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# **NUCLEAR LEGISLATION IN OECD COUNTRIES**

## **Regulatory and Institutional Framework for Nuclear Activities**

### **Germany**

## ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

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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.

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## **GERMANY**

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

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

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## I. GENERAL REGULATORY REGIME

### 1. Introduction

There are 18 operating nuclear power reactors at 15 sites in Germany; six units are boiling water reactors (BWR) and 12 are pressurised water reactors (PWR). In 2002, nuclear power produced 155.8 Net TWh, accounting for 29% of the nation's total electricity production. When Germany was reunited in 1990, four operating VVER-440 MWe reactors in the east were shut down for safety reasons and are being decommissioned. In addition, Germany shut down the PWR reactor at Stade in 2003.

Several power companies own the shares of the various nuclear power generating stations in Germany: EnBW, EON, HEW, RWE Power, TWS Stuttgart, Nekarwerke AG and Vattenfall Europe.

Prior to 1994, German utilities were obliged to reprocess spent fuel, however the policy of the present coalition government is for direct geological disposal of spent fuel. As all types of waste are planned to be disposed of in deep repositories, wastes are only separated into two categories; heat-generating and non heat-generating. The utilities are responsible for interim storage and have formed joint companies to build and operate off-site facilities at Ahaus and Gorleben. In line with the intentions of the federal government, a final repository should be available after 2030 for high-level (heat-generating) radioactive waste. The exploration work in the salt dome of Gorleben, planned for the storage of high-level waste has been interrupted for a minimum of three and a maximum of ten years to clarify conceptual issues. In the middle of 2002, permission was granted to establish a repository for low- and medium-level radioactive waste in the Konrad mineshaft. Complaints, however, were lodged against the authorised plan, and these complaints are pending in court.

There are 12 operational research reactors in Germany. In addition, 12 have been shut down, 22 have been decommissioned and one is under construction. The principal research reactors are the FRJ-2 DIDO heavy water reactor (23 MWe), and the BER-II (10 MWe) and FRG-1 (5 MWe) pool reactors.

The legal basis for the regulation of the peaceful uses of nuclear energy in the Federal Republic of Germany was created in 1959 by an addition to the Basic Law (the Federal Constitution – *Grundgesetz*). Under Article 74, No. 11a, the scope of the concurrent legislative power of the federal state (*Bund*) was broadened to include the production and use of nuclear energy for peaceful purposes, the construction and operation of installations for such purposes, protection against hazards arising from the release of nuclear energy or from ionising radiation, and the disposal of radioactive substances. Article 87c of the Basic Law provides that laws promulgated under Article 74, No. 11a may, with the consent of the federal council (*Bundesrat*), which is composed of representatives of the *Länder* governments, stipulate that they are to be implemented by the *Länder* (states making up

Germany) on behalf of the federal authorities (so-named *Bundesauftragsverwaltung*) [Act of 23 December 1959 amending the Basic Law, BGBl<sup>1</sup> I p. 813].

Against this background the Act on the Peaceful Use of Atomic Energy and Protection Against its Hazards (Atomic Energy Act) became law on 23 December 1959.<sup>2</sup> In accordance with Article 87c of the Basic Law, the Atomic Energy Act provides that it is to be implemented by the federal authorities and the *Länder*. The *Länder* are subject to federal supervision of both the regularity and appropriateness of measures taken by them to give effect to the act [Article 85 of the Basic Law]. For the purpose of exercising such supervision, the competent supreme federal authorities (i.e. in the case of nuclear safety and radiation protection, the Federal Minister for the Environment, Nature Conservation and Nuclear Safety) may issue instructions [Section 24 of the Atomic Energy Act].

The 1959 Atomic Energy Act in its version as last amended in 2001 was intended to:

- promote nuclear research and the development and use of nuclear energy for peaceful purposes;
- protect life, health and property from hazards associated with nuclear energy and from the harmful effects of ionising radiation and provide compensation for damage caused by nuclear energy or ionising radiation;
- prevent the domestic or external security of Germany from being endangered by reason of the use or release of nuclear energy;
- ensure fulfilment of the international obligations of Germany in the field of nuclear energy and radiation protection [Section 1 of the Atomic Energy Act].

The government of the Federal Republic of Germany elected in 1998 decided to phase out the use of nuclear energy for electricity-generating purposes. This decision led to the introduction of substantial changes in the nuclear legislation. The legal instrument to implement the phasing-out decision was the Act on the Structured Phase-Out of Nuclear Power for the Commercial Production of Electricity (*Gesetz zur geordneten Beendigung der Kernenergienutzung zur gewerblichen Erzeugung von Elektrizität*) dated 22 April 2002 [BGBl 2002 I p. 1351]. The same act introduced consequential amendments into the 1977 Nuclear Financial Security Ordinance and the 1981 Nuclear Costs Ordinance.

While the 1959 Atomic Energy Act in its 2001 version, in accordance with Section 1, was aimed at promoting the use of nuclear energy and at preventing damages caused by the use of nuclear energy, the new act changed its purpose substantially. The promotion purpose of the act was deleted, and Section 1 of the 2002 Atomic Energy Act now reads as follows:

“The purpose of this act is:

1. to phase out the use of nuclear energy for the commercial generation of electricity in a structured manner, and to ensure on-going operation up until the date of discontinuation;
2. to protect life, health and property against the hazards of nuclear energy and the detrimental effects of ionising radiation and to provide compensation for damage and injuries caused by nuclear energy or ionising radiation;

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1. BGBl: *Bundesgesetzblatt* = Federal Gazette.

2. Consolidated version published on 15 July 1985 [BGBl I p.1565], last amended on 13 December 2001 [BGBl I p.3586].

3. to prevent danger to the internal or external security of the Federal Republic of Germany from the application or release of nuclear energy;
4. to enable the Federal Republic of Germany to meet its international obligations in the field of nuclear energy and radiation protection.”

The new act is the result of intensive preparation and discussions conducted within the government and between the government and the German energy industry. A 1999 government working group reviewed the framework conditions of national and international law with regard to the envisaged phasing-out of nuclear energy. In particular, there was one legal question which needed to be clarified, namely to which extent the limitation of the previously unrestricted operating licences for German nuclear power plants was in line with constitutional law. The outcome of this discussion was that an unconditional restriction in time of the operators’ licences could be seen as an expropriation of the energy utilities, which would entail claims for compensation of a very considerable size. After difficult negotiations, the government and the utilities agreed on the restriction of the future operation of existing nuclear power plants. They also agreed that a high standard of safety has to be maintained for the remaining operational period. This agreement was initialled on 14 June 2000 and signed on 11 June 2001. This agreement is of a political nature and is not a legally binding instrument. The Phasing-Out Act of 2002 is, in substance, the implementation of the major elements of that agreement.

The key provisions of the Phasing-Out Act:

- replace the original promotional purpose of the act with the objective of phasing out the use of nuclear energy for the commercial generation of electricity in a structured manner as quoted above;
- phase out the use of nuclear power and ensure safety during the remaining operating period of the respective licences;
- establish new requirements governing nuclear waste management;
- stipulate a ten-fold increase in the financial security to be provided by the operators of nuclear power plants (up to EUR 2.5 billion);
- repeal the amendment of the Atomic Energy Act of 6 April 1998.

The aim of affording protection, which underlies the Atomic Energy Act, is given practical effect through provisions dealing with licences, surveillance, liability and insurance cover, and in provisions relating to offences and penalties. In the event of a conflict concerning the purposes of the act, the principle of protection against hazards and risks prevails, as the well-established case law of the Federal Administrative Court and other courts has shown.

The Atomic Energy Act empowers the federal government (in certain cases with the consent of the *Bundesrat*) to issue ordinances for the achievement of the objectives set out in the act. So far the following instruments have been issued:

- Ordinance of 20 July 2001 on protection against damage caused by ionising radiation (*Strahlenschutzverordnung* – Radiation Protection Ordinance) as last amended by Ordinance of 18 June 2002 [BGBI 2001 I p. 1714; 2002 I p. 1459, 1869, 1903];
- Ordinance of 14 October 1992 on persons responsible for nuclear safety and on the notification of safety-related events (*Atomrechtliche Sicherheitsbeauftragten und Meldeverordnung* – Safety Officers and Notification Ordinance) as last amended by Ordinance of 18 June 2002 [BGBI 1992 I p. 1766; 2002 I p. 1459, 1869, 1903];



- Ordinance of 8 January 1987, as amended, concerning protection from damage by X-rays (*Röntgenverordnung – X-ray Ordinance*) as last amended by Ordinance of 18 June 2002 [BGBl 1987 I p. 114; 2002 I p. 1869];
- Ordinance of 18 February 1977 concerning the procedure for licensing of installations pursuant to Section 7 of the Atomic Energy Act (*Atomrechtliche Verfahrensverordnung – Nuclear Installations Ordinance*) in its consolidated version of 3 February 1995 and as last amended by Act of 25 March 2002 [BGBl 1977 I p. 280; 1995 I p. 180; 2002 I p. 1193, 1217];
- Ordinance of 25 January 1977 concerning financial security pursuant to the Atomic Energy Act (*Atomrechtliche Deckungsvorsorge Verordnung – Nuclear Financial Security Ordinance*) as last amended by Ordinance of 18 June 2002 [BGBl 1977 I p. 220; 2002 I p. 1869, 1906];
- Ordinance of 17 December 1981 concerning costs under the Atomic Energy Act (*Atomrechtliche Kostenverordnung – Nuclear Costs Ordinance*) as last amended by Act of 22 April 2002 [BGBl 1981 I p. 1457; 2002 I p. 1351, 1359];
- Ordinance of 28 April 1982 on advance contributions towards construction of federal installations for safe containment and final disposal of radioactive waste (*Endlagervorausleistungsverordnung – Final Disposal Ordinance*) as last amended by Ordinance of 18 June 2002 [BGBl 1982 I p. 562; 2002 I p. 1869, 1906];
- Ordinance of 27 July 1998 on the movement of radioactive waste into or out of the territory of the Federal Republic of Germany (*Atomrechtliche Abfallverbringungsverordnung – Nuclear Waste Shipment Ordinance*) as last amended by Ordinance of 20 July 2001 [BGBl 1998 I p. 1918; 2001 I p. 1714, 1840];
- Ordinance of 1 July 1999 on the assessment of reliability regarding theft or significant release of radioactive substances under the Atomic Energy Act (*Atomrechtliche Zuverlässigkeitsüberprüfungs Verordnung – Nuclear Reliability Assessment Ordinance*) as last amended by Ordinance of 20 July 2001 [BGBl 1999 I p. 1525; 2001 I p. 1714, 1837].

Nuclear and radiation protection law is not, however, to be found exclusively in the Atomic Energy Act and the above ordinances. Another important piece of legislation is the Preventive Radiation Protection Act of 19 December 1986, as last amended by the Act of 14 December 2001 (*Gesetz zum vorsorgenden Schutz der Bevölkerung gegen Strahlenbelastung – Strahlenschutzvorsorgegesetz*) [BGBl 1986 I p. 2610; 2001 I p. 3714, 3718]. This Act has been complemented by the 1<sup>st</sup>-5<sup>th</sup> Ordinances of 1989, 1991, 1997, 1998 and 2002 to Assign Competence for Measurements and Evaluation in Accordance with the Preventive Radiation Protection Act [BGBl 1989 I p. 1582; 1991 I p. 1768; 1997 I p. 2474; 1998 I p. 2009; 2002 I p. 3184].

There are also numerous relevant provisions in other specialised fields. The principal ones are:

- national and international provisions on the transport of radioactive materials;
- foreign trade law;
- environmental law;
- provisions of water law dealing with protection and liability in regard to the disposal of radioactive sewage into surface waters;

- the Mining Act with regard to the search for radioactive minerals and the design of installations for the deep underground disposal of radioactive waste;
- provisions of the law relating to foodstuffs and medicine;
- radiation protection law regarding female civil servants including soldiers.

One of the objectives of the Atomic Energy Act is to ensure the fulfilment of Germany's international obligations in regard to nuclear energy. Consequently, nuclear energy law, including the enforcement of the Atomic Energy Act in Germany, is influenced by and, in part, directly subject to international treaties, particularly within the framework of Euratom, the OECD and the IAEA.<sup>3</sup>

## 2. Mining Regime

The search for radioactive minerals requires a permit and mining operations require a licence or a concession for the mine, in accordance with the provisions of the Federal Mining Act of 13 August 1980, as amended, which regulates such matters in detail [BGBl 1980 I p. 1310; 2001 I p. 3138, Sections 6 to 8]. A licence for handling radioactive materials under the Radiation Protection Ordinance is not required for activities to which the Federal Mining Act applies, but the radiation protection provisions of that Ordinance are applicable [Radiation Protection Ordinance, Section 7(3), 3(2), No. 34 (the concept of "handling radioactive substances" includes mining activities); see also: Sections 93 *et seq.*].

In accordance with Section 118 of the Radiation Protection Ordinance, two ordinances of the former GDR remain valid:

- the Ordinance of 1984 on Nuclear Safety and Radiation Protection (*Verordnung über die Gewährleistung von Atomsicherheit und Strahlenschutz – VOAS*) [GBl GDR I, p. 341] and its implementing Regulation of 1984 [GBl GDR I, p. 348; 1987, p. 196];
- the Order of 1980 on Radiation Protection in relation to Slagheaps and Industrial Repositories [GBl GDR I, p. 347].

These regulations, however, only apply to the remediation and restoration of the detrimental consequences of GDR activities in relation to the uranium industry. In all other cases, the provisions of the Radiation Protection Ordinance apply.

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3. Note on the Unification of Germany: In accordance with Section 2(2) of the Act of 21 June 1990 bringing into force the regulations of the Federal Republic of Germany (FRG) in the German Democratic Republic (GDR) (so-called *Mantelgesetz*) [GBl of the GDR I, p. 357], the Atomic Energy Act of the FRG entered into force in the GDR on 1 July 1990, with the status of GDR law. At the same time, the implementing Ordinances of the Act became valid, and the corresponding legislation of the GDR expired. Following the conclusion of the Treaty of 31 August 1990 between the FRG and the GDR on the establishment of the unity of Germany (Unification Treaty) [BGBl 1990 II pp. 885, 889], federal law including the Atomic Energy Act, the Radiation Protection Ordinance, and all other implementing and complementing legal instruments entered into force on 3 October 1990 in the five new *Länder* in the territory of the former GDR.

The unification further brought about some minor amendments of the nuclear law in force. Thus the Atomic Energy Act was amended to provide for necessary transitional rules, e.g. concerning limited continuation of old licences [Section 57(a)]. The Radiation Protection Ordinance was also amended, to provide that in the new *Länder* the Ordinance would not be applicable to mining of radioactive minerals [Section 89(a)].

The Radiation Protection Commission (*Strahlenschutzkommission* – SSK) in 1991 issued recommendations concerning the use of areas and material contaminated by the uranium mining activities of the former Soviet-German public limited company *Wismut* in the *Länder* of Saxony and Thüringen [BAnz<sup>4</sup> 1991, pp. 5461, 5684, 7858]. *Wismut*'s activities were terminated following the unification of Germany in accordance with an Agreement between Germany and the USSR of 16 May 1991 [BGBl II p. 1142].

### **3. Radioactive Substances, Nuclear Fuel and Equipment**

#### **a) Definitions**

Sections 3 to 6, 9, and 17 to 19 of the Atomic Energy Act provide for a regime of licensing and permanent surveillance of export and import, transportation, storage, and any kind of handling and processing of nuclear fuel material. Other radioactive substances which are not nuclear fuel are covered by the licensing regime established by the Radiation Protection Ordinance of 2001, in particular in Sections 7 to 10 and 16 to 22.

The terms “radioactive substances”, “nuclear fuel”, and “other radioactive substances” are defined in Section 2 of the Atomic Energy Act. The term “radioactive substances” is the overall generic term, which includes “nuclear fuel” as well as “other radioactive substances”. The term “nuclear fuel” refers to special fissionable material in the form of:

- $^{239}\text{Pu}$  and  $^{241}\text{Pu}$ ;
- uranium enriched in isotopes  $^{235}\text{U}$  or  $^{233}\text{U}$ ;
- any material containing one or more of the substances cited under points 1 and 2;
- substances which permit a self-sustaining chain reaction to be maintained in a suitable installation and which are defined in a statutory ordinance.

The term “uranium enriched in isotopes 235 or 233” shall mean uranium containing the isotopes  $^{235}\text{U}$  or  $^{233}\text{U}$  or both in such quantities that the sum total of the amounts of these two isotopes is greater than the amount of isotope  $^{238}\text{U}$  multiplied by the naturally occurring ratio of isotope  $^{235}\text{U}$  in relation to isotope  $^{238}\text{U}$ .

The activity or specific activity of a substance in the sense of Section 2, paragraph 1, sentence 1 of the Atomic Energy Act may be disregarded if certain prerequisites are fulfilled as listed in Section 2, paragraph 2 of the act.

With regard to the application of licensing requirements under the Atomic Energy Act or implementing ordinances, substances in which the proportion of isotopes  $^{233}\text{U}$ ,  $^{235}\text{U}$ ,  $^{239}\text{Pu}$  and  $^{241}\text{Pu}$  does not exceed 15 grams in total or the concentration of the isotopes listed does not exceed 15 grams per 100 kilograms shall be classified as “other radioactive material”. This rule, however, does not apply to solidified high-level fission product solutions derived from the processing of nuclear fuel [Section 2, paragraph 3 of the Atomic Energy Act].

Furthermore, Section 2 of the Atomic Energy Act stipulates that with regard to nuclear liability and coverage of liability, the definitions of the Paris Convention on Third Party Liability in the Field of Nuclear Energy of 29 July 1960, as amended, apply. It follows that the definitions of “nuclear fuel”

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4. BAnz: *Bundesanzeiger* = Federal Bulletin.

and “other radioactive substances” as listed above only apply to the parts of the Atomic Energy Act and its implementing ordinances which do not deal with nuclear liability and financial security [Section 2, paragraph 4 of the Atomic Energy Act].

**b) Licensing requirements**

In accordance with Section 3 of the Atomic Energy Act, the import and export of nuclear fuel requires a licence. The licensing and notification regime for other radioactive substances is regulated in Sections 19 *et seq.* of the Radiation Protection Ordinance. For further details, see *infra*, Section 5 “Trade in Nuclear Materials and Equipment”.

The transport of nuclear fuel and other radioactive substances requires a licence under Sections 4 *et seq.* of the Atomic Energy Act and Sections 16-18 of the Radiation Protection Ordinance respectively. For further details, see *infra*, Section 9 “Transport”.

The storage of nuclear fuel and other radioactive substances requires a special licence under Section 6 of the Atomic Energy Act and Sections 7 *et seq.* of the Radiation Protection Ordinance in connection with the definition in Section 3, paragraph 2, No. 34 of the Radiation Protection Ordinance.

Section 9a, paragraph 2 of the Atomic Energy Act requires the operator of a nuclear power plant to ensure that an interim storage facility for spent fuel is available on or close to the site of the installation. The interim storage facility must be licensed under Section 6, paragraphs 1 and 3 of the Atomic Energy Act.

Nobody is entitled to possess nuclear fuel without an appropriate licence under Sections 4, 6, 7 or 9a to 9c of the Atomic Energy Act. Persons who are in possession of nuclear fuel without the necessary licence are required to either deliver those materials to a person who is authorised to possess them, or to deliver the material to the Federal Office for Radiation Protection, which has to store such material [Section 5, paragraphs 2 to 4 and Section 23, paragraph 1, No. 1 of the Atomic Energy Act].

The treatment, processing, or any other use of nuclear fuel other than in installations which require a licence under Section 7 of the Atomic Energy Act are subject to a licence [Section 9 of the Atomic Energy Act]. The same applies to any substantial deviation from procedures for processing, treatment or other uses covered by the licence and to any change in the location of operations as defined in the licence. As regards “dealing with” other radioactive substances outside an installation, Sections 7 to 10 of the Radiation Protection Ordinance set out licensing requirements. The concept of “dealing with” (“*Umgang*”) comprises the production, storage, processing, treatment, and any other utilisation and disposal of radioactive substances [Section 3, paragraph 2, No. 34 of the Radiation Protection Ordinance].

The Radiation Protection Ordinance provides for an exemption from licensing requirements for low-level risk radioactive material: such exemptions apply in respect of Section 8 (handling and any kind of dealing with radioactive material), Section 17 (transport), Sections 19, 20 (import and export) and Section 21. In some of these cases, the ordinance requires a notification to the competent authority.

The construction and the operation of nuclear facilities for the production of ionising radiation (accelerators) which exceed a specified energy level require a licence [Section 11 of the Radiation Protection Ordinance]. There is an exemption from the licensing requirement for plasma facilities and

accelerators with a low energy level as defined in Section 12 of the Radiation Protection Ordinance. There is a special licensing regime for X-ray appliances in accordance with the X-Ray Ordinance [Sections 3 and 6].

#### **4. Nuclear Installations**

##### **a) Licensing regime**

Any person who constructs, operates or otherwise holds, or who substantially alters any installation for the production, treatment, processing or fission of nuclear fuel, or for the reprocessing of irradiated nuclear fuel must obtain a licence in accordance with Section 7, paragraph 1 of the Atomic Energy Act. However, no further licences will be granted for the construction or operation of nuclear power plants or reprocessing facilities [Section 7, paragraph 1, sentence 2 of the Atomic Energy Act].

In accordance with Section 7, paragraph 1a of the Atomic Energy Act, the authorisation to operate a nuclear power plant shall expire once the electricity volume for that installation as listed in Appendix 3, column 2, of the act or the electricity volume derived from transfers from other installations in accordance with paragraph 1b of Section 7 has been produced. The electricity volume listed in the Appendix corresponds to a standard operating life of 32 years per plant.

In order to ensure the correct implementation of this provision, the licensee must:

- notify the responsible authority, on a monthly basis, of the volumes of electricity generated in the previous month;
- submit to the responsible authority the results of the checks and certificates pursuant to paragraph 1c2, sentence 3, within one month of receipt; and
- notify the responsible authority of any transfers implemented between installations pursuant to paragraph 1b within one week of determining the transfer.

A licence to construct, operate or otherwise hold a nuclear installation may only be granted if the following prerequisites are fulfilled:

- there are no known facts giving rise to any doubts as to the reliability of the applicant or of the persons responsible for the construction and management of the installation and the control of its operation, and the latter persons possess the requisite specialised knowledge;
- the persons who are otherwise engaged in the operation of the installation possess the necessary knowledge concerning the safe operation of the installation, its possible hazards, and the safety measures to be applied;
- every necessary precaution has been taken in the light of existing scientific knowledge and technology to prevent damage resulting from the construction and the operation of the installation;
- the necessary financial security has been provided to cover all legal liability to pay compensation for damage;
- all necessary protection is provided against disturbance or other interference by third parties (physical protection);

- the choice of the site of the installation, in particular with respect to non-contamination of water, air, and soil, is not contrary to overriding public interests.

The decommissioning, safe confinement, or dismantling of a nuclear installation require a licence, which may be granted if the prerequisites listed in Section 7, paragraph 2 are met. A licence shall not be required if the decommissioning, etc. has already been the subject of a licence to construct, operate or otherwise hold an installation [Section 7, paragraph 3 of the Atomic Energy Act].

Licences under Section 7 are issued by the supreme *Land* authorities (i.e. ministries) [Section 24, paragraph 2 of the Atomic Energy Act].

The administrative procedures to obtain a licence are set out in the Nuclear Installation Ordinance of 1977 as amended and in the general Administrative Procedure Act 1976 as amended [BGBI 1976 I p. 1253; 1986 I p. 265].

The licensing procedure is conducted in several stages and involves consultation and intervention of the public and local authorities. Technical bodies are involved at the federal as well as at the *Land* level. When the application is filed, the licensing authority of the *Land* concerned forwards copies of the request for the licence to the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety, which is advised on licensing questions by the Reactor Safety Commission and the Radiation Protection Commission. After consultations with the Commissions have been concluded, the ministry informs the *Land* authorities of the findings and issues the relevant instructions. In addition, the *Land* authorities request expert opinions from independent experts.

As regards the different stages of the licensing procedure, provisional site approval is not a mandatory step within this procedure: it is at the discretion of the applicant whether he applies for that approval or not. Such approval is limited to the question of whether a given site is suitable for construction and operation of a nuclear installation, but it does, however, provide the opportunity to settle certain questions which would be likely to cause public controversy. This provisional site approval is binding in nature, but it will become invalid if the applicant does not apply for the final licence within two years from the date on which this approval is no longer subject to appeal [Section 7a of the Atomic Energy Act].

The construction permit may be and is normally granted in several stages: a partial construction permit concerning, *inter alia*, a specified construction volume, the site and the basic safety design of the installation. The operating licence may also be applied for and granted in several stages. Before issuing an operating licence, the licensing authority must be certain that other provisions of public law, such as those relating to buildings and zoning, water and environmental protection, trade and nuisance control, have been observed and the requisite permits and licences have been granted by the appropriate (*Bund*, *Land* or local) authorities.

Costs connected with decisions and rulings and with the official custody of nuclear fuels, or other official acts by the competent authorities under the Atomic Energy Act are dealt with in accordance with the relevant provisions of the act, or in the 1981 Nuclear Costs Ordinance made under it and in the Administrative Costs Act (*Verwaltungskostengesetz*) [Atomic Energy Act, Sections 21, 21a, 21b; Nuclear Costs Ordinance].

Finally, the construction, operation and possession of nuclear installations are subject to continuous government supervision [Atomic Energy Act, Section 19]. The supreme authorities of the *Länder* are responsible for exercising supervisory and control functions, which they may delegate to

subordinate agencies in individual cases. For further details, see *infra* Section 4(d) “Surveillance of installations and activities”.

The holder of a licence to operate an installation referred to in Section 7, paragraph 1 of the Atomic Energy Act must appoint a person to be responsible for nuclear safety (*kerntechnischer Sicherheitsbeauftragter* – Safety Officer). This person shall supervise and assess the measures aiming at guaranteeing nuclear safety in the installation, including, *inter alia*, assessing safety-related events, elaborating measures to improve nuclear safety, and informing the operator on deficiencies in the nuclear safety of the installation. The operator must support the safety officer in fulfilling his tasks and, in particular, must provide the necessary personnel for his assistance [Safety Officers and Notification Ordinance of 14 October 1992, BGBl I p. 176].

Germany is a Contracting Party to the 1994 Convention on Nuclear Safety since 20 January 1997 [Act of 7 January 1997 on the Convention on Nuclear Safety, BGBl 1997 II p. 130].

**b) *Protection of the environment against radiation effects***

Where a licence or land planning permission is required for a nuclear installation or waste disposal facility, an environmental impact assessment must be included in the procedure leading to a decision. [Section 7, paragraph 2, No. 6 and Section 9b of the Atomic Energy Act; Section 3 of the Act on Environmental Impact Assessment of 12 February 1990, as amended, BGBl 1990 I p. 205; 2002 I p. 1921]. This act was originally promulgated as Article 1 of the Act of 12 February 1990 to implement Council Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment [BGBl 1990 I p. 205].

According to Sections 4 to 6 of the 2001 Radiation Protection Ordinance, radiation protection is governed by three main principles:

- justification;
- optimisation;
- dose limits.

A person who is intending to handle radioactive substances as listed in Section 2 of the Radiation Protection Ordinance is required to plan the technical design and the operation of the installation or equipment in such a manner that the dose limits set out in Sections 46, 47, 55, 56 and 58 will not be exceeded. Any unnecessary radiation exposure or contamination of man or the environment must be avoided. The licence-holder has to ensure that radioactive releases from installations or facilities will be notified to the competent authority [Section 48]. The Penal Code, as amended in particular by two Acts Concerning Criminal Acts Against the Environment [Act of 28 March 1980, BGBl I p. 373 and Act of 27 June 1994, BGBl I p. 1440] and as last amended by Act of 22 August 2002 [BGBl I p. 3390], covers offences committed in connection with the use of nuclear energy or ionising radiation, as well as non-compliance with licence conditions or an order of the authorities.

**c) *Emergency response***

In accordance with Section 6 *et seq.* of the 1992 Safety Officers and Notification Ordinance, the operator is obliged to notify accidents, incidents and other safety-related events to the competent

authority. The criteria for a notifiable event are laid down in detail in Annexes 1 and 2 of that Ordinance which also provides for a formal notification procedure. The safety officer must supervise the notification by the operator to check that it is correct and complete.

The 1986 Preventive Radiation Protection Act sets out the respective administrative responsibilities of the *Bund* and the *Länder* in relation to monitoring radioactivity and taking protective measures following an incident [Sections 2 and 3]. It also establishes a federal information system on “Radioactivity in the Environment” [Section 4]. The Federal Minister for the Environment, Nature Conservation and Nuclear Safety has the power to fix acceptable dose levels [Section 6]. These dose levels may be implemented by ordinances prescribing restrictions on trade in, and use of, foodstuffs, tobacco products and drugs [Sections 7 and 8]. Border police and customs officers have special powers for controlling transborder traffic and trade with regard to radioactive contamination.

Five Ordinances to implement the Preventive Radiation Protection Act were adopted in 1989, 1991, 1997, 1998 and 2002 in order to assign competence for measurements and evaluations in accordance with that act (for further details, see *supra* Section 1 “Introduction”).

The Federal Minister for the Environment, Nature Conservation and Nuclear Safety has the exclusive power to issue recommendations to the population as to the conduct they should adopt in order to protect themselves [Section 9 of the Preventive Radiation Protection Act].

At international level, Germany is a Party to both the 1986 Convention on Assistance in the Case of Nuclear Accident or Radiological Emergency and the 1986 Convention on Early Notification of a Nuclear Accident since 14 September 1989 [BGBI 1989 II p. 434, 444]. Germany has also concluded numerous bilateral agreements on information and assistance with its neighbouring states, in particular with a view to implementing the 1986 Conventions.

**d) *Surveillance of installations and activities***

All installations, facilities, and activities which fall under the scope of application of the Atomic Energy Act and its implementing and supplementing ordinances are under permanent surveillance by the competent authorities. The legal basis for this surveillance under the Atomic Energy Act is its Section 19, “Government Supervision”.

Paragraph 1 of this provision describes in detail the duties and installations to which the provision applies:

- handling of and dealing in radioactive material, construction, operation, and possession of nuclear installations;
- handling of and dealing in the facilities and equipment as listed in Section 11, paragraph 1, No. 3 of the act;
- the carriage of such material, installations, equipment and devices, as well as work of the type defined in Section 11, paragraph 1, No. 7 of the act.

It is the task of the authorities to ensure that all activities are conducted in compliance with the requirements of the legal framework and the respective licence conditions. The competent authority and its experts have the right of access at any time to those places where radioactive material, installations, and other equipment are located. They are entitled to obtain the necessary information from personnel and to verify such information if necessary. The competent authority may even order



that compliance with the legal framework and the licence conditions be reinstated. The authority may in particular order that protective measures shall be taken and at which places certain radioactive material shall be stored.

Section 19a, which was introduced by the 2002 amendment of the Atomic Energy Act, obliges the operator of a nuclear power plant to conduct a safety review on a regular basis. Appendix 4 to the act specifies for each nuclear power plant in Germany the date by which such safety review has to be performed (periodical safety evaluation). Ten years after the first safety review, the results of a renewed safety review should be submitted. Paragraph 2 of Section 19a exempts licensees from the requirements in relation to safety reviews where they provide a binding declaration to the supervisory authority that the installation will be permanently shut down no later than three years after the date specified in Appendix 4 to the act.

## **5. Trade in Nuclear Materials and Equipment**

Nuclear trade in general (both domestic and foreign) is subject to the provisions of the Atomic Energy Act and its implementing ordinances. Therefore, the applicable norms concerning licensing and supervision, radiation protection, financial security and physical protection must be observed. In addition, the international obligations of Germany must be respected, notably European Union legislation, international transport agreements, the nuclear third-party liability conventions and the Treaty on the Non-Proliferation of Nuclear Weapons.

Foreign trade in nuclear material is subject also to the general foreign trade legislation contained in the Foreign Trade Act (*Außertwirtschaftsgesetz*) of 28 April 1961 [BGBl I p. 481] as last amended [BGBl 2002 I p. 3202], as implemented by the Foreign Trade Ordinance (*Außertwirtschaftsverordnung*) of 18 December 1986 [BGBl 1986 I p. 2671; 1993 I p. 2493], last amended in 2002 [*Bundesanzeiger* 2002 p. 26497]. The Foreign Trade Act lays down the principle that all economic transactions with other countries are unrestricted, subject to the limitations provided for by the act itself, other laws and international agreements. The act allows restrictions to be prescribed by ordinance and the Foreign Trade Ordinance specifies such restrictions in relation to trade in nuclear material, installations and equipment. The Foreign Trade Ordinance also incorporates the restrictions on nuclear trade imposed by the recommendations of the Nuclear Suppliers' Group (London Club) and by the so-named Trigger List. The Import and Export Lists annexed to the Foreign Trade Ordinance were last revised in 2002 [*Bundesanzeiger* 2002 pp. 26681, 26498].

The import and export of nuclear fuel or other radioactive substances require either a licence or a declaration, depending on the substances involved [Atomic Energy Act, Section 3; Radiation Protection Ordinance, Sections 19 to 22]. Exemptions from these requirements are made for certain low-risk radioactive substances and for other radioactive substances which are imported/exported by the Armed Forces [Radiation Protection Ordinance, Section 19, paragraph 3 and Sections 20 and 21]. Both the Atomic Energy Act and the Radiation Protection Ordinance expressly stipulate that other legal provisions on import and export remain unaffected. In this respect, the Foreign Trade Act and the Foreign Trade Ordinance are of particular relevance, as are the Import List and the Export List which are annexed to them, respectively. The Export List comprises a Nuclear Energy List, which enumerates nuclear material, installations and equipment which are subject to a special regime under the Foreign Trade Act and Ordinance, while both lists provide country lists which provide details on countries with which trade has been liberalised and those which are subject to restrictions.

Additional provisions to be observed when importing or exporting radioactive substances are the Nuclear Waste Shipment Ordinance of 1998/2001 (for further details, see *supra* Section 1

“Introduction”) and Council Regulation No. 1493/93/Euratom on shipments of radioactive substances between Member States [EC Official Journal 1999 No. L 148].

## **6. Radiation Protection**

The Radiation Protection Ordinance of 13 October 1976, as amended, was totally revised on 20 July 2001 [BGBl I p. 1714; 2002 I p. 1459, 1869, 1903]. This revision results from the implementation at national level of Council Directives 96/29/Euratom of 14 May 1996 and 97/43/Euratom of 30 June 1997 [EC Official Journal 1996 No. L 159, 1997 No. L 180]. The revised ordinance comprises 118 Sections and 14 Annexes, which are mostly of a technical nature.

### **a) General**

Section 1 states that the objective of the ordinance is to regulate principles and requirements in relation to the protection of man and the environment against the detrimental effects of radioactive substances and ionising radiation of natural or man-made origin.

The ordinance covers activities and practices involving artificial and natural radioactive substances including, *inter alia*, transportation, storage, construction, and operation of facilities for the production of ionising radiation and the use of radioactive substances in connection with the production of foodstuffs and medicine. The revised ordinance extends for the first time to the protection of persons against natural radiation sources, e.g. in aircraft.

The revised ordinance entered into force on 1 August 2001.

### **b) Principal elements of the Radiation Protection Ordinance**

In implementing the Euratom Directives, the ordinance establishes a regime of licensing and notification which complements the corresponding regime in the Atomic Energy Act. While the Atomic Energy Act deals essentially with nuclear fuel and nuclear installations and the ordinance covers other radioactive substances and ionising radiation, the ordinance does nonetheless contain certain provisions which are applicable to nuclear fuel and nuclear installations. The act is the enabling statute for the ordinance and the two instruments should be read in parallel.

The Radiation Protection Ordinance deals, in five parts, with the following principal elements of radiation protection:

- Objective, scope and definitions of the ordinance [Sections 1-3].
- Principle of justification of practices [Sections 4, 80]
- Decrease of the dose limits for the general public from 1.5 to 1 millisievert (mSv) per year and for occupationally exposed workers from 50 to 20 mSv per year [Sections 46 and 55].
- Maintenance of the existing dose limit for the entire professional life of 400 mSv and of a comprehensive dose limit system for organs and tissues [Sections 55 and 56].
- Special radiation limits and improved protection requirements for occupationally exposed female workers with a view to protecting women of childbearing age, pregnant women and nursing mothers [Section 55, paragraph 4, 80, 95].

- Establishing procedures and principles to define exemption limits, etc. from the Euratom Directives and from the International Commission on Radiological Protection (ICRP): Annex III.
- Release of insignificantly contaminated objects from control under Atomic Energy Act (*Freigabe*) [Section 29, Annex IV].
- Establishing general conditions for the definition of design requirements to prevent incidents (*Störfälle*) [Section 50].
- Introduction of a more stringent regime governing the use of radioactive substances and ionising radiation in medicine, including quality assurance requirements [Sections 82 and 83].
- Transfer of the competence to license activities in the field of medical research to the Federal Radiation Office in co-operation with a Special Committee on Ethics [Sections 23 and 92].
- Radiation protection requirements and control of exposure of workers dealing with natural radioactive sources, in particular aircraft personnel; also the protection of the general public against risks from the disposal and use of radioactive residues [Sections 95 to 103].
- New requirements for achieving expertise in radiation protection [Section 30].
- Limitation and replacement in part of GDR radiation protection law by federal law with regard to the protection of workers in the field of mediation and restoration of GDR uranium mining sites [Section 118].
- Introduction of a more severe regime of notification and of state control governing radioactive waste [Sections 42, 48, 70].
- Improvement of emergency preparedness measures, in particular by strengthening the powers of the competent authorities [Section 51].

Section 117 of the ordinance provides for transitional rules regarding licences issued under the old law prior to 1 August 2001. The revision of the Radiation Protection Ordinance also led to a consequential amendment of the Ordinance on Weights and Measures of 12 August 1998 as last amended on 13 December 2001 [BGBl 1988 I p. 1657; 2001 I p. 3586].

**c) *Additional radiation protection norms***

The operation of X-ray apparatus is regulated by the X-Ray Ordinance of 8 January 1987 as last amended on 18 June 2002 [BGBl 1987 I p. 114; 2002 I p. 1869]. The governing principles are identical to those established in the Radiation Protection Ordinance including the principles of justification, dose limits, and optimisation [Sections 2a to 2c]. Section 3 of the X-Ray Ordinance establishes a licensing requirement for the operation of X-ray apparatus, with the exception of low-risk apparatus which only require a notification in accordance with Section 4.

The Law on the Marketing of Medicines (*Arzneimittelgesetz*) of 24 August 1976 as last amended on 9 August 1994 [BGBl 1976 I p. 2445, 2448; 1994 I p. 2071] is designed to ensure safety in the use of medicines. The law provides that it is unlawful to market radioactive medicines or medicines produced with the aid of ionising radiation without the appropriate permit. Based on this act, the Ordinance on Radioactive Medicines or Medicines Treated with Ionising Radiation of

28 January 1987 as last amended on 20 July 2001 [BGBl 1987 I p. 502; 2002 I p. 1714] establishes a special system of licensing and control.

Under Section 13 of the Foodstuffs and Consumer Goods Act of 15 August 1974 as last amended by Act of 8 August 2002 [BGBl 1974 I p. 1945; 1997 I p. 2296; 2002 I p. 3116], the treatment of foodstuffs with ultraviolet light and ionising radiation and the marketing of irradiated foodstuffs for commercial purposes are prohibited. Exceptions are set out in the Food Irradiation Ordinance of 14 December 2000 as amended on 29 October 2001 [BGBl 2000 I p. 1730; 2001 I p. 2785]. Prohibited foodstuffs must not be introduced into Germany, with the exception of products which have been brought lawfully into circulation in the territory of a Member State of the European Union. This exception also applies to states in the European Economic Area. The Federal Minister for the Environment, Nature Conservation and Nuclear Safety is, in consultation with other ministers, entrusted with the right to forbid or limit the sale of foodstuffs affected by radioactive contamination of the environment.

According to the Drinking Water Ordinance of 22 May 1986 as last amended on 20 December 2002 [BGBl 1986 I p. 760; 1990 I p. 2612; 2002 I p. 4695, 4709], drinking water must not contain radioactive substances in such concentration as to be capable of affecting human health.

## **7. Radioactive Waste Management**

### **a) Atomic Energy Act 2002**

Major changes were introduced into the law of radioactive waste management by the 2002 Act to Phase-Out the Use of Nuclear Energy.

According to Section 9a, paragraph 1, sentence 2 of the Atomic Energy Act, as amended, the delivery of spent nuclear fuel originating from the operation of nuclear power plants for electricity production to a reprocessing installation shall become unlawful as of 1 July 2005. Such spent fuel elements are nuclear waste.

The Atomic Energy Act does not contain an express definition of the term “nuclear waste”. However, Section 9a, paragraph 1 of the act clearly implies that the definition should read: “Radioactive waste is residual radioactive material which is to be disposed of in a regulated manner.”

This definition is confirmed by an express definition in Section 3, paragraph 2, number 1, lit. a of the Radiation Protection Ordinance, which defines radioactive waste as follows: “Radioactive waste is radioactive material within the meaning of Section 2, paragraph 1 of the Atomic Energy Act which, in accordance with Section 9a of the Atomic Energy Act, has to be disposed of in a regulated manner.”

In principle, the Atomic Energy Act establishes an option for persons in possession of radioactive waste to either reuse such waste in a non-detrimental way or to dispose of it. The first option, namely reuse of the waste, is excluded with regard to spent nuclear fuel waste from nuclear power plants. It follows that, in principle, this spent fuel must be disposed of by delivery to a final repository. Since a repository for highly radioactive waste is not yet available in Germany, paragraph 1b of Section 9a obliges the operator of a nuclear power plant to erect a local interim storage facility on the site or close to the site of the installation and to store the irradiated fuel therein until its surrender to a facility for final disposal is possible.

With regard to nuclear waste which is not spent fuel from a nuclear power plant, the producers of the waste have to surrender it to collection points for interim storage to be established and operated by the *Länder*.

The federal authorities are responsible for the establishment and operation of facilities for the safe containment and final disposal of radioactive waste. The construction and operation of these facilities, which are under the responsibility of the Federal Radiation Protection Office, must be approved pursuant to a land-use planning procedure carried out by the *Land* in which the facility is situated.

The Federation and the *Länder* may call upon the services of third parties to meet their obligations with regard to waste disposal. The federal state is expressly authorised to wholly or partially transfer the performance of its duties regarding final disposal to third parties, provided that they are capable of fulfilling such tasks [Section 9a, paragraph 3, sentence 3 of the Atomic Energy Act].

To cover the necessary costs associated with the construction and operation of a final disposal repository, the federal state is entitled to levy advance contributions from those persons who are obliged to surrender nuclear waste to the repository [Section 21b of the Atomic Energy Act, Ordinance on Advance Contributions Towards Construction of Federal Installations for Safe Containment and Final Disposal of Radioactive Waste of 28 April 1982, as amended].

**b) *Radiation Protection Ordinance***

The 2001 Radiation Protection Ordinance [Sections 72 to 79] contains provisions on nuclear waste which implement and complement the basic standards set out in the Atomic Energy Act.

In accordance with Section 72 of the ordinance, the licence holder is obliged to provide, in advance, a plan on the amount of radioactive waste which he expects to incur from his activities and the manner in which such waste will be disposed of. These notifications have to be provided every year on 31 December. The licence holder has also to establish an inventory of the radioactive waste in accordance with the forms contained in Annex X, parts A and B of the Radiation Protection Ordinance [Section 33]. The competent authority may require information about the manner in which the waste has to be treated and packed prior to its surrender to the repository [Section 74]. The transfer of radioactive waste to third parties or carriers is only permitted if the receiving party agrees in writing [Section 75]. Sections 76 to 78 provide detailed regulations on how to surrender the waste to a federal repository.

Of major practical importance is Section 79, which prohibits the diluting of radioactive waste generated from activities which are subject to licensing, with a view to decreasing its radioactivity and thereby meeting provisions on exemptions from licensing.

**c) *International obligations***

Germany is a Party to numerous international agreements dealing with the disposal of radioactive waste. These agreements include the 1972 Convention on the Prevention of Marine Pollution by Dumping of Waste and Other Matter [BGBl 1977 II pp. 165, 180] and its Protocol of 7 November 1996 [BGBl 1998 II p. 1345] and the Joint Convention on the Safety of Spent Fuel

Management and on the Safety of Radioactive Waste Management of 5 September 1997 [BGBl 1998 II p. 1753].

## **8. Non-Proliferation and Physical Protection**

### **a) *Non-proliferation regime***

By Acts of 4 June 1974, the Federal Republic of Germany approved:

- the 1968 Treaty on the Non-Proliferation of Nuclear Weapons (ratification took effect on 2 May 1975) [BGBl 1974 II p. 785; 1976 II p. 552];
- the Agreement of 5 April 1973 between Belgium, Denmark, the Federal Republic of Germany, Ireland, Italy, Luxembourg, the Netherlands, Euratom and the IAEA in implementation of Article III(1)(4) of the Treaty on the Non-Proliferation of Nuclear Weapons (Verification Agreement) [BGBl 1974 II p. 794; 1980 II p. 102].

The Agreement of 5 April 1973 was given effect in the Federal Republic of Germany by an act containing detailed provisions regarding the safeguarding of fissionable materials. Alongside Commission Regulation (Euratom) No. 3227/76 of 19 October 1976 concerning the application of the provisions on Euratom safeguards [OJ EC 1976 No. L 363] there exists extensive regulations to give effect to the Non-Proliferation Treaty and the Verification Treaty [Act of 7 January 1980, BGBl 1980 I p. 17; 2001 I p. 2785].

The Act on Control of Military Weapons of 22 November 1990, as amended, forbids development, production, import and export (including transit), trade in or possession of nuclear weapons [BGBl I p. 2506; 2002 I p. 3970]. In order to enhance control over foreign trade and to prevent proliferation of atomic, biological and chemical weapons, the Federal Minister for the Environment, Nature Conservation and Nuclear Safety may inform the appropriate authorities of any facts which become known to him in connection with nuclear licensing procedures which arouse suspicion of an infringement of the Foreign Trade Act [Atomic Energy Act, Sections 19(1) and 24(a)]. The Foreign Trade Act and the Foreign Trade Ordinance (*Außenwirtschaftsverordnung*) of 22 November 1993 [BGBl I, pp. 1934, 2493] were repeatedly amended in order to improve supervision and control of the export and transit of sensitive material and equipment, including nuclear material, goods and technology (for further details, see *supra* Section 5 “Trade in Nuclear Materials and Equipment”).

Germany is a Contracting Party to the following additional international agreements which prohibit or limit the proliferation and use of nuclear weapons: the Treaty of 5 August 1963 banning nuclear weapon tests in the atmosphere, in outer space, and under water [BGBl 1964 II p. 906]; the Treaty of 11 February 1971 on the proliferation of the emplacement of nuclear weapons or other weapons of mass destruction on the sea-bed and the ocean floor and in the subsoil thereof [BGBl 1972 II p. 325]; the Comprehensive Nuclear Test-Ban Treaty of 24 September 1996 [BGBl 1998 II 1210; implementing act BGBl 1998 I p. 1882].

### **b) *Physical protection regime***

One of the prerequisites for granting a licence under the Atomic Energy Act or the Radiation Protection Ordinance is that the applicant has to ensure the necessary protection against interference or other action by third parties (physical protection) [See e.g. Section 4, paragraph 2, No. 5; Section 6

paragraph 2, No. 4; Section 7, paragraph 2, No. 5; Section 9, paragraph 2, No. 5; Section 12, paragraph 1, No. 10; Section 12b of the Atomic Energy Act; Section 9, paragraph 1, No. 8; Section 13, No. 5; Section 18, paragraph 1, No. 5 of the Radiation Protection Ordinance].

Germany ratified the 1979 Convention on the Physical Protection of Nuclear Material on 6 September 1991, and has given effect to it through provisions in the Penal Code [Law on the Convention on the Physical Protection of Nuclear Material, of 24 April 1990, BGBl II p. 326, as amended by the Second Act Concerning Criminal Acts Against the Environment of 27 June 1994, BGBl 1994 I p. 1440].

## **9. Transport**

The transport of radioactive substances is subject not merely to the provisions of the Atomic Energy Act and the Radiation Protection Ordinance, but also to the provisions applicable to each type of carrier (Ordinances on the Transport of Dangerous Goods by Road, Rail, Sea and Inland Waterways), which are based on the Act on the Transport of Dangerous Goods (*Gesetz über die Beförderung gefährlicher Güter*) of 6 August 1975, as amended [BGBl I, p. 2121; 1998 I, pp. 2037, 3114; 2002 I p. 3082]. This act does not, however, apply to carriage on the sites of installations where dangerous goods are produced, stored, used or disposed of. Furthermore, the act does not apply to the transboundary shipment of dangerous goods to the extent that regulations of the European Union or international agreements apply to that carriage, and it does not apply to transportation by mountain railway. The provisions relating to the transport of radioactive substances follow the IAEA Regulations for the Safe Transport of Radioactive Materials.

Germany is a party to the following international agreements concerning the transport of dangerous goods:

- European Agreement of 30 September 1957 concerning the International Carriage of Dangerous Goods by Road (ADR) including the Protocol of 1975 [BGBl 1969 II p. 1489; 1979 II p. 1334; 1998 II p. 2618 (annex volume)];
- Regulations for the Transport of Dangerous Goods on the Rhine (ADNR) [BGBl 1994 II p. 3830; Special annex volume to BGBl 1997 II, No. 48];
- Agreement of 9 May 1980 on International Transport by Rail (COTIF) [BGBl 1985 II p. 130] including the Protocol of 17 February 1984 [BGBl 1985 II, p. 666] and including the International Regulations concerning the Carriage of Dangerous Goods by Rail (RID) [Annex 1 Attachment B as amended; Special annex volumes to BGBl 1985 II No. 18; 1997 II No. 51].

The Ordinance on Domestic and Transboundary Transportation of Dangerous Goods by Road and Rail (*Gefahrgutverordnung Straße und Eisenbahn*) (Dangerous Goods Ordinance – Road and Rail) of 11 December 2001 [BGBl 2001 I p. 3529] implements and complements the ADR and COTIF Agreements including their Protocols.

In addition, the transport of radioactive materials requires a licence under nuclear legislation. This licence is available in the case of nuclear fuel and major sources of radiation from the Federal Office for Radiation Protection, and in the case of other radioactive substances from the competent authorities of the *Länder* [Atomic Energy Act, Sections 4, 23 and 24; Radiation Protection Ordinance, Sections 16 to 18].

Specific exemptions apply to certain low-level radioactive substances and articles containing small quantities of radioactive substances [Radiation Protection Ordinance, Section 17, Annexes I and III].

As regards the domestic transport of radioactive substances, carriers are subject to a large number of instruments, which are in conformity with international agreements and recommendations.<sup>5</sup>

## **10. Nuclear Third Party Liability**

The operator of a nuclear installation is liable under the 1960 Paris Convention, ratified by Germany on 30 September 1975, and the 1963 Brussels Supplementary Convention, ratified on 1 October 1975, as supplemented by the provisions of the Atomic Energy Act [Section 25 of the Atomic Energy Act]. Germany has also been party to the 1971 Convention relating to Civil Liability in the Field of Maritime Carriage of Nuclear Material since 1 October 1975.

The liability of the operator of a nuclear installation for damage occurring within Germany is unlimited, unless the incident is due to war, insurrection or a grave natural disaster, in which case liability is limited to the amount of the state guarantee, which is set at EUR 2.5 billion. The maximum in the case of damage occurring abroad is determined in accordance with the principle of reciprocity, i.e. the extent to which the state in which the damage occurs has equivalent compensation arrangements in relation to Germany. In relation to states which do not operate a nuclear installation in their territory, liability is limited to the maximum amount under the Brussels Supplementary Convention, which currently is 300 million Special Drawing Rights (SDR) [Section 31 of the Atomic Energy Act].

The licensing authorities are responsible for defining the nature, extent and amount of cover necessary to meet the legal liability for compensation (financial security), which is not to exceed EUR 2.5 billion for nuclear installations. The Financial Security Ordinance of 1977 as last revised in 2002 [BGBl 1977 I p. 220; 2002 I p. 1869, 1906] regulates in detail how and in which individual amounts financial security has to be provided.

The maximum amount of financial security of EUR 2.5 billion is provided by a two-tiered system. Up to EUR 256 million is covered by third party liability insurance taken out by each operator. Between this amount and EUR 2.5 billion, cover is provided in the framework of a contract jointly subscribed to by all nuclear power plant operators in Germany.

The operator of a nuclear installation will be indemnified against claims for damages of up to EUR 2.5 billion to the extent that they are not covered by private financial security or that claims cannot be paid out of such security. Such indemnification is borne, up to the amount of EUR 500 million, as to 75% by the federal authorities and as to 25% by the *Land* within which the installation is situated. The federal state covers the amount between EUR 500 million and 2.5 billion alone [Atomic Energy Act, Sections 34 and 36].

In certain circumstances, the state will pay compensation for damage suffered in Germany following a nuclear incident in another country, if adequate compensation is not obtainable under the law of that country [Atomic Energy Act, Section 38]. Following the Chernobyl accident in 1986,

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5. These may be found in a loose-leaf collection: Eberhard Ziegler (ed.), *Bestimmungen über die Beförderung radioaktiver Stoffe* (Provisions applicable to the transport of radioactive substances), NOMOS Publ., Baden-Baden.



guidelines were issued concerning the compensation to be paid to persons who had suffered damage [Equity Guidelines of 2 June 1986, BAnz 12 June 1986, No. 105, p. 7237; Guidelines of 21 May 1986, BAnz 27 May 1986, No. 95, p. 6417; Equity Guidelines of 24 July 1986, BAnz 2 August 1986, No. 140, p. 10388].

An act which, *inter alia*, amends Annex 1 to the Atomic Energy Act was adopted on 6 April 1998 [BGBl 1998 I, p. 694]. This Annex, which contains the definitions applying to the liability chapter of the act, is identical to Article 1(a) of the Paris Convention. Following the NEA Steering Committee's decision of 11 April 1984 [NE/M (84) 1], "installations for the disposal of nuclear substances" are included in the list and are now "nuclear installations" governed by the Paris Convention.

A catch-all clause covers all other cases of liability; this clause is particularly relevant in the case of handling of radioisotopes and particle accelerators as well as for nuclear material not covered by the Paris Convention, *e.g.* transit through German territory of nuclear fuel being transported from the United States to Austria [Section 26]. Section 26 establishes strict and unlimited liability of the holder of radioactive substances. However, the liability is not exclusive, and the person liable is exempted from liability upon proof that the incident occurred despite all necessary precautionary measures (so-called modified strict liability). This exemption, however, does not apply if the material involved in the incident is radioactive substances or material in the sense of the Paris or the Vienna Conventions [paragraphs 1, sentence 2, 1a].

On 22 October 1986, an Agreement on Third Party Liability in the Nuclear Field was concluded between Germany and Switzerland to expressly declare reciprocity in regard to the amount of compensation and to provide for greater uniformity in the compensation regimes in the two countries [BGBl 1988, p. 598]. It entered into force on 21 September 1988.

Non-nuclear damage resulting from activities involving certain nuclear installations is covered by the Act on Liability for Damage to the Environment of 10 December 1990 [BGBl I p. 2634, 2002 I p. 2674] and by general tort law.

## II. INSTITUTIONAL FRAMEWORK

### 1. Regulatory and Supervisory Authorities

Germany's federal structure plays a crucial role in implementing nuclear and radiation protection. As mentioned above, an amendment to the Constitution gave the *Bund* concurrent legislative power in the field of the peaceful use of atomic energy. Due to the special safety needs in this field, the *Länder* are responsible for enforcing existing federal legislation not on their own behalf but as agents for the *Bund* to the extent that the *Bund* has not established its own agencies for this purpose [Article 87c of the Basic Law and Section 24, paragraph 1 of the Atomic Energy Act].

Implementation of the Atomic Energy Act and of ordinances to give effect to it by the *Länder* on behalf of the *Bund* has the following consequences:

- the establishment of the appropriate agencies remains the responsibility of the *Länder* except where federal legislation otherwise provides;
- the federal government, with the approval of the Federal Council can regulate general administration and the standardised training of officials and other employees;
- the *Land* authorities must comply with the directions of the supreme federal authorities (federal ministries), such directions to be addressed as a general rule to the supreme authorities of the *Länder*;
- federal supervision covers the legality and appropriateness of measures taken by the *Länder*; for this purpose the federal government may require the submission of reports and may inspect documents [Article 85 of the Basic Law].

The Atomic Energy Act defines the distribution of the administrative duties between the federal authorities and those of the *Länder* [Sections 22 to 24a of the Atomic Energy Act].

## **A. Federal Authorities**

### **a) Federal Minister for the Environment, Nature Conservation and Nuclear Safety**

The Federal Minister for the Environment, Nature Conservation and Nuclear Safety is responsible for nuclear safety and radiation protection pursuant to the Atomic Energy Act. He has the power to issue directions in this field and he supervises the legality and appropriateness of the acts of authorities responsible for enforcing the Atomic Energy Act and the 2001 Radiation Protection Ordinance [Article 85, paragraph 3 of the Basic Law].

The Federal Minister for the Environment, Nature Conservation and Nuclear Safety and the authorities of the *Länder* responsible for enforcing the Atomic Energy Act work together within the *Länder* Committee for Nuclear Energy (*Länderausschuß für Atomkernenergie*) [BAnz 1977 No. 206].

In carrying out his duties the Minister is advised by two commissions, namely the Reactor Safety Commission (*Reaktorsicherheitskommission* – RSK) and the Radiation Protection Commission (*Strahlenschutzkommission* – SSK). The Nuclear Technology Committee (*Kerntechnischer Ausschuß* – KTA) was also set up to develop standards in the nuclear field. Its members represent all groups active in the nuclear field (nuclear operators, industry, etc.) and its Secretariat is part of the Federal Office for Radiation Protection which is under the authority of the Ministry for the Environment, Nature Conservation and Nuclear Safety.

Under the Act on Preventive Protection of the Public against Radiation (Preventive Radiation Protection Act) of 19 December 1986 [BGBl I p. 2610, as last amended on 14 December 2001, BGBl I p. 3714, 3718], the Minister for the Environment, Nature Conservation and Nuclear Safety has power to fix dose levels, which may be implemented by ordinances jointly issued with other interested federal ministers [Sections 6 and 7]. The Minister also has exclusive power to issue recommendations to the population as to the conduct they should adopt following a nuclear incident, but must do so in close contact with other competent authorities of the *Bund* or *Länder* [Section 9].

In 1994, the Minister for the Environment, Nature Conservation and Nuclear Safety published a comprehensive list of the authorities which are competent in the field of nuclear licensing and nuclear surveillance in Germany, covering both federal authorities and authorities of the *Länder*

[*Gemeinsames Ministerialblatt* 1994 No. 28 p. 838]. This list provides precise information about the powers of each authority and indicates the respective legal bases of those powers.

**b) *Federal Minister for Education, Science, Research and Technology***

The Federal Minister for Education, Science, Research and Technology is responsible for nuclear research.

**c) *Federal Minister for Finance***

The Federal Minister for Finance and the customs authorities answerable to him are responsible for supervising the import and export of nuclear fuels and other radioactive substances [Section 22, paragraph 2 of the Atomic Energy Act].

**d) *Federal Minister for Transport***

The German railway authorities designated by the Federal Minister for Transport are responsible for the supervision of the transport of radioactive substances by rail and by boat within Germany [Section 24, paragraph 1 of the Atomic Energy Act].

**e) *Federal Minister for Economy and Labour***

The Federal Minister for Economy and Labour is responsible for international nuclear co-operation, in particular with the IAEA, OECD/NEA, and Euratom.

**f) *Federal Minister for Defence***

The Federal Minister for Defence has the competence to license and supervise nuclear activities within the army, the navy and the air force. As Germany does not have any nuclear weapons, these activities largely comprise the use of radioisotopes in the military field. The Minister for Defence acts in all cases in agreement with the Federal Minister for the Environment, Nature Conservation and Nuclear Safety [Section 24, paragraph 3 of the Atomic Energy Act].

**g) *Federal Office for Radiation Protection (BfS)***

The Federal Office for Radiation Protection (*Bundesamt für Strahlenschutz – BfS*) is an independent federal authority (*selbständige Bundesoberbehörde*) within the portfolio of the Federal Minister for the Environment, Nature Conservation and Nuclear Safety [Law of 9 October 1989, as amended, BGBl I p. 1830; 2001 I p. 636, 640]. Pursuant to Section 23, paragraph 1 of the Atomic Energy Act, it is responsible for:

- government custody of nuclear fuels;
- construction and operation of federal installations for the safe containment and final disposal of radioactive waste, including the transfer of these functions to third parties and their supervision;

- licensing of the transport of nuclear fuels and large sources;
- licensing of the storage of nuclear fuels outside government custody to the extent such storage is not preliminary to or part of a practice requiring a licence pursuant to Sections 7 or 9 of the Atomic Energy Act;
- withdrawal or revocation of transport and storage licences;
- establishment and maintenance of a register of the radiation exposures of occupationally exposed persons;
- establishment, operation, and revocation of an ethics commission, as defined in Section 12, paragraph 1, sentence 1, No. 3a of the Atomic Energy Act;
- the obtaining, preparation, and publication of diagnostic reference figures, determination of the radiation exposure of individuals for medical purposes, and related surveys required under an Ordinance pursuant to Section 12, paragraph 1, sentence 1, No. 3b of the Atomic Energy Act;
- the acceptance and publication of information pursuant to Section 7, paragraph 1c of the Atomic Energy Act;
- decisions pursuant to Section 9a, paragraph 2, sentence 4 of the Atomic Energy Act.

It also has administrative responsibilities, and undertakes scientific research in the fields of radiation protection, nuclear safety, transport of radioactive substances and radioactive waste management.

**h) Federal Export Office**

This body (*Bundesausfuhramt*), which is an independent federal authority (*selbständige Bundesoberbehörde*) within the portfolio of the Federal Minister for Economy and Labour, is responsible for the issue of import and export licences for nuclear material. In carrying out this function, it is bound by the technical instructions issued by the federal minister responsible for nuclear safety and radiation protection (the Minister for the Environment, Nature Conservation and Nuclear Safety) [Section 22, paragraph 1 of the Atomic Energy Act, Act on the establishment of a Federal Export Office of 28 February 1992, BGBl I p. 376; BGBl 2001 I p. 2785].

**B. Authorities of the Länder**

Administrative duties (licensing and supervision) under nuclear and radiation protection law not performed by the federal authorities are exercised by the *Länder* on behalf of the *Bund*, subject to technical and legal supervision by the Federal Minister for the Environment, Nature Conservation and Nuclear Safety [Article 87c of the Basic Law and Sections 19 and 24, paragraph 2 of the Atomic Energy Act].

For the purpose of enforcing nuclear and radiation protection law the *Länder* designate their authorities responsible in accordance with their own rules for determining competence. The *Länder* can make administrative regulations for the implementation of nuclear and radiation protection law; in practice, however, the guidelines and recommendations adopted by the *Länder* Committee for Nuclear Energy serve as the basis for decisions by the *Land* authorities.

The main duty of the authorities designated by the *Länder* is the issue of licences for the construction and operation of nuclear installations. The licensing procedure however involves the participation of all competent federal, *Land* and local authorities. In the event of differences of opinion between the licensing authorities of the *Land* and a federal agency, the licensing authority must obtain directions from the Federal Minister for the Environment, Nature Conservation and Nuclear Safety [Section 7, paragraph 4 of the Atomic Energy Act].

## **2. Advisory Bodies**

As part of the supervision by the Federal Minister for the Environment, Nature Conservation and Nuclear Safety of the legality and appropriateness of action by subordinate authorities, advisory bodies have been set up within the Ministry for that purpose.

### **a) Reactor Safety Commission (RSK)**

#### *i) Legal status*

A Reactor Safety Commission (*Reaktor Sicherheitskommission* – RSK) was set up within the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety and consists of some twelve members representing all specialist fields involved in nuclear safety [Notification of 22 December 1998, BAnz 9 January 1999 p. 201].

#### *ii) Responsibilities*

The Commission is responsible for advising the Federal Minister for the Environment, Nature Conservation and Nuclear Safety on all matters concerning the safety of nuclear installations and related issues as well as in the field of radioactive waste management. The Commission thereby backs up the Federal Minister for the Environment, Nature Conservation and Nuclear Safety in exercising federal supervision over the *Länder* as regards the performance of tasks delegated to them by the *Bund*.

As a result of its deliberations the Commission issues recommendations and opinions, which require a majority of two-thirds of its members in the case of recommendations and opinions relating to the siting, design and commissioning of nuclear installations or to intermediate storage facilities for spent fuel elements. The Reactor Safety Commission has set out the safety requirements for the design, construction and operation of nuclear power plants equipped with pressurised water reactors in the form of guidelines. The latter are used as a basis for deliberations and recommendations in individual cases.

#### *iii) Structure*

The Federal Minister for the Environment, Nature Conservation and Nuclear Safety normally appoints the members of the Reactor Safety Commission for a period of three years, usually renewable for one further three-year term. Membership is a personal honorary office and as such cannot be delegated. Members are independent and may not receive instructions from any higher authority. In the event of bias the member concerned will be excluded from the deliberations of the Commission. In order to ensure that the Commission provides well-balanced advice, its members should represent the

entire spectrum of views (*Brandbreite*) on the state of science and technology. The Minister has entrusted the Federal Office for Radiation Protection with the operation of the Secretariat of the Commission. This Secretariat functions independently from the Office.

*iv) Financing*

The Federal Minister for the Environment, Nature Conservation and Nuclear Safety is responsible for the financing of the Reactor Safety Commission and for reimbursement of the expenses of its members.

For further details see homepage [www.rskonline.de](http://www.rskonline.de) (available in English).

***b) Radiation Protection Commission (SSK)***

*i) Legal status*

A Radiation Protection Commission (*Strahlenschutzkommission* – SSK) has been set up within the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety and is comprised as a rule of 14 well-known and experienced specialists from the fields of radiation biology, radiation genetics, radiation protection medicine, radiation protection technology, radiation physics, biophysics, radiochemistry and radioecology [Notification of 22 December 1998, BAnz 9 January 1999 p. 202]. In the same manner as the RSK, its members should represent the entire spectrum of views (*Brandbreite*) on the state of science and technology.

*ii) Responsibilities*

The Radiation Protection Commission is responsible for advising the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety on all major issues of radiation protection. It does not cover matters dealt with by the Reactor Safety Commission. The Radiation Protection Commission has six committees and specialist groups which help in the preparation of opinions and recommendations. The Commission was consulted with regard to the preparation of the Radiation Protection Ordinance of 13 October 1976 and subsequent amendments and has also in recent years issued a series of significant recommendations on basic radiation protection matters. It also gives its views via its Committee on Radiation Protection in Nuclear Installations on questions arising in connection with the licensing of nuclear installations.

*iii) Structure*

As for the SSK, the Federal Minister for the Environment, Nature Conservation and Nuclear Safety appoints the members of the Radiation Protection Commission for a period of three years. Reappointment for a consecutive period is possible only once. Membership is a personal honorary office. Members are independent and may not receive instructions from any higher authority. The Secretariat of the Commission, which is subject to instructions from the Minister, is provided by the Federal Office for Radiation Protection.

iv) *Financing*

The Federal Minister for the Environment, Nature Conservation and Nuclear Safety is responsible for the financing of the Commission and for reimbursement of the expenses of its members.

For further details see homepage [www.rskonline.de](http://www.rskonline.de).

c) *Nuclear Technology Committee (KTA)*

The general reference in nuclear law to the state of science and technology means that the relevant rules and guidelines for deciding what that state is, are of decisive importance. Private associations and organisations, with objectives independent of those of the authorities, concern themselves with the definition of technical and scientific rules and guidelines.

i) *Legal status*

In 1972, in view of the multiplicity of existing bodies, a Nuclear Technology Committee (*Kerntechnischer Ausschuß* – KTA) comprised of experts reflecting the interests concerned was set up within the Federal Ministry for the Interior and is now attached to the Ministry for the Environment, Nature Conservation and Nuclear Safety [Notification of 20 July 1990, BAnz 1990 No. 144, Procedural Rules of the KTA: BAnz 1986 No. 183].

ii) *Responsibilities*

The Committee is responsible in areas of nuclear technology where, on the basis of experience, specialists working for manufacturers, constructors and operators of nuclear installations, experts and the authorities consensually agree to prepare technical safety rules and to promote their application. Rules adopted by the Committee are published by the Federal Minister for the Environment, Nature Conservation and Nuclear Safety in the *Bundesanzeiger*; proposed rules are published in the Bulletin before being adopted so as to give the public an opportunity to present their views.

iii) *Structure*

The Committee consists of fifty expert members in the following proportions:

- ten represent manufacturers and constructors of nuclear installations;
- ten represent operators of nuclear installations;
- ten represent the competent authorities of the *Länder* and of the Federal Minister for the Environment, Nature Conservation and Nuclear Safety;
- ten represent expert advisory bodies;
- ten represent various specified authorities, organisations and other bodies.

Members and their deputies are designated by the agencies they represent and appointed by the Federal Minister for the Environment, Nature Conservation and Reactor Safety for a period of four years. The office of member or deputy member is an honorary one. The Committee is led by a board

and its business is conducted by a secretariat established within the Company for Nuclear Safety and run by a manager acting on the instructions of the board. The Committee establishes its own rules of procedure. The adoption of technical safety rules by the Committee requires a majority of five-sixths of its members. The rules must be published by the Federal Minister for the Environment, Nature Conservation and Nuclear Safety in the *Federal Bulletin*.

iv) *Financing*

Responsibility for the expenses of the Committee is borne in accordance with a general agreement between the Federal Minister for the Environment, Nature Conservation and Nuclear Safety and the three private interest groups.

For further details see homepage [www.kta-gs.de](http://www.kta-gs.de) (available in English)

### **3. Public and Semi-Public Agencies**

a) *Technological Surveillance Associations (TÜV)*

The Technological Surveillance Associations (*Technische Überwachungsvereine – TÜV*) are autonomous economic bodies in the form of private registered associations. They exist in all the *Länder* and may be entrusted by the competent official bodies to act on their behalf with respect to the implementation of nearly all control and surveillance measures required by law in relation to technical equipment and installations. In the nuclear technology field the licensing authorities also as a rule entrust the Technological Surveillance Associations with the implementation of detailed safety inspections and the preparation of opinions and reports.

The Technological Surveillance Associations all belong to the private Union of Technological Surveillance Associations (*Vereinigung der technischen Überwachungsvereine eV*), and the latter body has in turn set up a central unit for nuclear technology (*Leitstelle Kerntechnik*). This unit issues instructions to ensure uniformity of controls and technological standards. Where there is disagreement on the application of these instructions, the *Länder* Committee for Nuclear Energy is responsible for ensuring uniformity of practice among licensing authorities in the *Länder*.

b) *Company for Reactor Safety (GRS)*

The Company for Reactor Safety (*Gesellschaft für Anlagen und Reaktorsicherheit mbH – GRS*), whose headquarters are in Cologne, originated from the Institute for Reactor Safety of the Technological Surveillance Associations. Its founding members were the Federal Republic of Germany, the *Länder* of Bavaria and North-Rhine-Westphalia, several technological surveillance associations and *Germanischer Lloyd* Company. The Company for Reactor Safety has the prime duty of advising the Federal Minister for the Environment, Nature Conservation and Nuclear Safety in the performance of his supervisory duties over the *Länder* in implementation of the Atomic Energy Act. It is also responsible for collecting and evaluating knowledge on nuclear safety matters and participating in an expert capacity in nuclear licensing and supervisory proceedings.

For further details see homepage [www.grs.de](http://www.grs.de) (available in English).



**c) *Karlsruhe Research Centre for Technology and Environment***

The Karlsruhe Research Centre (*Kernforschungszentrum Karlsruhe für Technik und Umwelt GmbH*) was created in 1956 with the participation of the federal authorities, the *Land* of Baden-Württemberg and German industry. Following the transfer of the shareholding of industry to the federal authorities and the *Land* in 1963, the federal share has since 1972 been 90% and that of the *Land* of Baden-Württemberg 10%.

The Centre makes an important contribution to the development of German nuclear research and nuclear technology in co-operation with nearby universities and industry.

The main concerns of the Centre in the nuclear field are the technological development of heavy water reactors, fast breeders, uranium enrichment, reprocessing, final disposal of radioactive substances, and basic and safety research into fusion reactor technology.

For further details see homepage [www.fzk.de](http://www.fzk.de) (available in English).

**d) *Jülich Research Centre***

The Jülich Research Centre (*Forschungszentrum Jülich GmbH*) was founded in 1967 by the federal authorities and the *Land* of North-Rhine-Westphalia. The Centre originated from a nuclear physics research establishment of the *Land* of North-Rhine-Westphalia set up in 1956. The federal authorities now have a 90% share in the company and the *Land* 10%.

The Centre's main concerns include the development of high temperature reactors, nuclear fusion, basic nuclear research and solid state physics.

**e) *GKSS Research Centre Geesthacht***

The GKSS Research Centre Geesthacht (*Forschungszentrum Geesthacht GmbH*) was established in 1956 as the Centre for the exploitation of nuclear energy in shipbuilding and shipping (*Gesellschaft für Kernenergieverwertung in Schiffbau und Schifffahrt GmbH – GKSS*).

The *Bund* has a 90% share in the company and the *Länder* of Schleswig-Holstein, Lower Saxony, Bremen and Hamburg a 10% share.

The GKSS began its work with the testing of engines for nuclear-powered ships, leading to the operation of the nuclear-powered research and trading vessel *Otto Hahn* from 1968 to 1979. Today the research and development programme of the GKSS covers the exploitation of the sea and the coasts as well as the use of nuclear energy. The nuclear side of its activities covers projects in the field of reactor safety and forms part of the reactor safety programme of the Federal Minister for Education, Science, Research and Technology.

For further details see homepage [www.gkss.de](http://www.gkss.de) (available in English).

**f) *Hahn-Meitner Nuclear Research Institute in Berlin (HMI)***

The Institute (*Hahn-Meitner-Institut für Kernforschung Berlin GmbH – HMI*) began its scientific work in 1959 and since 1971 has become a major research establishment of the *Bund* and the *Land* of Berlin, which have 90% and 10% holdings respectively.

The Institute's research is directed mainly to heavy ion nuclear physics, nuclear solid state research, radiation and photochemistry, nuclear chemistry, and data processing and electronics.

For further details see homepage [www.hmi.de](http://www.hmi.de) (available in English).

**g) *The Electron-Synchrotron in Hamburg (DESY)***

This Synchrotron (*Deutsches Elektronen-Synchrotron – DESY*) was set up in 1959 as a private law foundation. The *Bund* provides 90% of its financing, with the balance being provided by the *Land* of Hamburg.

DESY is mainly concerned with high-energy physics and elementary particle physics.

For further details see homepage [www.desy.de](http://www.desy.de) (available in English).

**h) *Max-Planck Institute for Plasma Physics at Garching/Munich (IPP)***

The Institute (*Max-Planck-Institut für Plasmaphysik – IPP*) was established in 1960 and receives 90% of its financing from the *Bund* and 10% from the *Land* of Bavaria.

It deals mainly with plasma physics and controlled nuclear fusion.

For further details see homepage [www.mpg.de](http://www.mpg.de) (available in English).

**i) *Company for Heavy Ion Research (GSI)***

The Company for Heavy Ion Research (*Gesellschaft für Schwerionen forschung mbH – GSI*) was established in 1969 with headquarters in Darmstadt and receives 90% of its financing from the *Bund* and 10% from the *Land* of Hesse.

The GSI carries out research work on heavy ions in the fields of nuclear physics, nuclear chemistry and solid state physics.

For further details see homepage [www.gsi.de](http://www.gsi.de) (available in English).

**j) *Rossendorf Association for Nuclear Technology and Analysis***

This Association (*Verein für Kernverfahrenstechnik und Analytik Rossendorf eV – VKTA*) is an establishment entirely financed by the Free State of Saxony. It disposes of waste from the nuclear facilities and nuclear material located at the Rossendorf research station, and undertakes practically oriented research on the disposal of radioactive waste and fissile material, as well as on the technology

of processing radioactive substances. It also undertakes basic research on the environmental restoration of old waste disposal sites.

The VKTA runs the *Land's* collection point for radioactive waste and the official intake measurement centre of Saxony.

For further details see homepage [www.vkta.de](http://www.vkta.de) (available in English).