

BMU
Federal Ministry for the Environment,
Nature Conservation and Nuclear Safety

BfS
Federal Office
for Radiation Protection

30 September 2011

**Nuclear Regulatory Issues
and Main Developments
in Germany**

Contents

- 1. General**
- 2. Operation and Decommissioning of German Nuclear Power Plants**
 - a) *Event Registration*
 - b) *Licensing and Supervisory Issues*
 - c) *Safety Reviews*
 - d) *Residual Electricity Production Rights*
 - e) *Decommissioning of Prototype and Power Reactors*
- 3. Laws and Regulations**
 - a) *Matters under International Law*
 - b) *National Regulation*
 - c) *Recommendations.*
- 4. Nuclear Fuel and Waste Management**
 - a) *Nuclear Waste Management Policy on Repositories*
 - b) *Repositories for Radioactive Waste*
 - c) *Interim Storage of Spent Nuclear Fuel*
 - d) *Nuclear Fuel Fabrication and Reprocessing*
 - e) *Transports*
- 5. Radiation Protection**

1. General

Several changes in the energy policy of Germany and in particular in the policy of using nuclear energy took place in the recent 12 months. Although there was and still is a cross-party consensus that Germany should phase out the use of nuclear power and move to a renewable energy supply as quickly as possible, the political debate immediately changed in the light of the nuclear accident at the NPP Fukushima-Daichii of 11 March 2011 in Japan.

Based on the 2009 coalition contract of the current Federal Government, details to implement a new energy policy were decided by the Federal Cabinet on 28 September 2010 and approved by the German Bundestag (Federal Parliament) on 28 October 2010 as part of a comprehensive energy plan for an environmentally friendly, reliable and affordable energy supply. The important facts on the future use of nuclear energy were at that time:

The operation time of the German NPPs, determined by the amount of electricity allowed for production, will be extended by granting further electricity production rights grossly equalling additional 12 years on average. Seven NPPs whose commercial commissioning was in 1980 or earlier will be granted 8 years, the operation time of the younger NPPs will be extended by 14 years. The existing regulations regarding the safety requirements of nuclear power plants will be further developed.

The additional electricity production rights and the safety requirements were implemented by amendment of the Atomic Energy Act in December 2010. The opposition parties and the governments of some federal *Länder* announced to take legal action against the amendment to the Atomic Energy Act at the Federal Constitutional Court.

In the light of the Fukushima, the German government decided to re-evaluate the risk of the use of nuclear power. In mid march, the competent authorities of the Länder in consent with the federal government ordered the license holders to take the seven oldest reactors whose start of commercial operation was before 1981 off the grid for a period of three months.

The Reactor Safety Commission, an advisory body to the Federal Ministry for the Environment, reviewed the safety of all German reactors, especially on robustness against beyond design events. The RSK published its review results on 17 May 2011. These results indicated weaknesses for some plants regarding protection against some identified natural hazards as well as against airplane crashes. At the end of May a commission on "reliable energy supply" to identify consensual transition ways into the future use of entirely renewable energy sources duly incorporating associated different risks and societal views gave advice to the Government on issues of economic, ecological and social questions of a phase out of nuclear power.

Taking the reports of both commissions into account, the German government decided to phase out the use of nuclear power for the commercial generation of electricity at the earliest date possible. On 6 June 2011 the cabinet passed a draft law to change the Atomic Energy Act accordingly. It includes the following:

- The additionally electricity production rights granted in December 2010 were withdrawn, i.e. the electricity volumes are cut to the size of those granted in the atomic energy act in 2002,
- The seven oldest reactors mentioned above and the NPP Krümmel are immediately shut down permanently,
- The three most recent NPPs (Isar 2, GKN 2, KKE) will be shut down by the end of 2022.
- All other NPPs (six) will be shut down until the end of 2021 in a stepwise programme.

The [Atomic Energy Act](#) was amended accordingly and put into force on 06 August 2011. The procedure of shutdown according to the production of allowed electricity volumes and the right to transfer electricity volumes remains in force. The use of nuclear power for the commercial generation of electricity is phased out by the year 2022. One of the above mentioned eight nuclear power plants could have been held in standby as back-up for a possible energy supply shortage in the coming winter, but the competent federal agency decided not to make use of this option.

The German government assumes that notwithstanding the accelerated phase-out security of energy supply will be assured at all times.

Electricity production and nuclear share

The gross electricity production increased to 621 TWh (593 TWh in 2009) and reached a similar level as used to be in 2005-2008. The nuclear share in the gross electricity production in 2010 was 22.6 %, remaining almost the same as was in 2009 (22.7 %). The share of the different energy sources are shown in Table 1 and Table 2.

Table 1: *Gross electricity production 2008 - 2010 [TWh]*

	2008		2009*		2010*	
	TWh	%	TWh	%	TWh	%
Nuclear	148.8	23.4	134.9	22.7	140.5	22.6
Lignite	150.6	23.6	145.6	24.6	147.0	23.7
Hard Coal	124.6	19.6	107.9	18.2	116.0	18.7
Oil	9.2	1.4	9.6	1.6	7.5	1.2
Gas	86.7	13.6	78.8	13.3	84.5	13.6
Renewables	92.4	14.5	95.0	16.0	102.3	16.5
Others	24.7	3.9	21.5	3.6	23.2	3.7
Total	637.7	100.0	593.3	100.0	621.0	100.0

[Data from: BDEW e.V. February 2011]

*preliminary data

Table 2: *Gross electricity production of renewable energy sources 2008 - 2010 [TWh]*

	2008		2009*		2010*	
	TWh	%	TWh	%	TWh	%
Water	20.4	3.2	19.1	3.2	19.7	3.2
Wind Power	40.6	6.4	38.6	6.5	36.5	5.9
Solar Power	4.4	0.7	6.6	1.1	12.0	1.9
Biomass	22.3	3.5	25.5	4.3	28.5	4.6
Refuse	4.7	0.7	4.4	0.7	4.8	0.7
Geothermal Energy	0.02		0.02		0.03	
Other Renewables			0.8	0.1	0.8	0.1
Total	92.4	14.5	94.9	16.0	102.3	16.5

[Data from: BDEW e.V. February 2011]

*preliminary data

2. Operation and Decommissioning of German Nuclear Power Plants

At present, there are 9 nuclear power reactors (7 PWR and 2 BWR) in operation with a gross capacity of 12,696 MWe. Eight nuclear power plants with a gross capacity of 8821 MWe were finally shut down on 6 August 2011 according to the amended Atomic Energy Act.

a) Event Registration

In 2010, a total number of 80 events according to the National Reporting Criteria were reported from German NPPs to the Incident Registration Centre at the BfS. All were rated as level 0 on the INES-Scale.

During the period January to August 2011 a total number of 69 events according to the National Reporting Criteria were reported from German NPPs to the Incident Registration Centre at the BfS. All were rated as level 0 on the INES-Scale.

The quarterly (until 2009) and monthly (since 2010) as well as the annual reports on reportable events of German NPPs and research reactors are available on BfS web-site http://www.bfs.de/de/kerntechnik/ereignisse/berichte_meldepflichtige_ereignisse.

b) Licensing and Supervisory Issues

During the year 2010 and the first half of year 2011 in total 5 licences were granted for the seventeen German NPPs in operation. For the Unterweser NPP (PWR 1410 MWe) and the Emsland NPP (PWR 1400 MWe) modification licences were granted concerning specific fuel parameters. For the Biblis NPP Unit B (PWR 1225 MWe) a sampling system in the containment for use in the case of severe accidents was granted. The other two licences concerned measures taken against terroristic attacks with airliners.

The Krümmel NPP had been shut down for four years after the event from 28 June 2007 when a short circuit led to a fire in one of the two machine transformers. The Brunsbüttel NPP is also not in operation since more than 4 years. Both NPPs were out of operation at the time of the Fukushima accident.

Seven older NPPs whose start of commercial operation was before 1981 were ordered to shut down immediately after the Fukushima accident at least for the time of three months: Unterweser, Biblis A, Biblis B, Philippsburg 1, Neckarwestheim 1, Isar 1 and Brunsbüttel. These NPPs and the Krümmel NPP were finally shut down according to the amended Atomic Energy Act.

c) Safety Reviews

In addition to the existing regulatory supervision and inspection of nuclear power plants, Safety Reviews (SR) are a legally binding requirement laid down in § 19 a of the Atomic Energy Act. Probabilistic Safety Analyses are required as part of a Safety Review.

Safety Reviews have been finalized by the respective license holders for Emsland, Isar 2 and Neckarwestheim 2 at the end of 2009. In 2010, safety reviews were completed for Biblis B and Grohnde NPPs. All were presented to the competent *Länder* regulatory authority and according to the timescale as prescribed by the Atomic Energy Act. The results are currently under regulatory review. During 2011, Safety Reviews were due for Biblis A, Unterweser and Brunsbüttel, but these plants were shut down according to the amended Atomic Energy Act.

d) Residual Electricity Production Rights

According to the amendment to the Atomic Energy Act in December 2010, the operating NPPs were assigned additional electricity volumes, in addition to the electricity volumes already laid down in the year 2002. Thereby the operating time for plants that were commercially commissioned before 1980 have been extended by approximately 8 years and that for younger plants by approximately 14 years. By the recent amendment of the Act, granting of these additional electricity volumes was withdrawn.

Electricity production rights may be transferred - partially or in total - from one NPP to another, normally from an older and smaller plant to a more recent one. In 2010, this possibility has been used two times. First, on 11 May 2010 a transfer of the residual electricity volume of 4.8 TWh from the NPP Stade (KKS), already decommissioned in 2005, was made to the NPP Biblis A (KWBA), which provided KWBA approximately additional 5 months of full load operation. Second, on 30 June 2010, a transfer of 8.1 TWh occurred from the decommissioned Mülheim-Kärlich NPP (KMK) to the NPP Biblis B (KWB B). This extended its full load operation time for approximately 8 months.

The Atomic Energy Act requires a yearly publication of the status on residual electricity production rights. The status as of 31 December 2010 has been published by BfS in the "Bundesanzeiger" (Federal Gazette) on 05 April 2011 and on the BfS web site.

In January 2011, the former granted production rights of the NPP Neckarwestheim 1 (GKN 1) were totally exhausted. Up to now, this NPP was the first one taking credit of the additional electricity volumes received by the amendment to the Atomic Energy Act in December 2010. However,

Neckarwestheim 1 had to be shut down in March for the following three months due to the Moratorium of the Federal Government.

More information about electricity production rights may be found on the BfS web site <http://www.bfs.de/en/kerntechnik/strommengen.html>.

e) Decommissioning of Prototype and Power Reactors

In Germany, 27 nuclear power plants (NPPs) and prototype reactors were permanently shut down. Three of them (KKN in Niederaichbach, HDR in Grosswelzheim and VAK in Kahl) were completely dismantled. The sites were restored to "green-field conditions" and released from nuclear regulatory control. Two of the NPPs (KWL in Lingen and THTR-300 in Hamm-Uentrop) are in safe enclosure. For 14 NPPs the dismantling is in progress with "green-field conditions" being the planning target. The eight nuclear power plants recently shut down are preparing for future decommissioning licence procedure.

The reactor pressure vessel of the Würgassen NPP was dismantled completely in 2010. Decommissioning of the Kahl Experimental NPP (VAK), the first NPP for electrical energy production in Germany, was finished in 2010. The buildings and the site were released from regulatory control, and the demolition of the buildings and the recultivation of the site were accomplished in September 2010.

3. Laws and Regulations

a) Matters under International Law

Germany is Contracting Party to the Convention on Nuclear Safety. Germany participated at the Fifth Review Meeting 04-15 April 2011 in Vienna. The National Report for the 5th Review Meeting of the Convention is available on the BfS internet:

http://www.bfs.de/en/kerntechnik/uebereinkommen_nukleare_sicherheit.

Germany is Contracting Party to the Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management. The Third National Report was published on the website of BMU http://www.bmu.bund.de/english/nuclear_safety/doc/42446.php. Germany participated at the Third Review Meeting 11-20 May 2009 in Vienna. Subsequent to that meeting Germany participates in Continuity Meetings of the contracting parties to the Joint Convention in order to enhance communication and to promote continuity between the review meetings. The preparatory work for the Fourth Review Meeting in May 2012 is in progress. Germany participated at the Organizational Meeting 10-11 May 2011 in Vienna. The National Report for this Review Meeting has been prepared.

b) National Regulation

The Atomic Energy Act was revised on 8 December 2010 by the 11th and 12th amendments and on 31 July 2011 by the 13th amendment. The revised Act went into force on 06 August 2011.

http://www.bfs.de/de/bfs/recht/rsh/volltext/A1_Englisch/A1_08_11_AtG.pdf

Following the "Act on the Structured Phase-Out of the Utilization of Nuclear Energy for the Commercial Generation of Electricity", the 11th amendment granted additional electricity volumes to the operating nuclear power plants, which led to 12 years of additional operating time on average. Seven NPPs whose commercial commissioning was in 1980 or earlier were granted 8 years, the operation time of the younger NPPs were extended by 14 years.

The 12th amendment transposed the Council Directive 2009/71/EURATOM of 25 June 2009, thereby establishing a community framework for making the nuclear safety of nuclear installations into national law. Furthermore, it requires safety measures which provide further precautions against damage in addition to the established licence prerequisites. These measures shall be taken according to the status of science and technology and only if they provide a not only marginal improvement of safety. Finally, the 12th amendment reintroduced the expropriation provisions which were deleted without replacement in 2002. The provisions allow the compulsory purchase for public purposes, which the act defines as the ensuring of the final disposal of nuclear waste. For this reason, the provisions enable

the Federal Office for Radiation Protection to initiate an expropriation procedure for the purpose of exploration for a suitable location for a repository, or the construction and the operation of an approved repository.

The 13th amendment withdrew the additional electricity volumes, ordered shut-down of eight NPPs and determined the dates for final shut-down of the remaining nine nuclear power plants.

The Act on Tax for Nuclear Fuel was prepared in 2010 together with the above mentioned 11th amendment to the Atomic Energy Act and came into force on 1 January 2011.

In June 2010 the Nuclear Safety Officer and Reporting Ordinance (AtSMV) was amended. Beside the established reporting criteria for nuclear power plants and facilities for supply or disposal of nuclear fuel also reporting criteria for research reactors, facilities under decommissioning and installations for storage of nuclear fuel are included in the amended Ordinance. The licensee will be obliged to announce a deputy of the safety officer, and the reporting could be performed by electronic communication. The amended Ordinance entered into force on 1 October 2010.

The development of new nuclear safety regulations to replace the German "Safety Criteria" and to integrate current international regulations is currently being undertaken. An open discussion process has been established to include participation of all stakeholders (see: <http://regelwerk.grs.de/>). In April 2009 the latest update of the draft "Safety Criteria for Nuclear Power Plants" was published as a Green Book for trial application. In the period 1 July 2009 until 31 October 2010 the competent licensing authorities of the *Länder* have applied these new requirements for selected licensing and regulatory oversight procedures. Currently the experience gained is under review; a report will be made as a basis for appropriate amendments to the "Safety Requirements for Nuclear Power Plants".

For further information on currently valid regulatory documents see: <http://www.bfs.de/en/bfs/recht>. English translations available thereof are documented for download at: <http://www.bfs.de/en/bfs/recht/rsh/englisch.html>

The German Nuclear Safety Standards Commission (KTA)

During the 65th meeting of the KTA on 16 November 2010, the following decisions were taken:

- Nine KTA safety standards were reviewed for the need of updating, for the following six of the reviewed standards a revision procedure was started: KTA 1502, 2103, 3401.2, 3503, 3505, and 3701. Three of the reviewed standards were re-affirmed for another 5 years: KTA 3601, 3604 and 3706.
- Eight revised draft safety standards were approved: KTA 1505, 2201.1, 2501, 2502, 3201.2, 3211.2, 3902 and 3903.
- One new safety standard was approved: KTA 1403.
- Four revised safety standards were approved: KTA 1501, 3201.4, 3403 and 3405.

For detailed information on the safety standards mentioned above see

http://www.kta-gs.de/welcome_engl.htm.

c) Recommendations

BMU is supported by three advisory committees regarding nuclear safety, waste management and radiation protection.

The Reactor Safety Commission (RSK) issued recently the following recommendations or statements:

- Regulations on plant conditions after occurrence of an incident (recommendation 07/2011)
- Plant-specific safety review (RSK-SÜ) of German nuclear power plants in the light of the events in Fukushima-1 (Japan) (statement 05/2011)
- Preface and Catalogue of requirements for plant-specific reviews of German nuclear power plants in the light of the events in Fukushima-I (Japan) (statement 03/2011)
- Evaluation of the three-pillar concept for testing of safety-relevant valves (statement 12/2010)
- Basic recommendations for the planning of emergency control measures by the licensees of nuclear power plants (recommendation 11/2010)
- Damage to steam generator (SG) tubes caused by stress corrosion cracking – cause and detection (statement 07/2010)

The complete listing of recommendations and statements by RSK is available on the website

<http://www.rskonline.de/English/index.html>.

The Nuclear Waste Management Commission (ESK - Entsorgungskommission) recently issued the following statements:

- Decommissioning and dismantling of the Obrigheim nuclear power plant (KWO) - 2nd decommissioning and dismantling licence (statement 06/2011)
- Requirements for irradiated fuel elements from the point of view of waste management (statement 05/2011)
- Specification by AREVA NC on medium-level vitrified waste (CSD-B) from the reprocessing of German LWR fuel elements (statement 12/2010)
- Guidelines for the decommissioning of nuclear facilities (recommendation 11/2010)
- Recommendations for guides to the performance of periodic safety reviews for interim storage facilities for irradiated fuel elements and heat generating radioactive waste (PSÜ-ZL) (recommendation 11/2010)
- Guidance for the decommissioning of nuclear facilities (recommendation 09/2010)

For further information see the website <http://www.entsorgungskommission.de/englisch/default.htm>

The Commission on Radiological Protection (SSK) issued recommendations and statements on the following topics:

- Radiation protection of patients in cranial computed tomography (gantry angulation) (recommendation 04/2011)
- Radiation hygiene requirements for highly conformal radiation therapy (statement 04/2011)
- Medical progress and radiation protection (statement 04/2011)
- Use of iodine tablets for thyroid blocking in the event of a nuclear accident (recommendation 02/2011)
- Requirements applying to personal dosimeter (recommendation 02/2011)
- Laser dazzle attacks (recommendation 12/2010)
- Requirements for obtaining a qualification in radiological protection for physicians – Explanatory notes on the practical experience required for the licence (recommendation 12/2010)
- Radiological requirements for the long-term safety of the repository for radioactive waste Morsleben (ERAM) (recommendation 12/2010)
- Guidance Document for Medical Imaging Applications – Changes to Chapter J "Breast Disorders" (recommendation 09/2010)
- Quality control of nuclear medicine equipment – Definition of action levels and tolerance limits (recommendation 09/2010)
- Modern Lamp Types (statement 07/2010)
- General guidelines for emergency planning by nuclear power plant operators (recommendation 07/2010)
- Asse II mine – License for handling radioactive substances pursuant to Article 7 of the Radiation Protection Ordinance (StrlSchV) (statement 07/2010)
- Radiation hygiene requirements for IGRT (image guided radiotherapy) (07/2010)

These recommendations and statements (in German, for some English translations are available), annual reports and other publications are available on <http://www.ssk.de/en/index.htm>

4. Nuclear Fuel and Waste Management

a) Nuclear Waste Management Policy on Repositories

In the Federal Republic of Germany it is intended to dispose of all types of radioactive waste in deep geologic formations. Following the Federal Elections on 27 September 2009 a Coalition was formed by the Christian Democratic Parties (CDU and CSU) and the Liberal Democratic Party (FDP). Pursuant to the coalition agreement of CDU/CSU and FDP the moratorium on the investigation of the Gorleben salt dome will be immediately terminated and the Morsleben and Asse II repositories will be closed in a timely and transparent process. The power utilities shall contribute to the Asse II closure costs.

At the request of the Federal States (*Länder*) BMU agreed on the discussion of the Safety Requirements on the Disposal of Heat-generating Radioactive Waste with the Federal States before setting them into force for their licensing authorities. Subsequent to further discussions and evaluations of the Nuclear Waste Management Commission (ESK) and discussions with representatives

of the Federal States the safety requirements were published on the BMU website.
(http://www.bmu.de/english/nuclear_safety/downloads/doc/44839.php)

These Safety Requirements will set out the safety standards that a repository site for heat-generating radioactive waste in deep geological formations must demonstrably observe in order to comply with atomic energy legislation. They will apply to all sites where the Federal Government, in its capacity as the body responsible for the construction of facilities for the final disposal of radioactive waste, has opted for a plan approval procedure. This includes a possible site selection procedure, too, in the course of which they are to be applied as far as applicable.

b) Repositories for Radioactive Waste

The Konrad repository had been licensed on 22 May 2002. Following necessary planning adjustments, the former iron ore mine is going to be converted into a repository for all kinds of radioactive waste with negligible heat generation. BfS is in charge of this work.

Since 1979 the Gorleben salt dome is subject of an ongoing site exploration programme in order to examine its suitability for hosting a repository for all kinds of radioactive waste, in particular heat-generating waste. The underground exploration at the Gorleben site was interrupted for 10 years 2000-2010 (Gorleben moratorium of 1 October 2000). In March 2010 the German federal environment minister Norbert Röttgen announced that the exploration of the salt dome would resume under a stepwise process including a preliminary safety analysis, based on an updated repository concept and a peer review by international experts. BfS resumed the exploration activities after the end of the moratorium on 1 October 2010. Corresponding licences were granted according to the mining law on 17 and 21 September 2010.

The Gesellschaft für Anlagen- und Reaktorsicherheit (GRS) was commissioned to update the repository concept, to perform the preliminary safety analysis and to summarise all available information on the Gorleben salt dome and the results of exploration activities to date. The results of the preliminary safety analysis are expected by the end of 2012. The results of the preliminary safety analysis as well as the findings of the exploration work at the Gorleben site will be reviewed by an international peer review group, the results being expected in 2013. Referring to the results of the preliminary safety analysis and the international peer review the Ministry for the Environment then will conclude the appropriateness of the salt dome of hosting a HAW repository and whether the site investigation will proceed. In order to achieve openness and transparency to the public an appropriate dialogue and participation process will be implemented to involve the public of the region of the Gorleben site.

The former Morsleben salt mine was used as repository for radioactive waste from 1971 until 1998. An application for the licensing procedure for closure was already filed on 09 May 1997. The respective documents were submitted to the licensing authority and published in 2009. Citizens that are concerned about the project were given the opportunity to address their objections to the licensing authority. The filed objections will be discussed within a public hearing organized by the licensing authority and scheduled to start in mid October 2011.

For the former Asse salt mine, which was used as disposal facility for nuclear waste and as an underground research laboratory, a closure concept is in preparation. Since the beginning of 2009, the Federal Office for Radiation Protection (BfS) took over responsibility for the Asse II mine, holding a licence under the Atomic Energy Act and the Mining Law. Closure of the Asse II mine presents a major challenge because of its design as an old commercial salt mine, its high degree of mined space and progressing degradation in geomechanical stability.

Three complementary and alternative closure concepts were evaluated by BfS and external experts. Following this review including a feasibility and safety study BfS stated that the full retrieval of all emplaced radioactive waste will be the best option to protect the public and the environment. Further investigations to collect the facts will have to support the feasibility of this plan. Currently, BfS prepares the opening of two waste chambers. A license to open the chambers for further investigations was granted on 21 April 2011. Fulfilling the additional licence conditions will require further preparations before drilling is commissioned.

c) Interim Storage of Spent Nuclear Fuel

Three central interim storage facilities are in operation at Gorleben, Ahaus and Rubenow/Greifswald (ZLN). The Gorleben storage facility is the only one in the Federal Republic of Germany that has a licence for the storage of vitrified high-level radioactive waste from the reprocessing of German fuel elements abroad. In November 2009 a license was granted for the interim storage facility at Ahaus also to store radioactive waste from the operation and decommissioning of nuclear power plants for at most 10 years (so-called combined use).

The on-site interim storage facility at Jülich contains the spent fuel spheres from the prototype AVR high temperature reactor. Because the license for the AVR storage facility is limited to June 2013, a license to store the 152 casks in the central interim storage facility at Ahaus was applied for in 2009.

Twelve on-site interim storage facilities at the sites of the nuclear power plants have been licensed by BfS between November 2002 and December 2003, all are in operation. In April 2005 an application for an interim storage facility has been filed for the Obrigheim nuclear power plant site. The licence procedure is not yet finalized.

d) Nuclear Fuel Fabrication and Reprocessing

At Lingen a facility for the fabrication of fuel elements for light water reactors (ANF) including storage facility for UF₆-container is in operation. The capacity for uranium conversion is 800 t per year, the other systems have a capacity of 650 t uranium per year.

The Gronau Uranium Enrichment Plant (URENCO Germany) is in operation with a capacity of up to 4,500 tSW/a. Programmes to expand the original design capacity of 1,000 tSW/a up to today's capacity of 4,500 tSW/a were implemented by several licences, granted at the latest in 2005. The additional systems were constructed since mid 2008 and stepwise commissioned.

At the Karlsruhe Reprocessing Plant (WAK - in decommissioning) the vitrification of 60 m³ HAWC (High Active Waste Concentrate) has been completed in June 2010. Until then 122 vitrified waste containers suitable for final disposal were produced. Flushing operation of the vitrification facility (VEK) subsequently started and 18 further vitrified waste containers have been produced until November 2010. In total, 56 t of vitrified waste were produced. The waste containers were placed into 5 transport and storage casks and were shipped to the storage facility ZLN at Rubenow/Greifswald in February 2011. The VEK vitrification facility has completed its assigned task; operation has been terminated. For the decommissioning of the WAK two licenses were granted on 23 April 2010 (deregulation after finish of vitrification) and on 08 December 2010 (dismantling of HAWC-storage-vessels).

e) Transports

The spent nuclear fuel shipments and shipments of vitrified waste are subject to the approval requirements of § 4 of the Atomic Energy Act. Licensing authority is BfS. According to the German Atomic Energy Act, shipments of spent fuel to reprocessing plants are not allowed anymore since 01 July 2005.

Nine licences for the transport of vitrified nuclear waste from the French reprocessing plant in La Hague to the Gorleben interim storage facility were issued from 2000 until today. During this time period 94 casks with vitrified waste were shipped. The latest transport comprised 11 casks and was performed on 5-9 November 2010. Major demonstrations of anti nuclear people accompanied the transport in the Gorleben area involving a high presence of police. The event achieved high media coverage. The next transport is scheduled for late 2011.

5. Radiation Protection

Regulatory guidelines in radiation protection are reviewed and revised on a regular basis.

The work on the following topics is of special interest. Requirements may lead to new legal documents or revision of existing regulatory guidelines:

- Reduction of exposures for patients and personnel during interventional radiology,
- Monitoring of workplaces where personnel is exposed to beta radiation,
- Competence requirements in radiation protection for all areas (nuclear, industrial, medical, research applications),
- Clearance of radioactive substances.

Discussions are ongoing with regard to the consequences of the Fukushima accident for precautionary radiation protection and emergency management measures in Germany.

In addition, discussions are ongoing with regard to

- Experiences gained with the operation of the National Register on High-activity Radiation Sources,
- Experiences gained with the operation the National Radiation Protection Register (Register of doses of occupationally exposed persons), in particular, handling of radiation passports
- Experiences gained with the implementation of the Guidelines on Competence in Radiation Protection,
- Maintaining competence in radiation protection,
- Competence in radiation protection for the application of devices for digital volume tomography ENT specialised medical doctors
- Preparatory activities for the evaluation of the German Mammography Programme,
- Quality assurance in mammography
- Teleradiology – impact on licensing procedures,
- Reduction of patient doses (CT procedures) due to application of specific software tools enhancing image quality,
- Application of electronic personal dosimeters
- Selective Internal Radiotherapy (SIRT)
- Intraoperative radiotherapy (IORT)
- beta dosimetry at radiosynoviortheses (RSO) work places
- Organisation of medical emergency management
- Justification of asymptomatic individuals taking part in health screening programmes or individual health assessment involving radiation
- Referral criteria
- Quality assurance in radiotherapy
- Criteria for acceptability of medical radiological equipment used in diagnostic radiology, nuclear medicine and radiotherapy
- Justification of proton therapy
- Cooperation within HERCA (Heads of European Regulatory Control Authorities)
- Shortage of radioisotope supply.
- Security of radioactive materials
- Radiation protection in geothermal energy usage
- Pu-containing pacemakers
- Safety requirements for final repositories of heat-generating radioactive wastes

In general, an important aspect of all discussions is the simplification of state supervision and how to achieve less bureaucracy.