NUCLEAR FUEL CYCLE INSTALLATIONS

CHAPTER 13

Fabrication of the fuel and its subsequent reprocessing after it has been used in the nuclear reactors (NPPs) constitute the fuel cycle. However, by convention, the cycle begins with extraction of the uranium ore and ends with disposal of a range of radioactive wastes arising from the spent fuel.

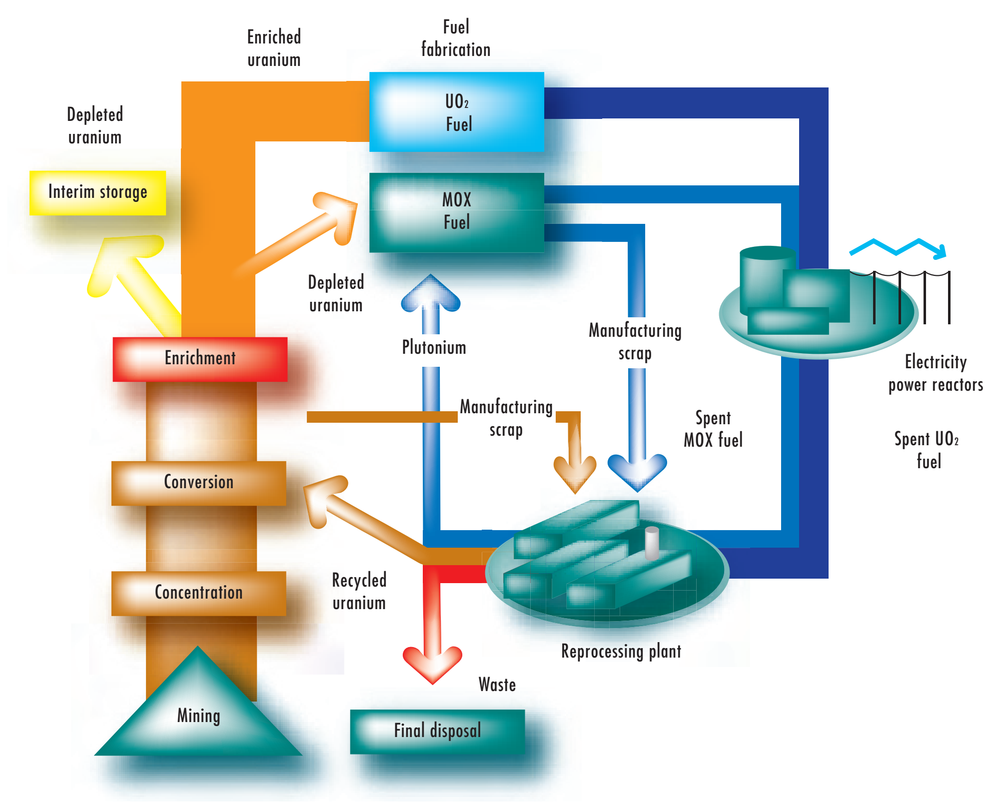
The uranium ore is extracted, then purified and concentrated into "yellow cake" on the mining sites. The solid yellow cake is then converted into uranium hexafluoride gas (UF_6) during the conversion operation. This fabrication of the raw material for enrichment is carried out by COMURHEX in Malvési (Aude *département**) and Pierrelatte (Drôme *département*). The installations involved – which are not regulated as basic nuclear installations (BNIs) – use natural uranium whose uranium 235 content is about 0.7%.

Most of the world's NPPs use uranium which is slightly enriched with uranium 235. For example, the pressurised water reactor (PWR) series requires uranium enriched to between 3 and 5% with isotope 235. Raising this proportion from 0.7% to between 3 and 5% is the role of the EURODIF plant in Tricastin, which separates the UF_6 by means of a twin-stream gaseous diffusion process, with one stream becoming enriched in uranium 235, while the other becomes depleted during the course of the process.

The process used in the FBFC plant at Romans-sur-Isère transforms the enriched UF_6 into uranium oxide powder. The fuel pellets manufactured with this oxide are clad to make up the fuel rods, which are then combined to form the fuel assemblies. These assemblies are then placed in the reactor core where they release power by fission of the uranium 235 nuclei.

After about three to five years, the spent fuel is removed from the reactor and cooled in a pond, first of all on the plant site and then in the AREVA NC reprocessing plant at La Hague.

The fuel cycle



*Administrative region headed by a *préfet*.

Table 1: fuel cycle industry movements[1]

Installation	Origins	Material processed	Tonnage	Product obtained	Destination	Tonnage (unless otherwise specified)
COMURHEX Pierrelatte[2]		$UO_2(NO_3)_2$ (derived from reprocessed uranium)		UF_4 UF_6 U_3O_8		
AREVA NC Pierrelatte TU5 facility	**CEA** Marcoule **AREVA NC** La Hague	$UO_2(NO_3)_2$ (derived from reprocessed uranium)	1252 3634	U_3O_8	Storage	375 1093
AREVA NC Pierrelatte W plant	**URENCO** **EURODIF**	UF_6 (based on depleted uranium)	8789 9064	U_3O_8	Storage	7053 7155
EURODIF Pierrelatte	Converters and **EURODIF** Production	UF_6 (derived from natural and depleted uranium)	20846	UF_6 (depleted uranium)	Defluorination and re-enrichment of tails	19306
	Re-enrichment of tails	UF_6 (based on enriched uranium)	1096	UF_6 (enriched uranium)	Fuel manufacturers	2410
FBFC Romans	**EURODIF** Pierrelatte **TENEX** **URENCO**	UF_6 (based on enriched natural uranium)) (ML[3])	528.866	UO_2 (powder)	FBFC, Dessel (Belgium), NFI (Japan), AREVA (France)	172.090
				Fuel elements derived from enriched natural uranium	EDF, Tihange + Doel (Belgium), KOEBERG (South Africa)	303.236 55.965 29.629
	AREVA NC	UF_6 (based on enriched natural uranium) (ML[3])	43.525	UO_2 (powder) Fuel elements derived from enriched natural uranium	EDF	0 35.851
MELOX Marcoule	**AREVA NC** Pierrelatte **AREVA NC** La Hague	UO_2 (based on depleted uranium) (ML[3]) PuO_2 (ML[3])	119.3 10.9	MOX fuel elements (ML[3])	CNPE EDF FBFC-Dessel AREVA NC La Hague (Japan)	141.1[4]
AREVA NC La Hague	UOX and MOX: EDF, CAORSO	Reprocessed irradiated fuel elements: UP3 $(U+Pu)_{init}$	686.32	$UO_2(NO_3)_2$ (tons of U)	Pierrelatte	1092.05
	RTR: BR2 MOL	Reprocessed irradiated fuel elements: UP3 $(U+Pu)_{init}$	0.12	PuO_2	AREVA NC MELOX	12.61 t[5]
	UOX and MOX: EDF	Reprocessed irradiated fuel elements: UP2 800 UP3 $(U+Pu)_{init}$	242.53	Number of vitrified waste packages produced in UP3	Interim storage La Hague	468 CSDV
		Reprocessed irradiatued fuel elements: UP2 400	0	Number of vitrified waste packages produced in UP2 800	Interim storage La Hague	371 CSDV
	UOX: EDF and CAORSO RTR: ILL Grenoble, OSIRIS and ORPHEE	Irradiated fuel elements unloaded into a pool $(U+Pu)_{init}$	1185.22	Number of compacted waste packages produced in UP2 800	Interim storage La Hague Switzerland and Netherlands	1459 CSDC 80[6] CSDC

(1) The table only deals with the movements inside fuel cycle BNIs, including those in the AREVA NC W plant, which is an ICPE (installation classified on environmental protection grounds) located within the boundary of a BNI.
(2) The facilities have been finally shut down and they received, shipped or converted no material. Production ceased in January 2008.
(3) Heavy metal
(4) Value which includes the production from 2008 but which was accepted in 2009.
(5) Production of PuO_2 in 2009: 12.07 tons and 1.4 kg of samples. The samples are not shipped to MÉLOX.
(6) These are the first shipments of CSD-C packages from La Hague in 2009. These CSD-C were not produced in 2009.

In this plant, the uranium and plutonium from the spent fuels are separated from the fission products and the other actinides. The uranium and plutonium are packaged and then stored for subsequent reuse. The radioactive waste produced by these operations is disposed of in a surface repository if low-level, or in storage pending a final disposal solution.

The plutonium resulting from reprocessing is used to manufacture fuel for fast neutron reactors (as was done in the ATPu in Cadarache). Alternatively, in the Marcoule MÉLOX plant, it can be used to manufacture the MOX fuel (mixture of uranium and plutonium oxides) used in particular in the French 900 MWe PWR reactors.

The main plants involved in the fuel cycle – COMURHEX, AREVA NC Pierrelatte, EURODIF, FBFC, MÉLOX, AREVA NC La Hague – are part of the AREVA group.

1 MAIN INSTALLATIONS IN OPERATION

1 | 1 The uranium conversion, processing and enrichment plants in operation at Tricastin

To allow production of fuels usable in the French reactors, uranium ore first has to be converted into UF6 and then enriched. These operations take place mainly on the Tricastin site, also known as Pierrelatte.

1 | 1 | 1 AREVA NC TU5 facility and W plant

On the Pierrelatte site, AREVA NC operates:
- the TU5 facility (BNI) for conversion of uranyl nitrate (UO_2 $(NO_3)_2$), produced by reprocessing spent fuel, into uranium tetrafluoride (UF_4) or into uranium sesquioxide (U_3O_8). However, the current technical configuration of the installation is not compatible with the production of UF_4;
- the W plant (ICPE within the BNI perimeter) for conversion of depleted UF_6 into U_3O_8, a solid compound which offers safer storage conditions and recycling of the hydrofluoric acid.

The installation can handle up to 2,000 metric tons of uranium per year.

Storage of depleted uranium on the Tricastin site (Drôme *département*)

The uranium from reprocessing is partly placed in storage on the AREVA NC Pierrelatte site and partly sent abroad for enrichment and reuse in the fuel cycle.

1 | 1 | 2 The uranium isotopes gaseous diffusion separation plant (EURODIF)

The isotope separation process used in the EURODIF plant is based on gaseous diffusion. The plant comprises 1,400 cascaded enrichment modules, split into 70 sets of 20 modules grouped in leak-tight rooms.

The gaseous enrichment principle consists in repeatedly diffusing UF_6 gases through porous walls called "barriers". These barriers give preferential passage to the uranium isotope 235 contained in the gas, thereby increasing the proportion of this fissile isotope in the UF_6 at each passage.

The UF_6 is introduced in the middle of the cascade, with the enriched product drawn off at one end and the depleted residue at the other.

Owing to the old design of this plant, the end of production is planned for about 2012. The final shutdown and decommissioning operations should take about ten years. The EURODIF plant will be replaced by the Georges Besse II plant (GBII), in which the enrichment process is based on ultracentrifuging technology.

ASN is already monitoring the first studies undertaken by the licensee concerning the shutdown procedures. Given the masses involved – 150,000 tons of steel for the diffusers for example – it is important to anticipate the inventory and characteristics of the equipment in order to optimise processing, disassembly, transport and disposal.

At the end of October 2008, the licensee also submitted an application for a modification to the EURODIF plant's

Decommissioning of Eurodif on the Tricastin site (Drôme *département*) will lead to the decommissioning of about 150,000 tons of steel

creation authorisation decree. This application concerned an increase in the maximum quantity of UF_6 present in the facility and a number of operations on behalf of the site licensees concerning the reception, shipment and monitoring of the UF_6. This application also concerns sorting and packaging of non-radioactive waste. The perimeter of the facility will therefore be modified in order to include the chlorine trifluoride (ClF3) disposal facility, which is an ICPE.

ASN began to examine this modification in 2009 and considered the dossier to be acceptable. A public inquiry will have to be held to discuss this modification.

In 2008, ASN was notified of three incidents involving 48Y or 30B type UF_6 containers. The handling measures requested by ASN following these incidents were implemented in 2009. The incident concerning boron release into the Gaffière river also led to an action plan which was implemented in late 2009. The licensee installed a boron measurement system to detect leaks, along with shut-off valves actuated from the facility's control room.

Finally, in 2009, an ASN inspection on waste management led to notification of an incident rated level 1 on the INES scale. This event concerns significant deficiencies in criticality risk prevention during storage of fissile materials in waste areas not specifically designed for this purpose. One of the causes of this event was a problem with supervision by the contractor responsible for waste management. ASN asked for remedial measures to be taken and an inspection will be carried out in 2010 to check their implementation.

1 | 1 | 3 The Georges Besse II ultracentrifugation enrichment plant project (GBII)

The ultracentrifugation process should eventually replace gaseous diffusion. This process, which will be operated by the *Société d'Enrichissement du Tricastin* (SET), consists in rotating a cylindrical bowl containing UF_6 at very high speed. The centrifugal force concentrates the heavier molecules (containing uranium 238) on the periphery, while the lighter ones (containing uranium 235) are recovered in the centre.

This process has two key advantages over the gaseous diffusion process currently used by EURODIF: on the one hand, it consumes far less energy (75 MW as opposed to 3,000 MW for equivalent production), and on the other, the design is safer (far less nuclear materials in the cascades, plus centrifuges below atmospheric pressure).

Creation of GBII, which comprises two separate enrichment facilities (South and North) and support facilities, was authorised by a decree on 27 April 2007.

The review carried out by ASN and its technical support organisations, IRSN and the Advisory Committee for laboratories and plants (GPU), revealed that the low level of UF_6 stocks in the enrichment modules and the operating conditions of the centrifugation process contribute to a high level of control of the risk of radioactive and chemical material dissemination. ASN also considers that the licensee has adopted satisfactory measures to control the risks associated with maintenance work being performed alongside normal operations, owing to the modular design of the plant.

ASN considered that the safety and radiation protection arrangements presented by the licensee for commissioning of the South facility are satisfactory and in early 2009 it authorised commissioning of the facility. This commissioning is dependent on a number of technical requirements explaining the centrifugation plant's start-up and operating conditions.

In January 2008, SET also submitted an application for modification of the creation authorisation decree for the

Cascade of centrifuges in the GBII facility on the Tricastin site (Drôme *département*)

GBII BNI (168). The public inquiry on this matter took place from 22 December 2008 to 30 January 2009 and the coordinating *préfet* approved the modification.

The arrangement envisaged by SET when the GBII project was launched, was to rely on a support facility called REC II – an integral part of the GBII BNI – and a TE facility operated by AREVA NC. AREVA decided to merge the TE and REC II functions. The resulting facility, incorporated into the GBII project, will provide services for licensees of other installations on the Pierrelatte site and will share resources with the GBII North facility, including the storage areas for UF_6 containers and the control room. This support installation should enter service by 2011.

1 | 2 Nuclear fuel fabrication plants in Romans-sur-Isère and Marcoule

After the uranium enrichment stage, the nuclear fuel is manufactured in various installations, depending on the type of reactor for which it is intended. The UF_6 is converted into uranium oxide powder so that after processing it can be made up into fuel rods, themselves subsequently assembled to form fuel assemblies.

This fuel, whether intended for PWRs or for fast or research reactors, is manufactured at FBFC in Romans-sur-Isère or MÉLOX in Marcoule, the latter installation being designed for the manufacture of fuels containing plutonium.

1 | 2 | 1 The FBFC and CERCA uranium-based fuel fabrication plants

The two BNIs located on the Romans-sur-Isère site belong to the CERCA and FBFC companies respectively. These two companies are now an integral part of the AREVA group. As far as the regulations are concerned, the FBFC company is the sole nuclear licensee for the site.

The CERCA plant comprises a series of facilities for the manufacture of highly enriched uranium based fuel for experimental reactors.

FBFC plant production, consisting of uranium oxide powder or fuel assemblies, is intended solely for light water reactors (PWR or BWR).

FBFC nuclear fuels fabrication plant

By a decree of 20 March 2006, FBFC was authorised to raise the plant's annual capacity to:

– 1,800 tons for the conversion facility;

– 1,400 tons for the rod, pelletizing and assembly lines.

However, pending the end of the work to renew and modernise the industrial tool, ASN restricted the capacity of the pelletizing lines to 1,000 tons per year. The industrial tool renewal and modernisation work continued in 2009. Part of the year was devoted to adjusting the production lines, in particular the new uranium pellets sintering[1] furnaces.

1. Sintering is a very high-temperature baking operation which transforms the compacted "raw" uranium pellets into pellets with a composition similar to that of a ceramic.

New sintering furnace for the uranium pellets production line in the FBFC plant in Romans-sur-Isère (Drôme *département*)

CERCA fuel elements fabrication plant

The CERCA plant, one of France's oldest nuclear installations, predates the BNI regulations. The Government was therefore simply notified of this installation in 1967.

In order to improve regulation of the activities carried out in the installation, work on drafting the requirements stipulated in Act 2006-686 of 13 June 2006 was started.

These technical requirements are currently being finalised.

While this is being done, and in accordance with the conclusions of the periodic safety review carried out on this installation in 2006, ASN is particularly vigilant to human factors being considered in the routine operation of the units and in handling of the waste produced by the site's activities.

No particular safety-related events occurred in 2009.

1 | 2 | 2 The MÉLOX uranium and plutonium based fuel fabrication plant in Marcoule

The MÉLOX plant is today the only French nuclear installation producing MOX fuel, consisting of a mixture of uranium and plutonium oxides.

In a decree of 20 March 2007, MÉLOX was authorised to raise the production capacity of its Marcoule plant to 195 tons of heavy metal.

As this increase does not entail any significant modifications to the industrial tool, ASN remains particularly attentive to ensuring that the organisation adopted for operation is appropriate and sufficient and that radiation protection optimisation measures are reinforced.

In 2008, pursuant to the requirements of Article 29 of decree 2007-1557 of 2 November 2007, the CEO of the MÉLOX SA company submitted an application for the transfer of nuclear licensee status from AREVA NC to the MÉLOX SA company.

ASN reviewed this application in 2009 and subsequently drafted a decree which will be presented to the ministers for signature in 2010. However, this authorisation will only become effective once ASN has issued a decision confirming that the licensee has indeed complied with the obligations of Article 20 of the "Waste Act" of 28 June 2006, concerning the provision of guarantees to cover the financial cost of decommissioning nuclear facilities and the management of radioactive waste.

2009 was marked by the event on 3 March 2009 which was rated level 2 on the INES scale (see section 3). Owing to the considerable criticality risk control margins designed into the facility, this incident had no real consequences.

As a result of this incident, the licensee immediately took remedial measures. It also reviewed all the software used both for accounting the fissile materials and for checking criticality, as part of the ten-yearly safety review it has just started on the facility.

1 | 3 AREVA NC reprocessing plants at La Hague

1 | 3 | 1 Presentation

The La Hague plant, designed for reprocessing of fuel irradiated in the power reactors (GCR then PWR) is operated by the Compagnie générale des matières nucléaires (AREVA NC), which replaced CEA as nuclear licensee under the terms of a decree of 9 August 1978.

The various facilities in the UP3, UP2 800 and STE3 were commissioned from 1986 (reception and storage of spent fuel) to 1994 (vitrification facility), with most of the process facilities becoming active in 1989/1990.

The decrees of 10 January 2003 set the individual capacity of each of the two plants at 1,000 tons per year of metal before passage in the reactor (U or Pu), and limit the total capacity of the two plants to 1,700 tons.

The discharge limits and conditions were revised by the order of 8 January 2007.

The production facilities in the UP2 400 plant have been shut down (see point 2).

Operations carried out in the plant

The main processing chain of these facilities comprises reception and interim storage installations for spent fuel, plus facilities for shearing and dissolving it, chemical separation of fission products, final purification of the uranium and plutonium and effluent treatment.

The first operations to take place in the plant are reception of the transport containers and storage of the spent fuel. Upon arrival at the reprocessing plant, the containers are unloaded, either underwater, in a pond, or dry, in a leak-tight shielded cell. The fuel is then stored in the ponds.

After shearing of the rods, the spent fuel is separated from its metal cladding by dissolving in nitric acid. The pieces of cladding, which are insoluble in nitric acid, are removed from the dissolver, rinsed in acid and then water and transferred to a packaging unit. The solutions taken from the dissolver are then clarified by centrifugation.

The separation phase consists of initial separation of the fission products and the transuranic elements from the uranium and plutonium contained in the solutions, and then of the uranium from the plutonium.

After purification, the uranium, in the form of uranyl nitrate (UO_2 $(NO_3)_2$), is concentrated and stored. It is intended for conversion into a solid compound (U_30_8) in the Pierrelatte TU5 installation.

After purification and concentration, the plutonium is precipitated by oxalic acid, dried, calcinated into plutonium oxide, packaged in sealed boxes and placed in storage. The plutonium can be used in the manufacturing of MOX fuel.

The production operations, from shearing up to the finished products, use chemical processes and generate gaseous and liquid effluents. These operations also generate what is called “structural” waste.

The gaseous effluents are given off mainly during cladding shearing and during the boiling dissolving operation. These discharges are processed by washing in a gas treatment unit. Certain residual radioactive gases, in particular krypton and tritium, are simply checked before being released into the atmosphere.

The liquid effluents are processed and generally recycled. Certain radionuclides, such as iodine and less active products are, after checking, sent to the marine discharge pipe. The others are sent to facilities for encapsulation (glass or bitumen).

Solid waste is packaged on the site. Two methods are used: compacting and encapsulation in cement.

Aerial view of the AREVA NC site at La Hague (Manche *département*)

The installations at La Hague

• **BNI 80:**	*high activity fuel*
HAO/North:	*facility for underwater unloading and spent fuel storage*
HAO/South:	*facility for shearing and dissolving of spent fuel elements*
• **BNI 33:**	*UP2 400 plant, the first reprocessing facility*
HA/DE:	*facility for separation of uranium and plutonium from fission products*
HAPF/SPF (1 to 3):	*facility for fission product concentration and storage*
MAU:	*facility for uranium and plutonium separation, uranium purification and storage in the form of uranyl nitrate*
MAPu:	*facility for purification, conversion to oxide and initial packaging of plutonium oxide*
LCC:	*product central quality control laboratory*
• **BNI 38:**	*STE2 installation: collection, treatment of effluents and storage of precipitation sludges in AT1 facility, prototype installation currently being decommissioned*
• **BNI 47:**	*Elan II B facility, CEA research installation currently being decommissioned*
• **BNI 116:**	*UP3 plant*
T0:	*facility for dry unloading of spent fuel elements*
D and E ponds:	*ponds for storage of spent fuel elements*
T1:	*facility for shearing of fuel elements, dissolving and clarification of solutions obtained*
T2:	*facility for separation of uranium, plutonium and fission products, and concentration/interim storage of fission products solutions*
T3/T5:	*facilities for purification and storage of uranyl nitrate*
T4:	*facility for purification, conversion to oxide and packaging of plutonium*
T7:	*facility for vitrification of fission products*
BSI:	*facility for plutonium oxide storage*
BC:	*plant control room, reagent distribution facility and process control laboratories*
ACC:	*hull and end-pieces compaction facilities*
AD2:	*technological waste packaging facility*
ADT – EDS – D/E EDS ECC:	*packaged technological and structural waste storage and recovery facilities*
E/EV South East (EEVLH extension):	*vitrified waste storage facility*
• **BNI 117:**	*UP2 800 plant*
NPH:	*facility for underwater unloading and storage of spent fuel elements in pond*
C pond:	*pond for storage of spent fuel elements*
R1:	*fuel elements shearing, dissolving and resulting solutions clarification facility (including the URP: plutonium re-dissolution facility)*
R2:	*uranium, plutonium and fission products separation, and fission product solutions concentration facility (including the UCD: Alpha waste centralised processing unit)*
R4:	*facility for purification, conversion to oxide and first packaging of plutonium oxide*
SPF (4, 5, 6):	*facilities for storage of fission products*
BST1:	*facility for secondary packaging and storage of plutonium oxide*
R7:	*facility for fission products vitrification*
AML – AMEC:	*packaging reception and maintenance facilities*
• **BNI 118:**	*STE 3 facility: effluent recovery and treatment and storage of bituminised packages*

The spent fuel solid radioactive waste from French reactors is sent to the low and intermediate level, short-lived waste repository at Soulaines (see chapter 16 - point 3|2|2) or stored pending a final disposal solution.

In accordance with Article L. 542-2 of the Environment Code concerning radioactive waste management, radioactive waste from irradiated fuels of foreign origin must be shipped back to its owners. In order to guarantee fair distribution of the waste among its various customers, the licensee proposed an accounting system for monitoring items entering and leaving the La Hague plant. This system was approved by order of the ministry responsible for energy on 2 October 2008. In 2009, the licensee thus shipped standard containers of compacted waste (CSD-C) back to the Netherlands.

1 | 3 | 2 Plant modifications

The plant authorised operating framework

The creation authorisation decrees for the nuclear installations on the La Hague site were revised in 2003, particularly in order to enable changes to be made to the activities on the installations in satisfactory safety and environmental protection conditions and in compliance with the regulations.

ASN decisions now authorise broadening of the nature and origin of the materials and substances to be treated, originating in other installations, while remaining within the domain defined by the decrees.

Adaptation of the industrial tool

Environmental protection concerns and new market trends require the licensee to modify its industrial tool.

The cold crucible project

Between 1966 and 1985, processing of UMo (uranium and molybdenum) and UMoSnAl (alloy of uranium, molybdenum, tin and aluminium) GCR fuels generated fission product concentrates with a high concentration of molybdenum and phosphorus, elements which are hard to incorporate into an aluminoborosilicate vitreous matrix. They were stored in tanks in the SPF2 unit, pending possible incorporation into a glass matrix. AREVA NC research into a packaging process led to the development of a vitroceramic type aluminosilicophosphate matrix which would be able to incorporate a large mass of molybdenum oxide (MoO_3) while offering good resistance to leaching. This glass will be produced in a cold crucible. The glass poured into this crucible is induction heated, with the metal structure of the crucible being externally cooled, allowing the formation of a protective auto-crucible with high temperatures being obtained at its centre. Active start-up of the line configured with a cold crucible is scheduled for the beginning of 2010. Its operation will have to comply with ASN requirements. The cold crucible will also allow incorporation into a vitreous matrix of the sludges created by processing of the effluents from the rinsing involved in the legacy waste recovery operations.

British plutonium

In May 2008, ASN authorised AREVA NC to accept, store and recondition plutonium oxide from the British plant at Sellafield in the UP3-A BNI.

This operation is carried out under the "Plutonium Return Agreement". This agreement was drawn up following the technical difficulties experienced by Sellafield Ltd's SMP plant, which was unable to meet its MOX fuel delivery contracts. AREVA NC then assisted the English plant by supplying MOX fuel to its European customers. In return, the plutonium advanced by AREVA NC had to be replaced by Sellafield. AREVA NC asked for a part of this plutonium to be sent to La Hague. The first batch of British plutonium landed in France on 21 May 2008. The first repackaging campaign started in the summer of 2009.

Periodic safety reviews

Article 29 of Act 2006-686 on transparency and security in the nuclear field requires that every ten years, the licensee conduct a safety review of its BNIs, taking account of the best international practices.

In 2008, ASN examined the periodic safety review for BNI 118, which includes the effluent treatment station (STE3), the solvents mineralisation facility (MDS-B) and the sea discharge outfall pipe. ASN is paying particularly close attention to the schedule for the licensee's implementation of the undertakings it made during the periodic safety review of this installation. The licensee's responses will be examined in 2010.

The licensee has also begun the periodic safety reviews of BNIs 116 (UP3 plant) and 117 (UP2-800 plant). When issuing the review guidelines document, ASN sets the main requirements resulting from decree 2007-1557 of 2 November. For the periodic safety review of the La Hague facilities, these requirements will in particular concern complete identification and application of the elements important for safety (EIS).

Construction of a vitrified waste package storage facility extension

The future production programmes for standard vitrified waste containers (CSD-V) and the end of the process to return containers from AREVA NC's foreign customers (contracts signed before 2001) mean that the storage capacity on the La Hague site (R7, T7 and EEVSE) will become saturated by the first half of 2012.

Ship which carried plutonium from Sellafield to La Hague (Manche *département*)

AREVA NC therefore decided to build an extension to the EEVSE storage facility called the "glass storage building extension on the La Hague site" (EEVLH), in order to increase the storage capacity of the existing facility. The extension to be built will retain the main design options chosen for the EEVSE facility.

In 2009, ASN reviewed the main principles of the safety options, presented by AREVA NC in a document called the "safety options file" (DOS). The actual construction work began in June 2009 with excavation of the foundations for the EEVLH building.

The new facilities planned

In order to ensure that it will be able to meet the needs of the coming years (increase in recycling of plutonium and storage capacity needs), AREVA NC plans to commission a "treatment of plutonium-bearing materials" facility (TMP) in the T4 unit. In 2009, the licensee sent ASN the corresponding DOS. This document is currently being reviewed.

This addition will entail modification of the BNI 116 decree and a public inquiry.

2 INSTALLATIONS IN CLOSURE PHASE

2 | 1 Older AREVA NC La Hague installations

2 | 1 | 1 Recovery of legacy waste

This point is also covered in chapter 16.

Unlike the new UP2 800 and UP3 plants, most of the waste produced during operation of the first plant, UP2 400, was placed in storage without packaging for disposal. The operations involved in recovering this waste are technically difficult and require the use of considerable resources. The issues linked to the age of the waste, in particular its characterisation prior to any recovery and reprocessing, confirm ASN's approach to the licensees which is to require that for all projects, they assess the corresponding production of waste and plan for processing and packaging as and when the waste is produced.

Subsequent to the November 2005 review of the waste management policy in use at the La Hague establishment by the Advisory Committees for laboratories and plants and for waste, ASN confirmed the need for recovery as early as possible of the sludges stored in the STE2 silos, the waste in the HAO silo and the waste in the building 130 silo, along with the primarily alpha waste drums stored in building 119 in BNI 38, which offer inadequate safety guarantees.

STE2 sludges

In recent years, processing of STE2 sludges has been the subject of research and development work, in particular with a view to determining the methods for recovery and transfer required prior to any packaging. The process then chosen consisted in bituminisation of the sludges using a process employed in the STE3 facility.

Following on from these experiments and the December 2007 review of the proposed packaging process by the GPU, ASN issued a decision on 2 September 2008, banning the bituminisation of STE2 sludges in the STE3 facility.

In the above-mentioned decision, ASN also asked the licensee to present a preliminary safety analysis report, no later than 1 January 2010, corresponding to the modifications necessary for implementation of an STE2 sludge packaging process, along with the characteristics of the associated waste packages. Recovery of these sludges should be completed no later than 31 December 2030.

HAO silo

The HAO silo contains various waste comprising hulls, end-pieces, fines (dust produced mainly by shearing), resins and technological waste resulting from operation of the HAO facility from 1976 to 1997. Decommissioning of this silo requires prior dismantling of the equipment installed on the silo slab, construction of the recovery cell and qualification of the equipment to be used. Initial dismantling work has already been done.

The detailed preliminary decommissioning studies were reviewed by ASN in 2007. However, the licensee informed ASN at the end of 2008 that recovery of the waste from these silos required further preliminary studies. ASN is continuing to pay close attention to ensuring that these modifications do not significantly delay the beginning of the waste recovery and packaging operations concerned.

Silo 130

Following the announcement of postponement of the creation of an intermediate level long-lived (IL-LL) waste repository, the licensee stated that its strategy would have to change, but that in any case, it still aimed to recover the waste from silo 130. The operations will therefore require interim storage of the waste recovered.

The project transmitted by the licensee therefore comprises four phases. The first is to transfer the GCR waste before storage in the D/E EDS facility. The second phase is to drain and treat the water in the silo, in the STE3 installations. The final phases will enable the waste to be recovered from the bottom of the silo, along with the rubble.

In 2008, ASN approved the preliminary preparatory work, in particular installation of the silo waste recovery and evacuation cells.

In early 2009, the licensee announced that the beginning of the waste recovery operations was postponed to a later date. Owing to the uncertain condition of the silo 130 civil engineering, ASN in December 2009 sent the licensee draft requirements for immediate compensatory safety measures and a detailed file of operations preparatory to and during waste recovery.

Old fission product solutions stored in the SPF2 unit in the UP2 400 plant

To package fission products from reprocessing of French gas-cooled reactor fuel, in particular containing molybdenum, the licensee has opted for cold crucible vitrification (see point 2|3|2).

The first cold crucible should enter service on the La Hague site in 2011, for packaging of solutions between 2011 and 2017.

Removal from storage in building 119 of BNI 38

An overall strategy was implemented by the licensee for priority treatment of the existing drums of alpha waste, which are currently stored in building 119.

At the end of 2006, ASN thus authorised the licensee to receive, store in conditions of adequate safety and process in the D/E EB facility in BNI 118, the drums of alpha waste from the French MOX fuel manufacturing plants. This authorisation was supplemented in 2008, to allow the reception, storage in satisfactory conditions of safety, and treatment in the D/E EB facility in BNI 118 of the drums of alpha waste from the plants on the La Hague site.

In 2009, verification and transfer for processing to the alpha waste conditioning unit (UCD) in the R2 facility continued. This conditioning will enable this waste to be sent to be disposed of using existing disposal routes.

The processing capacity of the UCD will be entirely devoted to building 119, which will enable this facility to be closed down earlier, as it no longer meets current safety requirements.

A new compacting unit, able to handle a large volume of alpha waste is currently being studied.

2|1|2 Final shutdown of the UP2 400 plants and STE2 facility

On 30 December 2003, the licensee notified its decision to stop processing spent fuel in the UP2 400 facility as of

1 January 2004. This notification was accompanied by a file presenting the operations planned for the preparation phase prior to final shutdown (*MAD*) of the various units in this plant, the associated effluent treatment station and the Elan IIB facility.

During the course of 2009, the licensee included the ORCADE project, which is responsible for final shutdown of the UP2 400 units and the legacy waste recovery programmes, into an entity on the site under the responsibility of the AREVA value development business unit. This unit, created at the end of 2008, handles all the group's decommissioning projects and promotes sharing of operating experience feedback between the various AREVA facilities (UP1 plant in Marcoule, ATPu in the CEA/Cadarache centre, SICN in Veurey - Voroise).

The decommissioning preparatory phase enables the licensee to carry out certain operations, which are covered by the operation safety requirements. For 2009, ASN agreed to the following operations being carried out:
- preparation of one of the dissolvers in the HA/DE facility for waste recovery;
- installation of a connecting line between the fission products disposal facilities (SPF) to send the rinsing effluents from the tanks to the HA/PF facility for vitrification;
- installation of a containment for opening the plutonium oxide (PuO_2) cans for removal from storage and repackaging of the PuO_2 stored in the MAPu.

At the end of 2008, AREVA NC submitted a final shutdown and decommissioning (MAD/DEM) dossier for the BNIs corresponding to the UP2 400 plant, the STE2 facility and the Elan IIB facility, i.e. BNIs 33, 38 and 47. ASN and the Ministry of Ecology, Energy, Sustainable Development and the Sea (MEEDDM) considered that additional data was needed in this dossier before it could be submitted for a public inquiry.

The MAD/DEM dossier for the HAO facility (oxide high activity facility: former lead unit for the UP2 400 plant) was submitted in February 2008; the technical options adopted were examined by the GPU in May 2008. The GPU identified the hold points necessary during decommissioning, which should continue until about 2025. These hold points were included in the ASN follow-up letter and in the draft decree sent to the Government. The dossier was submitted to a public inquiry in November 2008 and was approved. Final shutdown and decommissioning decree 2009-961 for BNI 80 was published on 31 July 2009 (see chapter 15).

The North part of the HAO facility (HAO/North) will however continue until 2015 to receive fuels that cannot be accepted by the UP3 and UP2 800 lead units until such time as the necessary modifications are made to allow reception of this waste in one of the two plants; it will ensure transfer to the UP3 and UP2 800 pools.

2 | 2 COMURHEX: the uranium hexafluoride (UF_6) fabrication plant in Pierrelatte

The COMURHEX plant in Pierrelatte is designed to manufacture uranium hexafluoride (UF_6).

This production uses natural uranium in the ICPE part of the plant, or reprocessed uranium in the BNI part of the plant. The latter plant consists of two units:

Aerial view of the COMURHEX facility on the Tricastin site (Drôme *département*)

– the 2000 unit, which transforms reprocessed uranyl nitrate ($UO_2(NO_3)_2$) into uranium tetrafluoride (UF_4) or uranium sesquioxide (U_3O_8);
– the 2450 unit, which converts the UF_4 (whose uranium 235 content is between 1 and 2.5%) from the 2000 facility into UF_6. This UF_6 will be used to enrich the reprocessed uranium for recycling in the reactor.

In 2008, through its inspections in COMURHEX BNI 105, ASN observed a large number of irregularities concerning the means of preventing chemical or radiological pollution risks. The licensee has begun a certain amount of improvement work, including on the hazardous products retention systems. The *préfet** of the Drôme *département* also served formal notice on COMURHEX to comply with the requirements of the order authorising that part of the installation classified on environmental protection grounds (ICPE), following environmental pollution events. The licensee improved its prevention of this pollution through various types of work carried out in 2009. This work will need to continue.

With regard to the ICPE, the licensee brought its facilities into compliance with the regulations concerning control of the explosion risk in 2009.

During its analysis of deviations and its observations during the course of 2009, ASN also found that a large share of operating performance problems were the result of deficiencies in the safety culture of the individuals concerned. The licensee implemented an action plan to remedy this. The ASN inspections show that the operating stringency of the licensee could still be improved.

On 13 October 2008, the licensee notified ASN of final shutdown of its BNI 105 on 31 December 2008. At the end of July 2009, in accordance with Article 37 of decree 2007-1557 of 2 November 2007, it also transmitted the decommissioning plan for this facility.

The BNI 105 stack, which collects the gaseous effluents from most of the establishment's installations, and some storage areas of BNI 105, should remain in operation beyond the final shutdown date.

The site of the present plant should in the next few years be used for the construction of a new ICPE, comprising fluorine production and fluorination units. If reprocessed uranium were to be used, this would, as in the past, entail classification of part of these installations as a new BNI. The operating authorisation application file for the COMURHEX II facility was submitted at the end of 2008.

3 REGULATING THE NUCLEAR FUEL CYCLE FACILITIES

3|1 Regulating the main steps in the life of nuclear facilities

ASN works at several levels to regulate the AREVA group's nuclear facilities.

ASN is responsible for regulating any modifications to the main steps in the life of these nuclear facilities (in 2009, change in the MÉLOX licensee and commissioning of GBII) and examines the decrees accompanying these changes. ASN also issues the requirements applicable to these main steps.

These high level requirement concerns BNI safety and radiation protection policy and management and the safety requirements regarding the resulting risks. These requirements were produced for the first time for the commissioning of GBII and the aim is ultimately to issue them for all the facilities of the AREVA group. In 2009, ASN produced drafts for the La Hague and CERCA facilities.

As and when necessary, ASN examines the safety analysis files specific to each BNI, paying particularly close attention to incorporating them into the more general framework of LUDD (Laboratories, Plants, Waste and Decommissioning) facilities safety. In this respect, it ensures that the safety requirements are applied uniformly to all these facilities and that they are regularly updated, in particular on the occasion of the ten-yearly safety reviews of these facilities.

In 2009, the periodic safety reviews of the AREVA group's facilities, in particular La Hague and MÉLOX, were discussed at meetings which reviewed the guideline files for the periodic safety reviews in progress. The key points were the organisation of the reviews as an activity directly

*In a *département*, representative of the State appointed by the President.

affecting safety and its regulation and inspection, the consideration of ageing of the facilities, the identification and application of EIS. These reviews will be presented to the Advisory Committees in 2010-2011. In 2011, the SOCATRI licensee will also initiate a periodic review of its facility.

At shutdown of the AREVA group's industrial facilities, ASN also ensures that each of them complies with the requirements of decree 2007-1557 of 2 November 2007, with regard both to informing ASN about the dates of shutdown and to the quality of the dossiers presenting the risks due to the changes in operation. In 2009, the shutdown dossiers for EURODIF, UP2-400 and COMURHEX were an opportunity for ASN to clarify its expectations on this subject.

ASN also reviews all the incidents in these facilities through an operating experience feedback unit specialising in laboratories and plants. In particular, the INES scale ratings notified are also determined by comparison with operating experience feedback from events which occurred in these facilities. The lessons learned from incidents are described in generic letters to the licensees. In 2009, following minor incidents, man-machine interfaces, management of the fire risk during clean-out, incompatibility between certain chemical products and nuclear material mass monitoring software were reviewed.

ASN's regulatory actions also cover the AREVA head office departments responsible for the group's safety, radiation protection and environmental policy (D3SE). ASN looks at how this entity drafts and facilitates the implementation of this policy in the various establishments within the group. In 2009, the main subjects were the production of internal authorisation systems for the group's licensees, and the more widespread consideration given to human and organisational factors (HOF), in particular through production of the "safety management in AREVA facilities" dossier.

Finally, because ASN will be taking over responsibility for regulation and inspection of the Pierrelatte site in the medium term, ASN and the the Defence Nuclear Safety Authority (ASND) are focusing on ensuring completely coherent application on the Tricastin site of the safety and radiation protection requirements for which each of them is responsible. Most of the facilities under the responsibility of ASND have been shutdown or are being decommissioned, and should shortly be considered to be civil facilities. Those facilities not to be decommissioned are those which currently process the effluents and waste for the site as a whole. Some of these now obsolete facilities must be replaced by new ones, which will then be placed under the authority of ASN, which will also oversee the end of shutdown and complete decommissioning of the other facilities under ASND oversight.

ASN and ASND set up a working group to clarify the steps involved in ASN's taking over responsibility for regulating the safety of the activities performed on this site. This working group will soon be opened up to the licensees for a more precise definition of the procedures involved in the change in regulatory body. It was decided that this would take place gradually as and when the regulatory situation of each technical BNI is clarified (after periodic safety review, decommissioning under way or planned). The end of this process is scheduled for about 2015.

3 | 2 Ensuring the consistency of the cycle

ASN regulates the overall safety-related and regulatory consistency of the industrial choices made with regard to fuel management. The issue of long-term management of spent fuel, mining residues and depleted uranium is examined taking account of the unforeseen variables and uncertainties attached to these industrial choices. In the short and medium terms, ASN particularly aims to anticipate and prevent saturation of the storage capacity of the NPPs, as has been seen in other countries, and to prevent the licensees from using former installations, for which the regulatory and technical licensing requirements are less strict, as an interim storage solution. To do this, ASN relies on the assistance of the General Directorate for Energy and Climate (DGEC) at the MEEDDM, in particular to obtain information concerning materials flows or the industrial constraints likely to have safety consequences.

EDF was asked to undertake a forward-looking study in cooperation with the fuel cycle companies, presenting elements demonstrating compatibility between changes in fuel characteristics or spent fuel management systems and fuel cycle installation developments.

The data presented by EDF and reviewed to date provide significant clarification of how the fuel cycle operates and the safety issues involved, in particular how changes to fuel management policies may result in changes to the technical and regulatory limits, subject to adequate justification.

In order to maintain an overview of the fuel cycle, the data will have to be periodically updated. For any new fuel management policy, EDF will be required to present a feasibility dossier specifying and justifying the differences with respect to the "fuel cycle" dossier previously transmitted.

At the end of 2008, EDF reached an important agreement with AREVA for management of processing-recycling traffic and, making allowance for unforeseen variables, for development of a long-term forward-looking vision of management of the plants in the cycle, including end-of-life operations.

An overall revision of this dossier was transmitted in 2008. ASN has begun an assessment of this dossier and it will be jointly carried out, with the support of IRSN, by the Advisory Committees for laboratories and plants and for waste. The Advisory Committees will therefore submit their opinions in 2010 during a meeting to which the DGEC and members of the Advisory Committees for reactors and for transport will be invited.

At the same time, ASN is considering redefining the contents of the dossier in order to take account of the increasingly international nature of exchanges in the fuel cycle.

3 | 3 Overseeing licensee organisation

Nuclear installation safety is primarily based on the supervision carried out by the licensee itself. In this respect, for each installation, ASN verifies that the organisation and resources deployed by the licensee enable it to assume this responsibility.

It is not the role of ASN to impose a particular organisational model on the licensees. It can however issue an opinion or recommendations concerning the organisations chosen, if it considers that they contain deficiencies in terms of internal oversight of safety and radiation protection or are not relevant.

ASN therefore primarily observes the working of the organisations put into place by the licensees through inspections, including those devoted to safety management. The main findings are the under-staffing of certain departments which play a key safety role. This is liable to make it hard for them to perform the duties entrusted to them, with production demands often taking precedence over the other constraints.

ASN therefore initiated a safety management review within the AREVA group, for the BNIs operated by the group. The review support dossier is to be forwarded by AREVA in early 2010. It will then be presented to the GPU.

3 | 4 Promoting operating experience feedback

3 | 4 | 1 Dealing with incidents

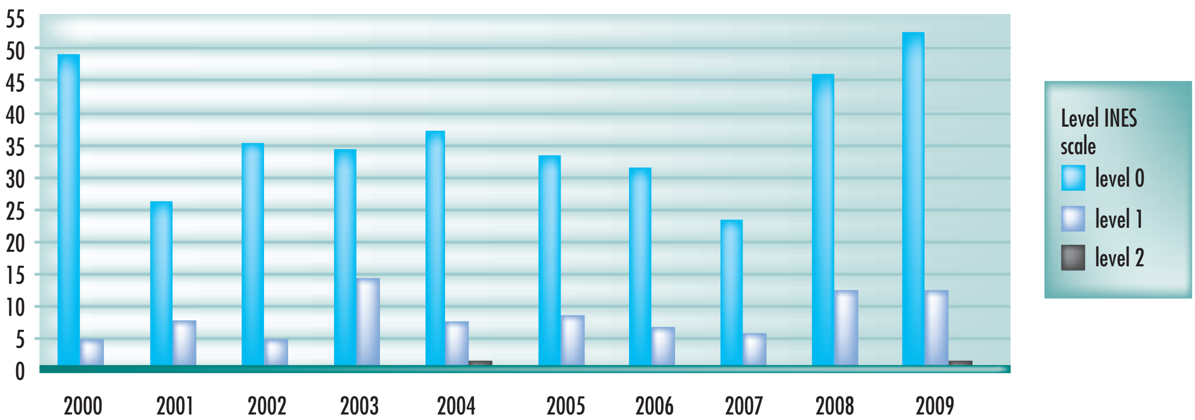
The detection and processing of significant events that have occurred during operation of the installations play a fundamental safety role. The lessons learned from these events lead to new requirements applicable to elements important for safety (EIS) and to new operating rules. Licensees must therefore set up reliable systems for detecting, correcting and learning lessons from all safety-related events.

Graph 1 presents the trend in the number of significant events reported by fuel cycle installations.

ASN's monitoring of these events and how they are managed by the licensees in particular enables it to identify:
– events recurring on the same installation;
– events requiring operating experience feedback to other installations to confirm or invalidate their generic nature, in other words affecting or likely to affect several installations belonging to one or more licensees.

There was a clear rise in the number of significant events notified in 2009 by comparison with 2007 and 2008. This is partly due, either directly or indirectly, to the fact that ASN has taken firm measures to ensure that the licensees

Graph 1: changes in the number of events in fuel cycle installations since 2000



concerned are aware that significant event notification criteria must be strictly adhered to.

The most significant event in 2009 was the incident that occurred on 3 March 2009 in the MÉLOX facility, which was rated level 2 on the INES scale: during an exceptional delivery of a plutonium and uranium oxide based sample from an entity outside the facility, a mass of fissile material was introduced into a workstation such that the applicable safety-criticality limit[2] was exceeded. This was due to application of an inappropriate and undocumented procedure. It was not due to operator error.

The fissile materials accounting software, which is used to check compliance with the authorised limits each time materials enter or leave, did not generate an alarm, as it did not take account of this type of operation.

The fissile materials limit defined in the facility's safety requirements was only exceeded by 1%. This type of limit, which is covered by ASN specifications, is determined at the design of the facility in order to maintain a wide safety-criticality margin during operation. Owing to this margin, the event had no criticality consequences.

The inspections carried out in the AREVA group's facilities in 2009 showed that, when they are detected, events are still not sufficiently analysed. ASN observed that even if abnormal situations are detected, their analysis does not always provide the licensees with a common view of the safety issues at stake, enabling them to learn all relevant lessons. ASN expects significant improvement in operating experience feedback based on significant events.

3 | 4 | 2 Taking account of organisational and human factors (HOF)

Formalisation of the way HOFs are taken into account actually began within the fuel cycle installations in 2005-2006, with the drafting of internal policies specific to each licensee. This approach began to be centrally applied within the AREVA group in 2008, when the group's head office departments employed a HOF specialist. Since then, a central policy has been drafted and is being gradually deployed among the group's licensees. This approach will still take some time to bear fruit.

The various licensees within the AREVA group are now staffed with persons competent in HOF. However, ASN is concerned by the fact that at certain licensees, these staffing levels are inadequate.

The analysis of significant event reports or the review of the technical dossiers would seem to indicate that the HOF approach has not yet been completely assimilated. The specialists in this field are not yet systematically consulted with regard to subjects with high stakes in terms of human reliability or workstation ergonomics. Analysis of the causes of significant events all too often refers to human error, without looking for the underlying organisational causes.

3 | 4 | 3 Maintenance

The EIS in a facility undergo maintenance with the aim of guaranteeing their long-term operation and their availability. Maintenance is said to be remedial when it is carried at the initiative of the licensee out after a failure. Preventive maintenance leads to maintenance programmes, usually annual, determined under the responsibility of the licensee. These programmes include the periodic checks and tests.

In an industrial environment, maintenance makes extensive use of subcontracting, with the licensee retaining responsibility for small "auto-maintenance" operations.

ASN considers that, being responsible for the safety of the facility, the licensee must guarantee the quality of preventive maintenance operations, must be familiar with its results and must conduct in-depth analysis of the causes of any deviations and drift observed.

ASN thus attaches particular importance to the choice of contractors, to the quality of the analysis of their work, to the results of the second level checks made by the licensee and to any improvements that need to be made.

ASN calls a number of inspections on this topic every year. Operating experience feedback in 2009 shows that the facilities in the AREVA group have considerable room for improvement.

3 | 4 | 4 Controlling sub-criticality

In 2009, a number of events revealed significant deficiencies in prevention of the criticality risk[3] in several AREVA

2. This limit aims to prevent a criticality accident involving the initiation of tan uncontrolled nuclear reaction when the mass of nuclear materials exceeds a certain threshold, called the "critical mass".

3. Criticality: the ability of fissile materials to trigger and, in certain circumstances, sustain a nuclear reaction. Criticality depends on three main parameters: the quantity of fissile materials brought together in the same place, the geometry of this quantity of materials and the presence of "moderating" materials (mainly materials which comprise hydrogen atoms).

nuclear facilities. With regard to the control of this risk through the geometry of the equipment or the structure, two events concerning fissile material storage should be noted: the use of an area not dedicated to storage of fissile material drums (and thus with no constraints appropriate to the criticality risk) and the identification of a storage area which did not have the geometrical dimensions specified in the criticality studies.

In addition, two events in laboratories and plants, rated level 2 on the INES scale, concern limitation of the mass of fissile materials: firstly, during an exceptional operation in MÉLOX (which is not covered by the appropriate mass monitoring software) the introduction of a mass of fissile material into a workstation led to the maximum authorised mass being exceeded; secondly, incorrect estimation in the ATPu (see decommissioning chapter) of the masses of residual fissile materials in certain workstations (undetected gradual accumulation during operation), which could have led to the maximum authorised mass being exceeded in several workstations. In this latter case, the authorised use of moderating materials during clean-out of certain workstations also leads to a very significant reduction in the criticality risk margins.

Following this last incident, ASN asked the licensees to check that the real residual masses of fissile materials in the workstations, including those which use them in powder form, were in conformity with the estimated masses, and to ensure that the measures implemented will in future allow correct estimates to be made of the quantities of fissile materials accumulating in said workstations.

It is worth remembering that a criticality accident, which is in fact the uncontrolled triggering of a nuclear reaction, can only be detected once it has occurred and can also have dramatic radiological consequences. The last criticality accident occurred in September 1999 in Japan (Tokaï-Mura). It led to the death of two operators close to the location of the accident, significant irradiation of a third person and evacuation of the populations in the vicinity of the facility concerned.

It is therefore essential to check the arrangements taken, ensuring that they are appropriate for all plausible situations, that safety-criticality requirements are met and that the operators have been trained.

4 INTERNATIONAL ACTION

In June 2009, ASN launched a bilateral cooperation programme with the NRC (United States Nuclear Regulatory Commission) for nuclear fuel cycle facilities and more particularly those involved in reprocessing-recycling. The United States had for a long time opted for the once-through fuel cycle with final disposal of spent fuel without reprocessing, but were obliged to review their position in the face of opposition from the populations living in the vicinity of the Yucca Mountain disposal site. Furthermore, the current storage areas in the production plants cannot be extended indefinitely. The NRC therefore began the drafting of regulations for the future reprocessing-recycling plants and expressed its interest in discussions with ASN with regard to its operating experience feedback concerning regulation and inspection of this type of facility. This led to a draft programme for discussions which could begin in 2010 on the basis of seminars and facility visits. These should concern the authorisation regulatory process, risk analysis methodologies and the criteria for establishing the EIS, safety and radiation protection management, waste management and transport.

In June 2009, ASN also took part in the annual public meeting to share experience about the fuel cycle (22 to 27 June 2009) which for the past 3 years has brought together licensees and associations in the NRC premises in Washington. These seminars, entitled FCIX "fuel cycle exchange information meetings" attract up to 300 people. They are the equivalent of the RIC for power generating reactors. ASN presented France's operating experience feedback concerning regulation of the nuclear fuel cycle and the main areas in which progress is expected.

Finally, ASN took part in an OECD/NEA seminar in Paris (from 5 to 7 October 2009) concerning ageing of the fuel cycle facilities. It presented French operating experience feedback concerning this subject and stressed the importance of the periodic safety reviews in this process. On 8 October, it also presented a summary of the incidents that occurred in the laboratories and plants in 2009 to the joint IAEA/NEA meeting on this subject.

5 OUTLOOK

a) Cross-disciplinary aspects

In 2009, the fuel cycle installations experienced a number of incidents highlighting weaknesses in the organisation of safety and radiation protection in the AREVA group installations. ASN will be particularly vigilant in the coming years to operating experience feedback concerning these incidents. ASN informed the AREVA group management of its concerns on this subject: ASN expects greater stringency in compliance with notification criteria and the event report transmission deadlines, plus more rigorous implementation of the measures required to prevent events happening again. ASN also initiated an overall review of the safety and radiation protection management process within the AREVA group.

In 2010, ASN will continue the action started in 2009 for improved management of the current and future authorisation applications and the planned periodic safety reviews, if necessary resorting to specific individual requirements. In 2010, it will systematically adopt this process of specific individual requirements.

b) Tricastin site

Although ASN approves of the changes made on the Tricastin site, which involve shutting down the older facilities and replacing them by safer ones, it is worried by the recent postponement of certain projects felt to be essential, such as that concerning the site's effluent and waste treatment stations. In 2010, pollution prevention will remain a major issue for this site. ASN will verify the progress of the remedial measures implemented by the various facilities.

Finally, ASN will ensure that preparation for the shutdown of the EURODIF plants takes place in the conditions specified in the TSN Act, including with regard to communication with the public.

c) Romans-sur-Isère site

On the Romans-sur-Isère, ASN will in 2010 closely monitor confirmation of the progress already achieved in terms of safety. It in particular expects improved management of the waste areas. It will also be focusing on the actions taken following the safety reassessment of the facilities belonging to the CERCA company.

c) MÉLOX plant

With regard to the MÉLOX plant in Marcoule, ASN will remain closely attentive to the organisation and resources implemented to boost the production capacity of the industrial tool and support the changes in the materials used. Control of dosimetry and the ability to prevent risks related to human factors will remain regulation priorities.

Finally, inadequacies in criticality risk management, including with regard to the working of the nuclear material masses monitoring software, were brought to light by the incidents of 2008 and 2009. ASN will thus be vigilant with respect to handling of this risk, in particular during the periodic safety review of the facility scheduled for 2010-2011.

d) La Hague site

For the La Hague plants, ASN considers the results to be satisfactory, including with respect to personnel exposure. However, ASN does believe that continued efforts are needed, in particular for the periodic safety reviews of the facilities, drafting of the general operating rules and defining of the EIS. Moreover, a number of significant events highlighted a certain lack of stringency in operation of the units.

With regard to the recovery of legacy waste, ASN is worried about AREVA NC's strategy U-turns, which are significantly delaying the recovery and removal of waste from the 130 and HAO silos. There again, ASN will ensure that there is no further slippage in the schedule.