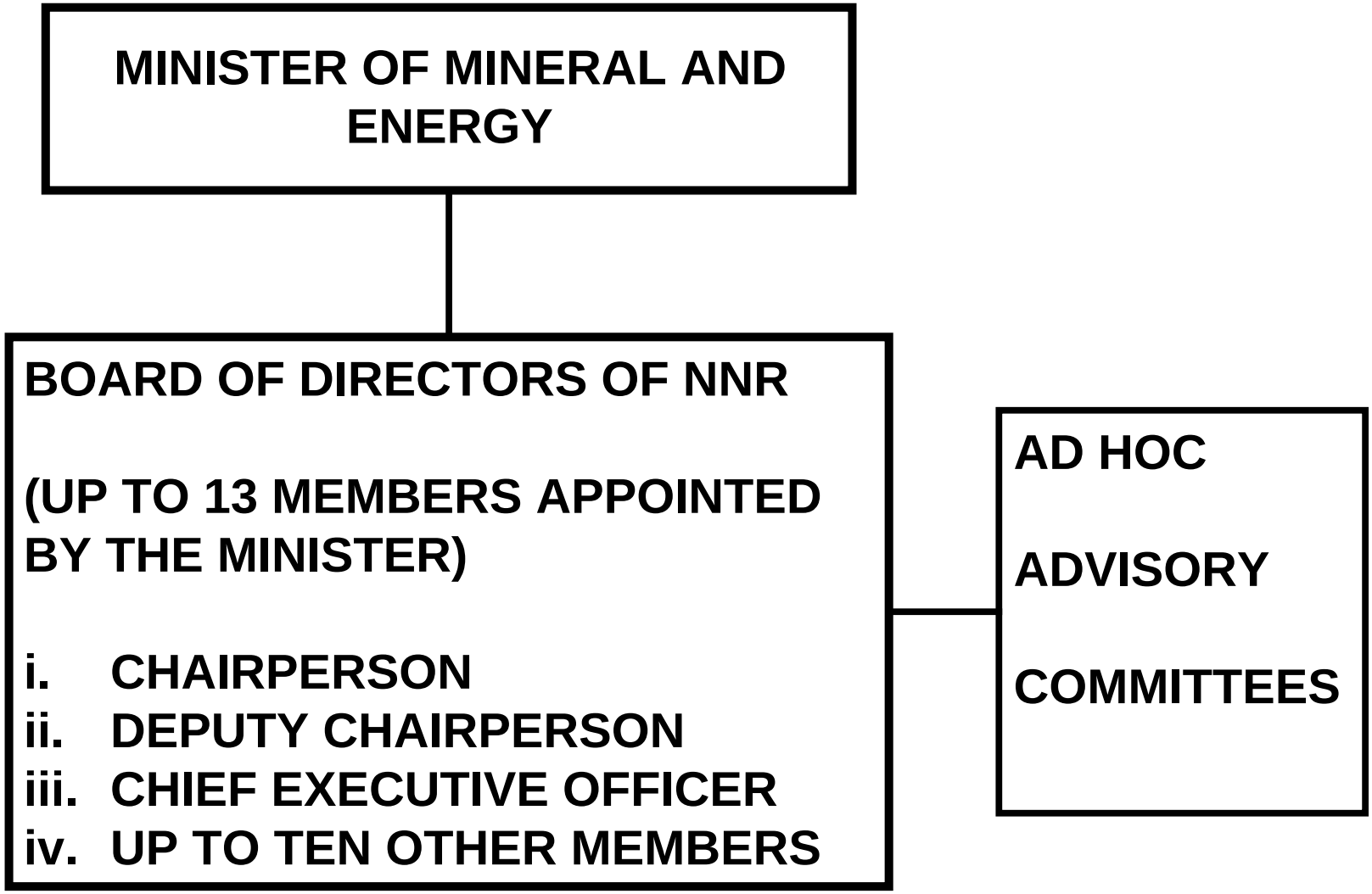
The ÚJD SR belongs to the system of central administrative state offices of the Slovak Republic
The Chairman of ÚJD SR is appointed by the Slovak Government
The ÚJD SR co-operates with other central administrative state offices of the SR



SLOVENIA

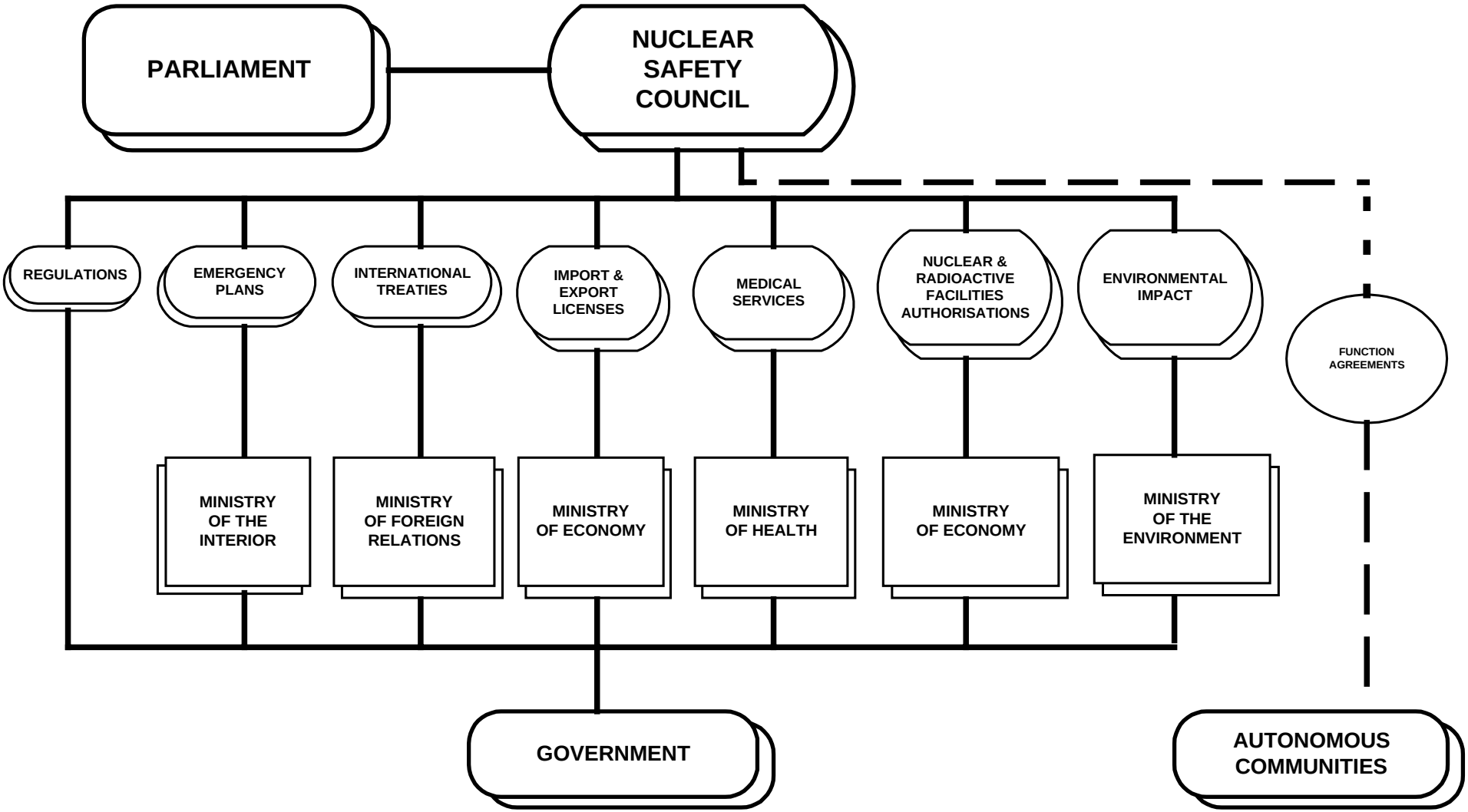

GOVERNMENT
MINISTRY OF LABOR, FAMILY AND SOCIAL AFFAIRS
MINISTRY OF ECONOMIC AFFAIRS
MINISTRY OF INTERNAL AFFAIRS
MINISTRY OF DEFENCE
MINISTRY OF HEALTH
MINISTRY OF ENVIRONMENT AND SPATIAL PLANNING
LABOUR INSPECTORATE
ENERGY INSPECTORATE
POLICE
FIRE PROTECTION INSPECTORATE
ADMINISTRATION FOR RESCUE AND DISASTER RELIEF
HEALTH INSPECTORATE
NUCLEAR SAFETY ADMINISTRATION

South Africa

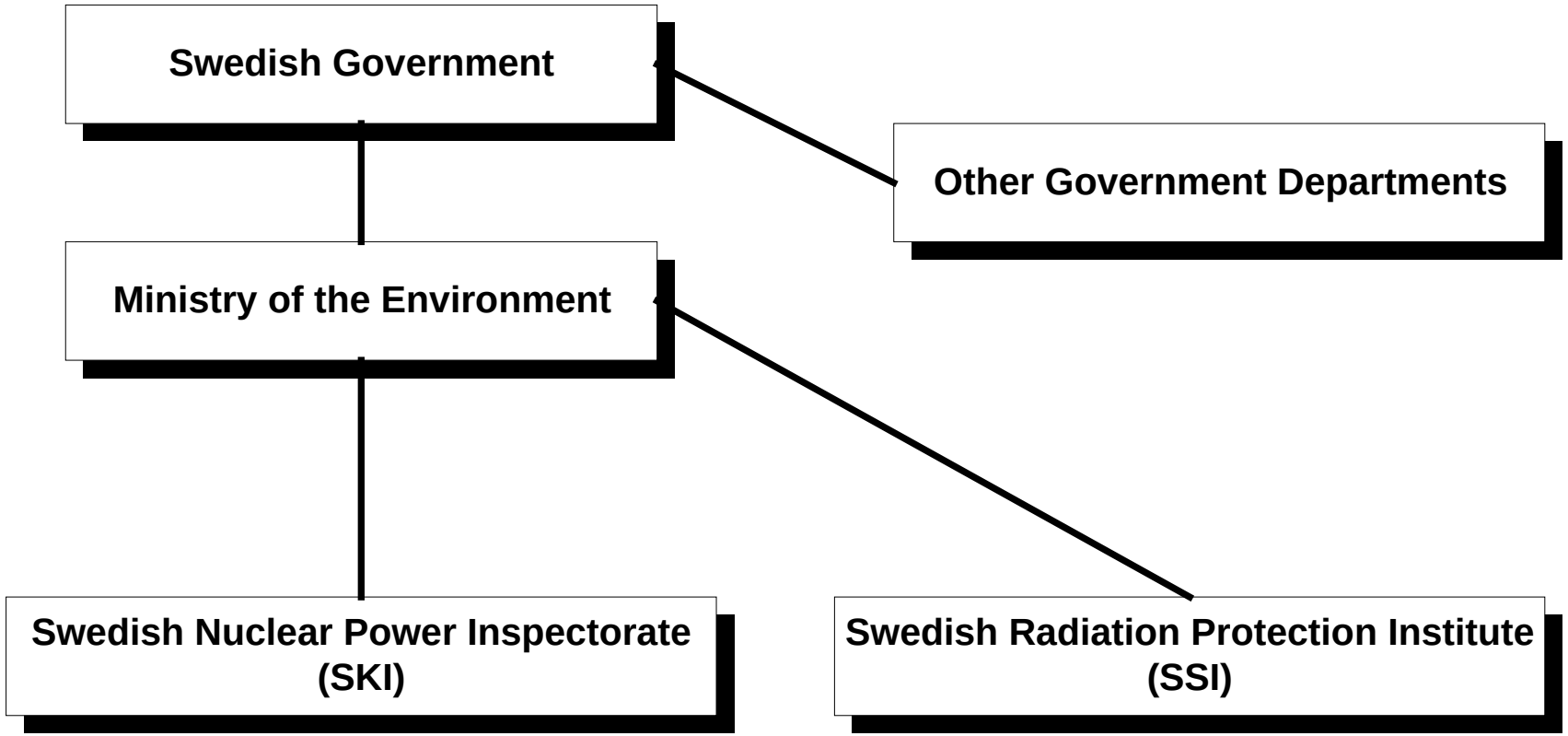


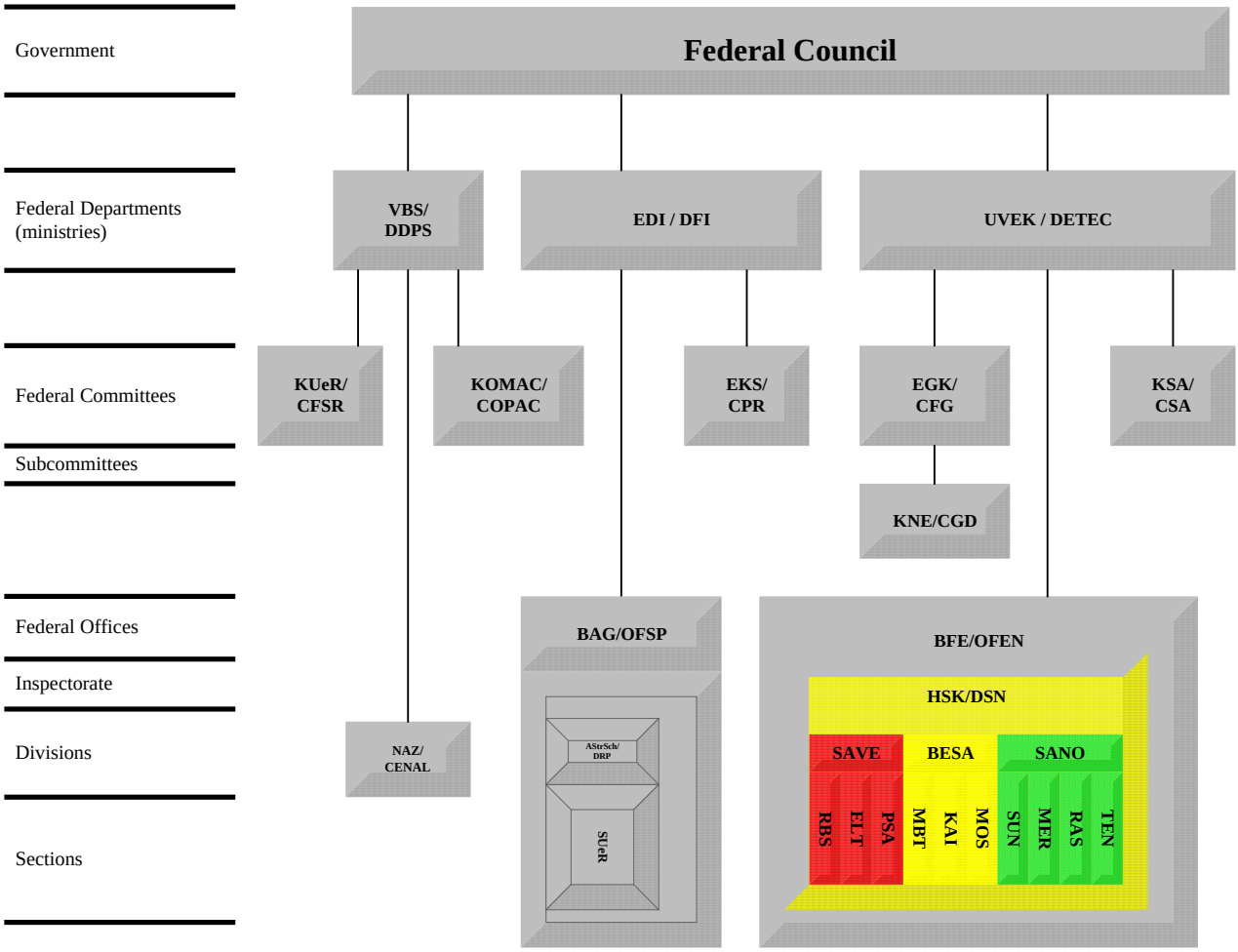
SPAIN

CSN GOVERNMENTAL ORGANISATIONAL STRUCTURE



SWEDEN


Swedish Government
Other Government Departments
Ministry of the Environment
Swedish Nuclear Power Inspectorate (SKI)
Swedish Radiation Protection Institute (SSI)



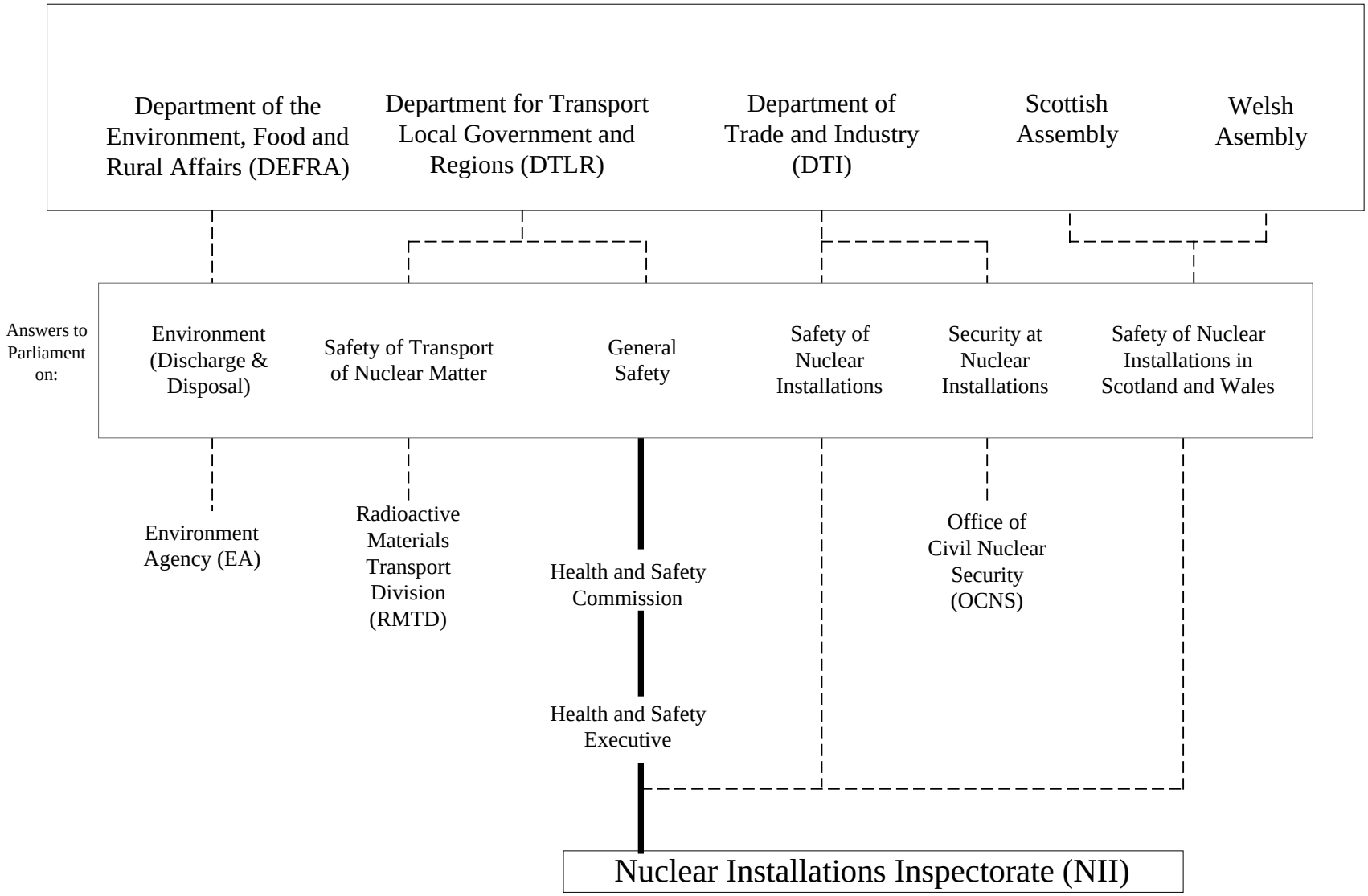
(as of 2000)

List of abbreviations

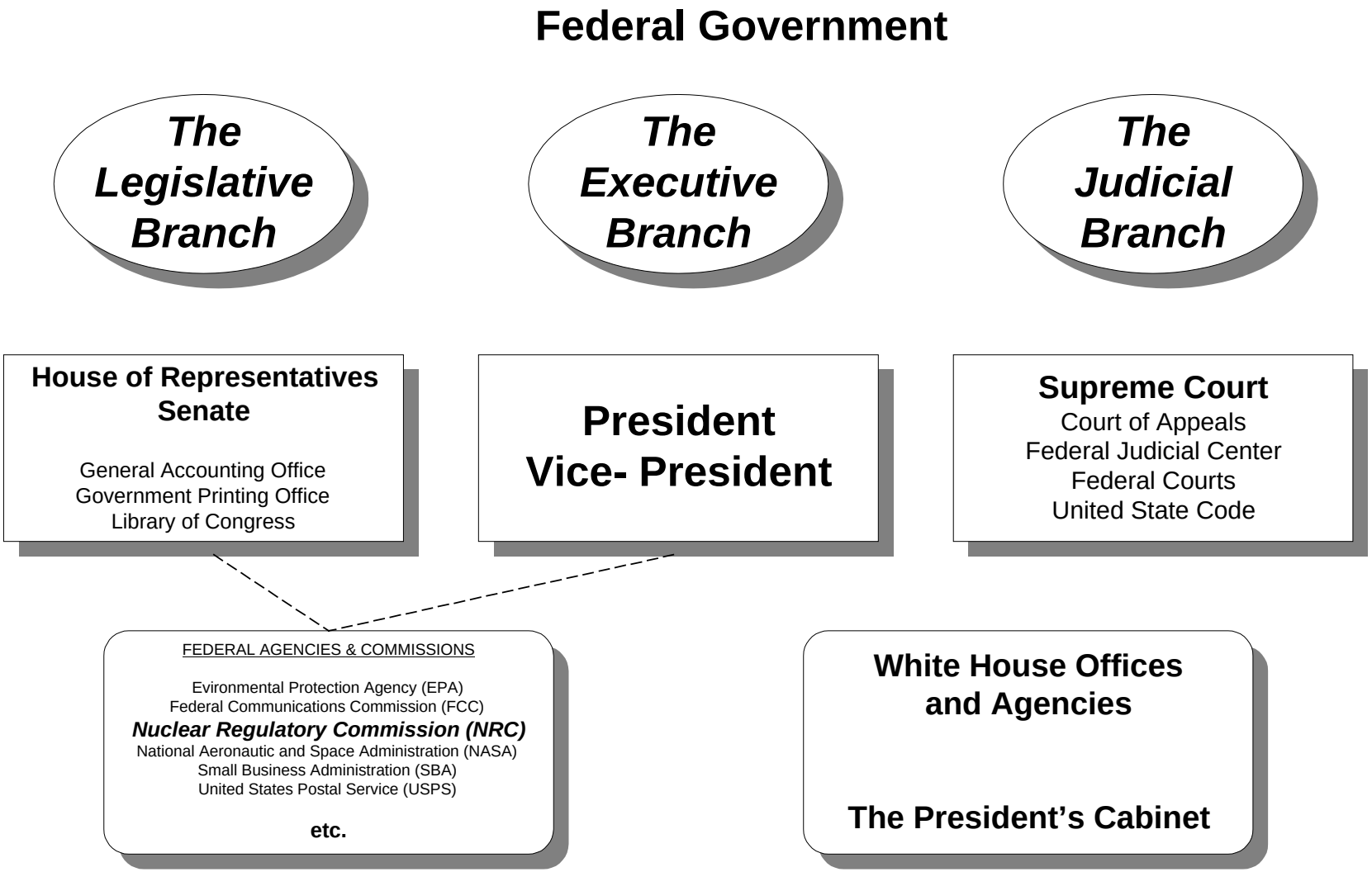
AstrSch	**Radiation Protection division, Bern**
BAG	**Federal Office of Public Health, Bern**
BESA	**Operational Safety and Inspection Management**
BFE	**Federal Office of Energy, Bern**
EDI	**Federal Department of Internal Affairs, Bern**
EGK	**Federal Geological Committee**
EKS	**Federal Committee for Radiation Protection**
ELT	**Electrical and Control Engineering**
HSK	**Swiss Federal Nuclear Safety Inspectorate, Würenlingen**
KAI	**Inspection Management**
KNE	**Committee for Nuclear Waste Disposal**
KOMAC	**Federal Committee for Radiological and Chemical Protection**
KSA	**Swiss Federal Nuclear Safety Committee**
KueR	**Swiss Federal Committee for Radioactivity Surveillance**
LAR	**Steering Committee for Radioactivity**
MBT	**Mechanical and Civil Engineering**
MER	**Radiation Measurement Technology and Radioecology**
MOS	**Personnel, Organisation and Safety Culture**
NAZ	**National Emergency Operations Centre, Zürich**
PSA	**Probabilistic Safety Analysis and Accident Management**
RAS	**Occupational Radiological Protection**
RBS	**Reactor, Fuel and Systems Engineering**
SANO	**Radiation Protection and Emergency Preparedness**
SAVE	**Safety Analysis, Systems and Electrical Engineering**
SueR	**Section for Radiation Monitoring**
SUN	**Accident Consequences and Emergency Preparedness**
TEN	**Transport and Waste Management**
UVEK	**Federal Department for Environment, Transport, Energy and Communication**
VBS	**Federal Department for Defence, Civil Protection and Sport**

Switzerland

UNITED KINGDOM



United States



ANNEX III - NUCLEAR CAPACITY TABLE

Country (see notes on next page)*	*Number of 'Operating' NPPs*	*Nuclear Capacity* MWe (Net)	*Number of 'Operating' Research Reactors*	*Number of 'Operating' Fuel Fabrication Facilities*	*Number of 'Operating' Reprocessing Facilities*	*NPPs being Decommissioned*
Argentina	2	1000	6	4	0	0
Armenia	1	376	0	0	0	0
Australia	0	0	1	0	0	0
Belarus	0	0	0	0	0	0
*Belgium *	7	5995	2	2	1	0
*Canada *	22	14960	11	2	0	0
Chines Taipei	6	4884	3	0	0	0
China, People's Republic of	3	2100	17	2	0	0
Czech Republic	1	1460	3	0	0	0
Finland	4	2656	1	0	0	0
*France *	58 + 1	63120	5	5	1	7
*Germany *	19	21283	6	2	0	16
*Hungary *	4	1840	2	0	0	0
Italy	0	0	4	0	0	
Japan	52	45082	12	6	2	0
Kazakhstan	0	0	3	1	0	0
Korea, Republic of	16	13716	2	1	0	0
Mexico	2	1416	1	1	1	0
The Netherlands	1	452	3	1	0	1
Pakistan	1	125	2	1	0	0
*Russia *	29	21242	18	2	1	5
Slovak Republic	6	2640	0	0	0	0
Slovenia	1	676	1	0	0	0
South Africa	2	1842	1	0	0	0
Spain	9	7396	0	1	0	1
Sweden	11	9448	1	1	0	0
Switzerland	5	3070	1	0	0	0
United Kingdom	35	14208	2	3	3	
United States	103	97631	37	8	0	27

NOTES ON NUCLEAR CAPACITY TABLE

Country	*Notes*
Belgium	Waste treatment facility
Canada	Includes 8 reactors in long shutdown
Czech Republic	Number of operating NPPs does not include Temelin NPP which is in commissioning stage
France	56 +2 = 56 PWRs plus 2 FBRs Figures given are for 31 December 1999
Germany	13 PWR and 6 BWR
Hungary	One research reactor is a training reactor
Korea, Republic of	Fuel Fabrication Facility is a pilot facility
Russia	Number of operating NPPs does not include Rostov NPP which is in commissioning stage

ANNEX IV - REGULATORY AUTHORITY STAFFING

Country (see notes on next page)*	*Regulatory Authority Total number of personnel*	*Technical or Professional Staff*	*Administrative Staff*	*Inspectors*	*Other*
Argentina	240	180	60	55	
Armenia	30	23	7	18	
Australia	16	16	4	16	
*Belarus *	24	21	3	14	
*Belgium *	58	46	12	13	1
Canada	410	297	88	130	25
China, People's Republic of	30	100 *			
*Chinese Taipei *	178	134	44	45	27
Czech Republic	178	35	32	95	16
*Finland *	308	111	112	85	
France	570	~350		120	
*Germany *					
Hungary	44	38	6	38	
Italy	60	60		26	
*Japan *	270		30	25 + 100 + 120	
Kazakhstan	21	18	3	15	
Korea, Republic of	336	283	53	241	
Mexico	192	126	66		
The Netherlands	24	18	6	4	
Pakistan	121	55	66	16	
Russia	1390	790	300	100	
Slovak Republic	82	64	18	44	
Slovenia	40	37	3	6	
South Africa	81	58	23	40	
Spain	423	192	95	120	
*Sweden *	100	80	20	15	
Switzerland	86	72	14	75	
United Kingdom	250	158	92	158	
United States	2801	2032	440	329	

Country	*Notes*
Belgium	AVN Only
Belarus	Total number of Regulatory Authority personnel includes only those in the field of nuclear and radiation safety. Inspectors includes members of technical, professional and administrative staff.
China, People's Republic of	Nuclear Safety Centre (NSC)
Chinese Taipei	Inspectors included in technical or professional staff. Other = Supporting staff not included in Total number.
Finland	Professional staff working in regulatory control of nuclear safety is 72.
France	Total number of Regulatory Authority personnel includes 120 inspectors and ~350 experts from IPSN.
Germany	Number of staff is distributed over Bund & Länder authorities and expert organisations
Japan	ANIS = 270 total personnel including 30 administrative staff and 25 inspectors. ANIS resident inspectors = 100 and ANIS regional bureau = 120.
Russia	Inspectors only includes those personnel involved with nuclear power plants co-ordination.
Slovenia	Inspectors included in technical or professional staff.
Spain	Technical or professional staff includes experts on nuclear safety or radiation protection. Inspectors carry out both assessments and inspections.
Sweden	Only includes SKI personnel.
Switzerland	Inspectors includes 20 private experts.
United Kingdom	All inspectors are technical/professional staff.

ANNEX V - ACRONYMS

The following annexes list a majority of the acronyms denoted within the document. While this list is not intended to be an *"all inclusive"* list, nevertheless, it hopefully provides the reader with an index of acronyms used in the many different countries represented in this report.

Country	Acronym	Title
Argentina	ARN	Autoridad Regulatoria Nuclear (Nuclear Regulatory Authority)
	CNEA	Comisión Nacional de Energia Atómica (National Atomic Energy Commission)
	ENREN	Ente Nacional de Energia Atómica (National Board of Nuclear Regulation)
Armenia	ANRA	Armenian Nuclear Regulatory Authority
Australia	ANSTO	Australian Nuclear Science and Technology Organisation
	ARL	Australian Radiation Laboratory
	ARPANSA	Australian Radiation Protection and Nuclear Safety Agency
	NSB	Nuclear Safety Bureau
Belgium	AVN	AIB-Vinçotte Nuclear
	FANC	Federal Agency for Nuclear Control
	GCC	Governmental Crisis Centre
	GMT	General Management Team
	HEC	Headquarters Emergency Centre
	HRS	Human Resources & Support Division
	LIO	Licensed Inspection Organisation
	NII	Nuclear Installations Inspections Division
	PEM	Projects & Experience Management Division
	SRD	Studies, Research & Development Division
	TRC	Technical Responsibility Centres

Country	Acronym	Title
Canada	CNSC	Canadian Nuclear Safety Commission (Commission de contrôle de l'énergie atomique)
	NSC	Nuclear Safety and Control Act
China, Republic of	NNSA	National Nuclear Safety Administration
	NSC	Nuclear Safety Centre
Chinese Taipei	AEC	Atomic Energy Council
Czech Republic	EAG	Expert Advisory Group
	ERC	Emergency Response Centre
	GCRA	Governmental Commission for Radiation Activities
	NRPL	National Institute for Radiation Protection
	RCRA	Regional Commissions for Radiation Accident
	SÚJB	Státní úrad jadernou bezpecnost (State Office for Nuclear Safety)
Finland	STUK	Säteilyturvakeskus (STUK -Radiation and Nuclear Safety Authority)
	YTO	Ydin Turvallisuus Osasto (Administrative Practices)
	YVL	Ydin Voima Laitos (Nuclear Power Plant Guides)

Country	Acronym	Title
France	CEA	Commissariat à l'Energie Atomique
	DRIRE	Direction Regionale de l'industrie, de la recherche et de l'environnement (Regional Directorates for Industry, Research and the Environment)
	DSIN	Division des installations Nucléaires (Nuclear Installation Safety Directorate)
	EdF	Electricité de France
	IPSN	Institut de Protection et de Sûreté Nucléaire (Institute for Nuclear Safety and Protection)
	OPRI	Office de Protection controles Rayonnements Ionisants (Office for Protection against Ionising Radiation)
Germany	BfS	Bundesamt für Strahlenschutz (Federal Office for Radiation Protection)
	BMU	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
	GRS	Gesellschaft für Anlagen- und Reaktorsicherheit
	RSK	Reactor Safety Commission
	SSK	Commission on Radiological Protection
	TÜV	Technical Inspection Agencies

Country	Acronym	Title
Hungary	AERI	Atomic Energy Research Institute
	CERTA	Centre for Emergency Response, Training and Analysis
	CM	Council of Ministers
	HAEA	Hungarian Nuclear Energy Authority
	HAEA	HAEA Emergency Preparedness Office
	HAEC	Hungarian Atomic Energy Commission
	HAEO	Hungarian Nuclear Energy Office
	NSD	Nuclear Safety Directorate
	SEESTSB	State Energetic and Energy Safety Technology Supervisory Board
	TUB	Technical University of Budapest
Italy	ANPA	Agenzia Nazionale per la Protezione dell'Ambiente (National Agency for the Environmental Protection).
	ANPA NUC	National Agency for the Environmental Protection, Nuclear & Radiological Risk Department
	CE	Emergency Committee
	DISP	Directorate of Nuclear Safety and Radiological Protection
	ECC	Emergency Co-ordination Centre

Country	Acronym	Title
Japan	AEC	Atomic Energy Commission
	JAPEIC	Japan Power Engineering and Inspection Corporation
	METI	Ministry of Economy, Trade and Industry
	MEXT	Ministry of Education, Culture, Sports, Science and Technology
	MLIT	Ministry of Land, Infrastructure and Transport
	NSC	Nuclear Safety Commission
	NUSTEC	Nuclear Safety Technology Centre
Kazakhstan	*KAEC*	Atomic Energy Agency of the Republic of Kazakhstan
Korea, Republic of	KAERI	Korean Atomic Energy Research Institute
	KINS	Korea Institute of Nuclear Safety
	MOST	Ministry of Science and Technology
Mexico	CNSNS	Comisión Nacional de Seguridad Nuclear y Salvaguardias (National Commission of Nuclear Safety and Safeguards)
Netherlands	EZ	Ministry of Economic Affairs
	KFD	Nuclear Safety Department
	SZW	Ministerie van Sociale Zaken en Werkgelegenheid (Ministry of Social Affairs and Employment)
	VROM	Ministry of Housing, Spatial Planning and the Environment

Country	Acronym	Title
Pakistan	PNRA	Pakistan Nuclear Regulatory Authority
	PAEC	Pakistan Atomic Energy Commission
	PNRB	Pakistan Nuclear Regulatory Board
	RNSI	Regional Nuclear Safety Inspectorate
Russia	OPSA	Emergency Situation Centres of Gosatomnadzor
	SEC NRS	Scientific and Engineering Centre for Nuclear and Radiation Safety
Slovak Republic	ÚJD SR (UJD)	Úrad Jadrového Dozoru Slovenskej Republiky (Nuclear Regulatory Authority of Slovak Republic)
Slovenia	SNSA	Slovenian Nuclear Safety Administration
	TSO	Staff of authorised organisations
South Africa	NECSA	Nuclear Energy Corporation of South Africa
	NNR	National Nuclear Regulator
	OTS	Operating Technical Specification
	KNPS	Koeberg Nuclear Power Station
Spain	CSN	Consejo de Seguridad Nuclear (Nuclear Safety Council)
Sweden	SKI	Statens Kärnkraftinspektion (Swedish Nuclear Power Inspectorate)
	SSI	Swedish Radiation Protection Institute

Country	Acronym	Title
Switzerland	EOR	Emergency Organisation for Radioactivity
	HSK	Hauptabteilung für die Sicherheit der Kernaniagen (Federal Nuclear Safety Inspectorate)
	KSA	Advisory Commission
	NSA	National emergency Operations Centre
United Kingdom	GTA	Government Technical Advisor
	HM NII	Her Majesty's Nuclear Installations Inspectorate
	HSC	Health and Safety Commission
	HSE	Health & Safety Executive
	NuSAC	Nuclear Safety Advisory Committee
United States	AIT	Augmented Inspection Team
	IIT	Incident Investigation Team
	SI	Special Inspection
	SDP	Significance Determination Process
	PI	Performance Indicator
	NOV	Notice of Violation
	NRC	Nuclear Regulatory Commission

Annex 5.2 General Acronyms

Acronym	Title
ALARA	**As Low As Reasonably Achievable**
ASSET	**(IAEA) Assessment of Safety Significant Events Team**
BWR	**Boiling Water Reactor**
FINAS	**Fuel Incident Notification and Analysis System**
FY	**Fiscal Year**
IAEA	**International Atomic Energy Agency**
ICRP	**International Radiation**
INES	**International**
IRS	**Incident Reporting System**
IRSRR	**International Reporting System for Research Reactors**
ISI	**In-Service Inspection**
LERs	**Licensee Event Reports**
NDT	**Non-Destructive Testing**
NPP	**Nuclear Power Plant**
OSART	**(IAEA) Operational Safety Review Team**
PBMR	**Pebble Bed Modular Reactor**
PSA /PRA	**Probabilistic Safety Assessment / Probabilistic Reliability Analysis**
PSR	**Periodic Safety Review**
PWR	**Pressurised Water Reactor**
QA	**Quality Assurance**
RIG	**Risk-Based Inspection Guides**