



## Shipments of vitrified high-level radioactive waste from France to Germany as routine shipments with special train service

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Delivery of spent fuel elements from nuclear power plants in Germany at the reprocessing facility of COGEMA in Cap de la Hague

The first shipment of spent fuel elements to the reprocessing facility of COGEMA in Cap de la Hague took place in 1973 (29. May 1973; one cask from NPP Obrigheim to COGEMA).

Since 1979 contracts between the operators of the nuclear power plants and the reprocessing plant in La Hague were in force. These contracts being granted by changing of notes between the government of the Federal Republic of Germany and the government of France. In the mean time the reprocessing contracts have had a value of 5 708 metric tons of heavy metal (spent fuel).

The situation in September 2004 shows, that roughly 5 400 t of heavy metal were shipped to the reprocessing facility in France. Up to the new German Atomic Law - in force since 2002 - shipments of spent fuel should be finished June, 30<sup>th</sup> 2005; it is expected that spent fuel from Stade Nuclear Power Plant – a NPP out of service since November 2003 – will be the last shipment with spent fuel from Germany to France in 2005.

At the end of this period roughly 5400 tons of heavy metal of spent fuel from nuclear power plants in Germany will be delivered since 1973 to the reprocessing facility in France.

contract	Spent Fuel [t] Heavy Metal	canister	Canister per t HM	No. of casks
“old contract”	4.581	2.532	0,55	90
“new contract”	1.127	1.026	0,91	37
<b>Both contracts fulfilled</b>	<b>5.708</b>	<b>3.557</b>	-	<b>127</b>
<b>Example I</b>	<b>4.581 + 819 = 5.400</b>	<b>2.532 + 746 =3.278</b>		<b>117</b>
<b>Example II</b>	<b>4.581 + 769 =5.350</b>	<b>2.532 + 700 = 3.232</b>		<b>115</b>

Up to the French Law (Verdict No. 91 – 1381, 30. December 1991) radioactive waste arising from reprocessing of German spent nuclear fuel at the La Hague reprocessing plant should be returned to the country of origin – in this case Germany

In compliance with the contracts signed between COGEMA and the German utilities, for which agreements have been signed between the Governments of France and Germany, the German utilities have to take back the residues resulting from the reprocessing of their spent fuel after the technical and administrative preconditions are fulfilled. The return of the residues is performed by the Company for Nuclear Service (GNS) which is a subsidiary of all German utilities and acts on their behalf.

For this purpose the Radiation Protection Agency (Bundesamt für Strahlenschutz, BfS) in Germany issued in 1995 a storage license for high-active vitrified radioactive waste as a content of transport- and storage casks of the French type TS 28 V or a CASTOR HAW 20/28 CG – cask for to the existing intermediate storage facility in Gorleben up to para 6 of the German Atomic Law.

The first shipment with a transport- and storage cask of the French type TS 28 V took place in 1996. In 1997 two casks of the German type CASTOR HAW 20/28 CG followed.

<b>Year</b>	<b>Date of shipment Arrival in Gorleben</b>	<b>No. of casks</b>	<b>HAW-Casks within the Interim Storage Facility Gorleben</b>
<b>1996</b>	<b>08. May 1996</b>	<b>1</b>	<b>1</b>
<b>1997</b>	<b>05. March 1997</b>	<b>2</b>	<b>3</b>

The next shipment of vitrified waste to Gorleben was scheduled for the end of the year 1998. But the occurring problem of non-compliance with the contamination limits for shipments of spent fuel to and from the reprocessing facilities in France and the United Kingdom lead to a delay of the shipments of vitrified high-level radioactive waste up to the year 2001.

The second reason for the delay was a severe problem of fatigue with an iron-construction of the railway-bridge to the river Jeetzel near to the railway station at Dannenberg not so far away from Gorleben. The old railway bridge from the nineteenth's century was scrapped and a new construction was build in the year 2000.

“French / German Working Group on Waste Shipments”:

During the year 1999 it was clear that the delay of waste shipments was a major unresolved problems between both countries. Discussions between the Ministries of Foreign Affairs of both countries started in 1999. The final discussion took place during the “76. France -German Summit”, November 2000, in Vittel, France. As a result from these various discussions, several meetings and the final decision in Vittel, a “French / German Working Group on Waste Shipments” were established and the first working group meeting started in March 2001. Since 2001 working group meetings took place two times a year, as a fruitful cooperation between both countries.

In March 2001 a shipment with 6 casks with vitrified high-level radioactive waste started at the railway station Valognes and reached the interim storage facility in Gorleben three days later.

In March and November 2001 a single shipment with 6 casks was organized, in November 2002 and 2003 shipments with 12 casks followed. In September 2004 the total amount of 39 casks with vitrified high-level radioactive waste are stored within the intermediate storage facility in Gorleben; at the end of this year 51 casks with vitrified high-level radioactive waste are expected.

<b>Year</b>	<b>Date of shipment (Arrival in Gorleben)</b>	<b>No. of casks</b>	<b>HAW-Casks within the Interim Storage Facility Gorleben</b>
<b>2001</b>	<b>29. March 2001</b>	<b>6</b>	<b>9</b>
<b>2001</b>	<b>14. November 2001</b>	<b>6</b>	<b>15</b>
<b>2002</b>	<b>14. November 2002</b>	<b>12</b>	<b>27</b>
<b>2003</b>	<b>13. November 2003</b>	<b>12</b>	<b>39</b>
<b>2004</b>	<b>expected</b>	<b>12</b>	<b>51</b>

Transport of vitrified high-level radioactive waste was done by a special train service from Valognes, France, to the railway station Dannenberg, Germany; nearby Gorleben and heavy-load truck access from the La Hague Plant to Valognes and from the railway station Dannenberg to the storage facility in Gorleben.

The 12 casks – shipment is “the state of the art”.

Within the time-period of one year at the reprocessing facility in Cap de la Hague loading schedule for these 12 casks is a maximum for customers in Germany up to COGEMA's contracts with other Nuclear Power Plants in Switzerland, Belgian and Japan.

It seemed to be unrealistic that more than 12 casks with vitrified high-level radioactive waste dedicated to customers in Germany will be loaded per year from COGEMA. For the special train service there is no public time-schedule, from Valognes, France, to Dannenberg, Germany, the rail-shipment has had a duration of 45 hours (starting in Valognes 9. November, arrival at Dannenberg 12. November 2003). Switching within one hours and loading/unloading at Dannenberg, 12 hours, means that very early the next morning the road transport with heavy-load trucks to Gorleben, needed less than one hours for the road-shipment.

The special train service in Germany with

- 4 locomotives (Diesel, 6 – axle, 2.400 kW per locomotive, 120 tons))
- 12 special 8-axle heavy-goods railway cars for 12 CASTOR casks; each car with a total weight of 160 tons
- 12 accompanying cars for police-guards

Total length: 649 m

Weight: 2.912 t

18.485 police-guards were involved in the last transport in November 2003.

With a total length of 649 meters the special train reaches the maximum length of trains within the German Rail Systems, because the normal length of sidings in the German Rail-network is 720 meters.

As a result of the experience which was made in the last two years, the special train could not be longer than 12 casks. A train with 12 casks is the optimum condition. Special train service with 15 or 18 casks is nowadays impossible within the existing railway system in Germany (and France). Because there is no chance that the railway company is able to build new sidings, for which the railway company needs an important value of money within an existing railway system.

#### German Policy on the Storage of Spent Fuel:

Germany's policy and strategy on the management and storage of spent fuel has undergone a number of modifications and changes also with reaction upon the concepts of storage of spent fuel.

- From the beginning of the commercial use of nuclear power up to 1994, the relevant legislation, the Atomic Energy Act, included the requirement of reusing the fissile material contained in the spent fuel elements. Until today German spent fuel elements are reprocessed in France and the UK. Following the concept of reusing the storage of spent fuel takes only place in the pools of the NPP's or in the reception pools of the reprocessing plants.
- At the end of the 70th there had been discussions between the government and the utilities to open the way of direct disposal of the spent fuel. This discussion leads to a decision of the heads of the governments of the federation and the states to examine the technical and economical aspects of this way. In this decision the installation of so called central storages for spent fuel was agreed which should be used as buffer before moving the spent fuel abroad in case of bottlenecks in the storage capacity of the NPP pools or the reception pools of the reprocessing plants. As well these storages could be used for storing the spent fuels be destined for direct disposal if this way is opened.
- In 1994, the Atomic Energy Act was appropriate modified in a way that in this law both options, either the reuse of the fissile material in the spent fuel or its direct disposal, is regarded in the same ranking. The amendment of the law opened only the possibility of following these two options, the decision to use one of these options or both rested solely with the operators of nuclear power stations. Preparative to this situation, two central storage facilities (Gorleben and Ahaus) were commissioned for dry storage of casks for spent fuel elements and in addition of casks for vitrified HAWC (high active waste concentration) repatriated from the reprocessing abroad.

The German Government has decided, in accordance with the power utilities, to phase out nuclear power by limiting the standard lifetime of the nuclear power plants to 32 years from the date of their commissioning. With an agreement negotiated between the Federal Government and the power utilities of 14 June 2000 (ratified on 11 June 2001), in spite of the prevailing differences of opinion on the use of nuclear power, the German power industry has demonstrated that it respects the Federal Government's decision to phase out the production of electricity from nuclear energy in a carefully coordinated process

The phasing out was fixed 2002 in the "Act for the Regulated Termination of the Commercial Use of Nuclear Power". In this law, a remaining operation time is fixed for each nuclear power plant and a new waste management concept was developed. Concerning the spent fuel management the separation of Uranium and Plutonium of the spent fuel was no longer desired politically with the consequence that only the direct disposal of the spent fuel will be allowed.

Up to the existing contracts between the operators of the nuclear power plants and the reprocessing plants in La Hague and Sellafield being granted by changing of notes between the government of the Federal Republic of Germany and the governments of the two reprocessing states France and United Kingdom. As of

June 30, 2005 transports to reprocessing will be prohibited in accordance with the mentioned amendment to the Atomic Energy Act (AtG) of April 22, 2002. Until that date, the quantities of spent fuel elements contractually agreed with the reprocessing facilities must have been taken to side facilities by the nuclear power plant operators. For the rest of the spent fuel then existing in Germany and those generated in the remaining lifetime of the NPP's only direct disposal will be possible.

As there is as yet no repository available for spent fuel elements, they will be stored intermediately at the site where they were used until such time as the repository is commissioned, in order to avoid the transportation of spent fuel and help spread the burden. If the licensing and subsequent construction proceeds on schedule, all onsite storage facilities are expected to be commissioned and ready for use by 2006.

The Federal Government is aiming to establish a repository in deep geological formations for the disposal of all kinds of waste including spent fuel elements by the year 2030.

The shipments of vitrified high-level radioactive waste by a special train service with 12 casks from Valognes, France, to Gorleben, Germany should be the normal procedure for the following years.

<b>Year</b>	<b>Date of shipment</b>	<b>No. of casks</b>	<b>HAW-Casks within the Interim Storage Facility Gorleben</b>
<b>2004</b>	<b>expected</b>	<b>12</b>	<b>51</b>
<b>2005</b>		<b>12</b>	<b>63</b>
<b>2006</b>		<b>12</b>	<b>75</b>
<b>2007</b>		<b>12</b>	<b>87</b>
<b>2008</b>		<b>12</b>	<b>99</b>
<b>2009</b>		<b>12</b>	<b>111</b>
<b>2010</b>		<b>12</b>	<b>123</b>
<b>2012</b>		<b>4</b>	<b>127</b>

Up to the reprocessing contracts between COGEMA and German Nuclear Power Utilities not more than 127 casks with vitrified high-level radioactive waste (3.556 glass canisters) should be shipped to Gorleben.

If the routine 12 casks shipment per year will be continued, the last shipment will arrive at the intermediate storage facility in Gorleben not later than 2012.

But – as further mentioned – less than 127 casks with vitrified high-active waste will be shipped to Gorleben. It is a realistic view that only 120 casks will be prepared in the reprocessing facility in Cap de la Hague due to the lower mass of spent fuel elements shipped from NPP's in Germany to Cap de la Hague. A mass reduction of 300 t of heavy metal may produce only 3.360 vitrified glass canisters, loaded for 120 casks. In this case the last shipment will take place in 2011.