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Plutonium Investigation

SPAIN

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EDITORIAL

Spanish Civil Plutonium for Weapons in the UK and France?

Spain is certainly the only country without its own nuclear weapons to both contribute to the military plutonium stockpile of a neighbor country, and to have the dangerous experience of four nuclear weapons land on its own territory, with all the consequent contamination.
In the global plutonium picture Spain is relatively insignificant if plutonium quantities alone are assessed. And as its government has renounced reprocessing, aside from the interesting and important cases of irradiated fuel already sent to France and the UK for separation, the main contemporary issue is the long term storage or eventual final disposal of plutonium-bearing spent fuel. In this focus Spain is similar to many countries that embarked on a commercial scale nuclear program in the late 1960s or early 1970s, for whom the promise of plutonium has become an expensive environmental liability.
The covert and opaque military assistance to the French 'Force de Frappe' nuclear warheads also serves to remind that any country that contracted into reprocessing services with the European Union's two reprocessor nations - France and UK - has run the risk that their plutonium has been mixed into the weapons stockpile of these two nuclear weapon states, which have typically not retained clear physical separation between commercially contracted fuel and military dedicated plutonium.
It was revealed in the leading Spanish newspaper, El Pais, in February 1987 that Spain had secretly done research and development on its own nuclear weapons from the 1950s. As in the case of Sweden, examined in PI last issue No.14-15, this military atomic aspiration was abandoned. Spain now does not even allow NATO allies' nuclear weapons to be officially stored on Spanish soil.

Plutonium Dispersal At Home And Abroad

Spain is not a big player in the nuclear business. It has nine commercially operating reactors, a few small research reactors, some indigenous uranium and little else. Yet Spain has more plutonium contaminated land than possibly either France or the UK, which both have full-scale plutonium separation (reprocessing) factories on their territories-arising from an accident in 1966 involving nuclear weapons (see box on page 3) - and has also contributed to the French weapons plutonium stockpile. Moreover Spain is the first country where a nuclear plant operator (at Lemoniz, Basque country, in 1981) has been politically executed by terrorists, and local politicians have been kidnapped, by opponents of nuclear energy. This makes Spain a quite unique case.

CONTINUED ON PAGE 2

Development background

Spain's nuclear program was initiated in the early 1960s under the Franco regime, with government sponsored research as in many other countries. Reactor development plans were followed by uranium exploration, and participation in uranium enrichment services abroad. Currently there are nine commercial power plants, with a design output of 7,400 MWe, owned and operated by a complex cluster of private and public utility companies resulting from a series of mergers and take-overs of the original companies (see box on page 5). Last year the Spanish power industry generated 172,771 TWh of electricity, of which 58,960 TWh were nuclear generated, equaling about 37.1% of output. (The OECD Nuclear Energy Agency calculate this will drop to around 31% in 1999.) Around 18% of the installed national power capacity of 43,522MW comes from nuclear, with 38% hydro power and 26% from coal.

In November 1998 Environment Minister Isabel Tocino presented a plan to Parliament to combat climate change. It was endorsed by Spain's National Climate Council in December 1998, and called for an extension of the operational lives of the existing nuclear plants.

The nuclear program began with a small (2 MW) research reactor, JEN-1, named after the Junta de Energia Nuclear - later renamed the Energy and Environmental Research Centre (CIEMAT) - which went critical in October 1958. Another research reactor, Coral-1, went critical in March 1968. By this time, the first two commercial power plants had been ordered in 1965. The 160 MWe pressurised water reactor, Zorita, (also now known as José Cabrera) was bought from Westinghouse, and was commissioned in 1969. A second 460 MWe boiling water reactor, Santa Maria de Garoña, was ordered from General Electric, and came on-line in 1971.

These two plants were ordered by private utilities, Unión Eléctrica-Fenosa and Nuclenor respectively. A third plant was ordered in 1966 by a joint Franco-Spanish company called Hifrensa (Hispano-Francesa de Energia Nuclear). This was a 500 MWe gas-graphite reactor, called Vandellós-1, a modification of the design of reactors built in France for EDF, the French national power utility, which also produced military plutonium.

Although Spain subsequently constructed a further six nuclear plants, the last of which at Trillo was commissioned in 1988, A decision by the high level Ministerial Council in October 1983 resulted in the halving of the original nuclear generation program from 10,535 MW to 5.725 MW. In May 1991 energy minister Claudio Aranzadi announced that no new nuclear plants would be commissioned before 2000. A new electricity planning law passed by the Spanish Parliament (Cortes) in March 1993, led to the definitive cancellation of the five nuclear plants whose construction had been frozen by the Socialist government in the 1984 moratorium. In June 1995 the closure of Zorita was announced, but in August that year Garoña won an extension of its operating permit.

It is the first three plants - along with the research reactors - that are of central interest for plutonium production, particularly because their discharged irradiated fuel has been contracted to be reprocessed in the UK and France.

Nuclear regulation and control

The nuclear industry is now managed and regulated by three main state-owned bodies, supervised by the Ministry of Industry and Energy (MINER). These cover research and development (CIEMAT, Centro de Investigaciones Energeticas, Medioambientales y Tecnologicas), 'front-end' of the nuclear fuel chain (ENUSA, Empresa Nacional del Uranio) and waste management (ENRESA, Empresa Nacional de Residuos Radioactivos).

The National Waste Management Company ENRESA was established in 1984 to be responsible for all radioactive waste management in Spain, and it has operated the low level radioactive waste disposal facility at El Cabril since 1992. It is a limited liability company, the shareholders of which are CIEMAT and the National Institute of Industry (INI).

ENRESA is organised as a management company with responsibility to define and control activities in the field of waste management, which, in turn, are carried out by a range of engineering and service firms. Its activities are defined in the General Radioactive Waste Plan (PGRR) which must be submitted yearly to MINER for approval. Spent fuel not contracted for reprocessing abroad is to be treated as high level waste. In early 1998 the government announced several major policy changes for the management and disposal of spent fuel and long-lived intermediate level waste (ILW).

Nuclear exports

Much of Spain's nuclear program has been rather insular. However there have been some deals done between the indigenous Spanish industry and foreign customers. For example, in March 1987 two bilateral "fuel cycle" agreements were signed with France by ENRESA and CIEMAT. In April 1988 ENUSA signed its first fresh fuel export deal withh the Swiss nuclear plant at Leibstadt (shared with the Italian company, Fabricazione Nucleare, an AGIP subsidiary). At the end of 1991 ENUSA joined up with the UK's BNFL and Westinghouse-since acquired by BNFL- in a new European Fuel Group consortium.

Spent fuel reprocessing agreements

The most important foreign deals however concern the Franco-Spanish collaboration on the

PALOMARES - A MORONIC BOMB ACCIDENT

17 January 1966

The Palomares catastrophe happened as a result of a failure in in-flight refuelling of a US Air force B-52 nuclear bomber, code named TEA 16, by a US Air Force KC-135 tanker over southern Spain. The tanker from the US Air Force base at Moron in the South-West of Spain collided at 30,000 feet with TEA 16; both planes broke up and seven aircrew were killed instantly. TEA 16 was carrying four B-28 H-bombs with plutonium warheads. One crashed down into the sea, damaged but not ruptured; another landed in a dry riverbed relatively intact: both were eventually safely recovered. The one that fell into the Mediterranean Sea took 81 days and 33 naval vessels to recover it, and was given more attention initially than the bombs that hit the land. The other two bombs were destroyed on impact with the ground, as the conventional explosive detonated near the small village of Palomares, in Almería province, the second poorest in Spain.

About 10 pounds of plutonium were dispersed in the explosion. About 650 acres of land were contaminated. It was not possible to cover up the fact of the accident; but the military authorities kept a tight reign on information release to the media.

This resulted in a massive plutonium clean-up and decontamination effort over the next three months, involving some 1,700 US servicemen and Spanish Civil Guards. The Americans apparently received far better precautionary protection with special clothing than did the Spanish guards.

JEN was involved with the US Defense Nuclear Agency in co-ordinating the crisis management: clean up and radiation monitoring of crops and housing areas. Around 1,750 tonnes of plutonium-contaminated soil was removed to the US for disposal. A post accident monitoring agreement was signed between JEN and the US authorities.

The authors of the US Atomic Energy Commission Los Alamos Laboratories summary report of 1975, on the implications of the Palomares accident, said “Palomares is one of the few locations in the world that offers an on-going experimental laboratory, probably the only one offering a look at an agricultural area.”

The summary report also said that as the prevailing winds churned up plutonium dust and “the total extent of the spread will never be known.” (See map on page 6)

controversial plant Vandellós-I, and the reprocessing agreements with France and the UK. The UK Atomic Energy Authority contracted irradiated spent MTR fuel from the JEN-1, Argos and Arbi research reactors to be reprocessed, which was delivered to the plant in Scotland in 1992. According to information provided by UKAEA, operators of Dounreay, six spent fuel rods from Arbi were reprocessed in March 1993. The "extremely small" amount of plutonium in the waste stream will be stored at Dounreay and eventually returned to Spain.

Earlier, in 1982, 47.52 tonnes of spent fuel from the Zorita plant and 97.97 tonnes from Garoña had been contracted for reprocessing at the UK’s other reprocessor, BNFL. If reprocessed to schedule, which with chronic operational delays in the THORP reprocessing facility seems unlikely, then the Garoña fuel should liberate 378.15 kg fissile plutonium in 2002; and the Zorita fuel some 249.51 kg of fissile pu in 2003. Another assessment, by David Albright suggested in 1997 that by the end of the year 2000, some 400 kilogrammes of Spanish–origin plutonium would be reprocessed.

A letter from the Spanish minister for relations with Parliament, dated 12 April 1988, to an MP states that the plutonium arising from the reprocessing of the spent fuel will become the property of BNFL. This means that Spain has handed over to a nuclear weapons state quantities of plutonium that could have been mixed with UK origin material and put into the military stockpile. The UK government has admitted up to 1986 it co-processed civil and military plutonium together at Sellafield. Since 1976 all commercial reprocessing contracts with BNFL at Sellafield have included commitments to return radioactive waste arisings to the country of origin of the fuel. It would seem in this case the waste will be repatriated to Spain, but not the plutonium.

But if the case of UK reprocessing raises some concerns, what has happened over the irradiated fuel from Vandellós-I is very disturbing. (See boxe on page 4)

Spent Fuel and High Level Waste Policy

Aside from fuel discharged from the three reactors discussed earlier, spent fuel bearing plutonium will be managed without reprocessing. In December 1986, CSN announced Spain would have some 5,500 tonnes of spent fuel discharged from its nuclear program by 2020, if the program continued at a steady state, costing US$5.5 billion to manage.

The first Nuclear Waste Plan was approved in October 1987, with updates published annually. In 1998, the government announced several major policy changes as regards the management and disposal of spent fuel and long-lived intermediate nuclear waste (ILW) :

These included:

- No decision on a choice of final disposal concept will be taken before the year 2010, following submission by ENRESA of its recommendations.
- There are to be no further siting activities until

2010, after which some form of 'volunteer' process will be introduced.
ENRESA has been developing a spent fuel storage cask with the American Nuclear Assurance Corporation (NAC) and separately with ENSA.

From the beginning of the search for a site to dispose of spent fuel and high level waste ran into difficulties of public acceptance. In May 1987, Portugal objected to research planned at a site just seven km from its border. In November that year ENRESA was forced to abandon the research - despite winning a $5.5m EC grant to support it - after intense protest.

In April 1988 antinuclear campaigners from the Coordinadora Anticementerio Nuclear strongly opposed plans to investigate a site near the Trillo nuclear plant in Guadalajara to assess its suitability for a spent fuel store (ATC, Almacenimiento Temporar de Combustible), resulting in violent clashes with the National Guard. (See on page 7)
In January 1995 the Energy Minister proposed a new radioactive waste bill, with a projected cost of $9.36 billion up to 2050. Further protests took place in 1997 at a possible site near Córdoba, and in May 1998 a special subcommittee of the Cortes recommended that Spain kept open all options for high level waste disposal.

THE CURIOUS CASE OF VANDELLÓS-1

In 1964, France's President De Gaulle agreed with Spain's General Franco that France could export nuclear reactors and technology to Spain. The joint French-Spanish company Hifrensa was formed to build and operate the 500 MWe reactor located 40 km from Tarragona, a 'sister' plant to the French Saint-Laurent-des-Eaux A2 gas graphite reactor in the Loire Valley. French state power utility EDF had a 25% stake in the joint venture.
According to Pedro Duran Farell, former head of Hifrensa, Vandellós-1 had been built only because of the military interests of France. The main goal was not to produce power but to produce plutonium- 239 for military purposes. Sñr Farell, now member of the Club of Rome, said that Vandellós was "the best plutonium factory in Spain".
Vandellós-1 was connected to the grid in 1972. Ironically Vandellós-1 was the only Spanish nuclear plant to get a full operating licence, all the others operating under provisional licenses. After some 10 years of operation, the reactor began to suffer increasing operating problems. From 1982-1989 reports record that 62 significant incidents were registered. Concerns were raised that the reactor had design similarities to the Chernobyl reactor after the 1986 accident. The Spanish Nuclear Safety Council (CSN) ordered that five basic changes concerning the cooling system and safety (especially fire protection) had to be implemented immediately. But little was done. Then on 19 October 1989 a serious accident occurred in the turbine room when a fire broke out. The plant's operating licence was suspended pending the outcome of an inquiry.
When it reported in April 1990, the CSN called for 15 further radical modifications of the plant. On 30 May 1990, the Industry minister announced the final closure of Vandellós-1. It was said this was due to economic reasons, the projected cost of back-fitting the required upgrade in safety equipment being too much, but critics said it was shut for political reasons, a chronic loss of confidence in the nuclear industry. Whatever the reasons, it was a popular decision locally, producing a celebratory fiesta.

Even before the accident, Vandellós had become a focus of public and political attention when it became known that Vandellós fuel was reprocessed in the French military nuclear plant UP1 at Marcoule, near Avignon. So secrecy surrounded the fate of both the plutonium and the safety arrangements that had gone so wrong at Vandellós. Pilar Bravo, head of the civil protection department, declared in spite of herself: "I'm not allowed to say more, except that the danger is big, humm... was big".
On closure, Vandellós contained about 450 MT of spent fuel. Contracts with Cogema, operators of Marcoule, guaranteed reprocessing capacity to be available until 2003. The defuelling strategy thus became an important issue. The 1986 national waste plan had estimated the cost of reprocessing Vandellós-1 fuel at 79.8 billion pesetas, out of a total planned waste management budget of 753 billion ptas.
A letter from the CSN to Greenpeace in February 1996 said that 186,756 irradiated fuel elements were sent to Marcoule from Vandellós-1, the final shipment taking place in November 1994. This would result in about 170 m3 of high level reprocessing waste being returned to Spain, but no date was fixed for its return.
At the time of the signing of the reprocessing agreement with France, neither country was party to the Nuclear Non Proliferation Treaty (NPT). Spain signed up in 1988, France in 1992. The 1981 safeguards agreement covering exported Vandellós-1 fuel stopped at the French border. In May 1999 ENRESA initiated the second stage of Vandellós-1 decommissioning.

Who's Who ?
In Spain

STATE and INDUSTRY

Sociedad Nuclear Española (SNE)
Spanish nuclear society, trade representation body. SNE will hold its 25th annual meeting in Granada, 17-19 November. Publishes a monthly magazine, and once a year, in January, an international edition in English.
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Foronuclear
Spanish nuclear forum.
BOIX Y MORER 6, E-28003 MADRID
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http://www.foronuclear.es

Consejo de Seguridad Nuclear (CSN)
Spain's nuclear safety council including radiological protection.
JUSTO DORADO 11, E-28040 MADRID
TEL: +34 91 346 01 100 - FAX: +34 91 346 05 88
e-mail: csnweb@csn.es
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ENRESA
National nuclear waste management company.
EMILIO VARGAS 7, E-28043 MADRID
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e-mail: cevisma@enresa.es
http://www.enresa.es

CIEMAT
Directs research on energy and environment policy.
AVENIDA COMPLUTENSE 22, CIUDAD UNIVERSITARIA, E-28040 MADRID
TEL: +34 91 346 00 0 - FAX: +34 91 346 60 05
e-mail: relaciones.publicas@ciemat.es
http://www.ciemat.es

UNESA
Umbrella industrial grouping of the major power companies involved in economic and technological co-ordination. Covers 14 utilities separated into 7 regions.
FRANCISCO GERVAS 3, E-28020 MADRID
TEL: +34 91 5674804 - FAX: +34 91 5674988
e-mail: comunic@unesa.es
http://www.unesa.es

UFSA
Unión Eléctrica-Fenosa S.A. is one of the four big electric power utilities in Spain together with Endesa, Iberdrola and Hidrocantabrico. It is the owner-operator of the José Cabrera, Zorita nuclear power plant.
CAPITAN HAYA 53, E-28020 MADRID
TEL: +34 91 567 60 00 – FAX: +34 91 567 66 28
e-mail: ufo25800@nef.es

Central Nuclear de Trillo 1
Is the operator of the 2 Trillo nuclear power reactors. They are owned 48% by Iberdrola, 34,5% by UFSA, 15,5% by Hidrocantabria and 2% by Nuclenor.
P2 CARLOS T BELTRAN 7 ED SALLUBE, E-28020 MADRID
TEL: +34 91 555 91 11 – FAX: +34 91 556 65 20

Central Nuclear Vandellós II AIE
Is the operator of the Vandellos 2 nuclear power plant. Vandellos 2 is owned 72% by Endesa and 28% by Iberdrola.
TRAVESSERA DE LES CORTS 55 LATERAL, E-08028 BARCELONA
TEL: +34 93 334 70 00 – FAX: +34 93 440 58 72

Hidroelectrica Espagnola S.A.
Is the operator of the Cofrentes nuclear power plant. Iberdrola is the owner of the power plant.
HERMOSILLA 3, APTDO 458 (C), E-28001 MADRID
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Central Nuclear de Almaráz
Is the operator of the Almaráz nuclear power plant. Almaráz I + II are owned 53% by Iberdrola, 36% by CSE and 11% by UFSA.
PRINCESE 3, E-28008 MADRID - TEL: +34 91 242 33 00

OPPOSITION ACTIVITIES and CONTACT ADDRESSES

Ecologistas en Acción
Ecologistas en Acción is a national environmental confederation of about 300 ecologist groups from all over the country. It is the most active organization on nuclear issues in Spain, leading a big campaign against the construction of a nuclear waste repository near the Trillo nuclear power plant (see on page 7).
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Involved in unveiling the accident problems and plutonium exports from Vandellós.
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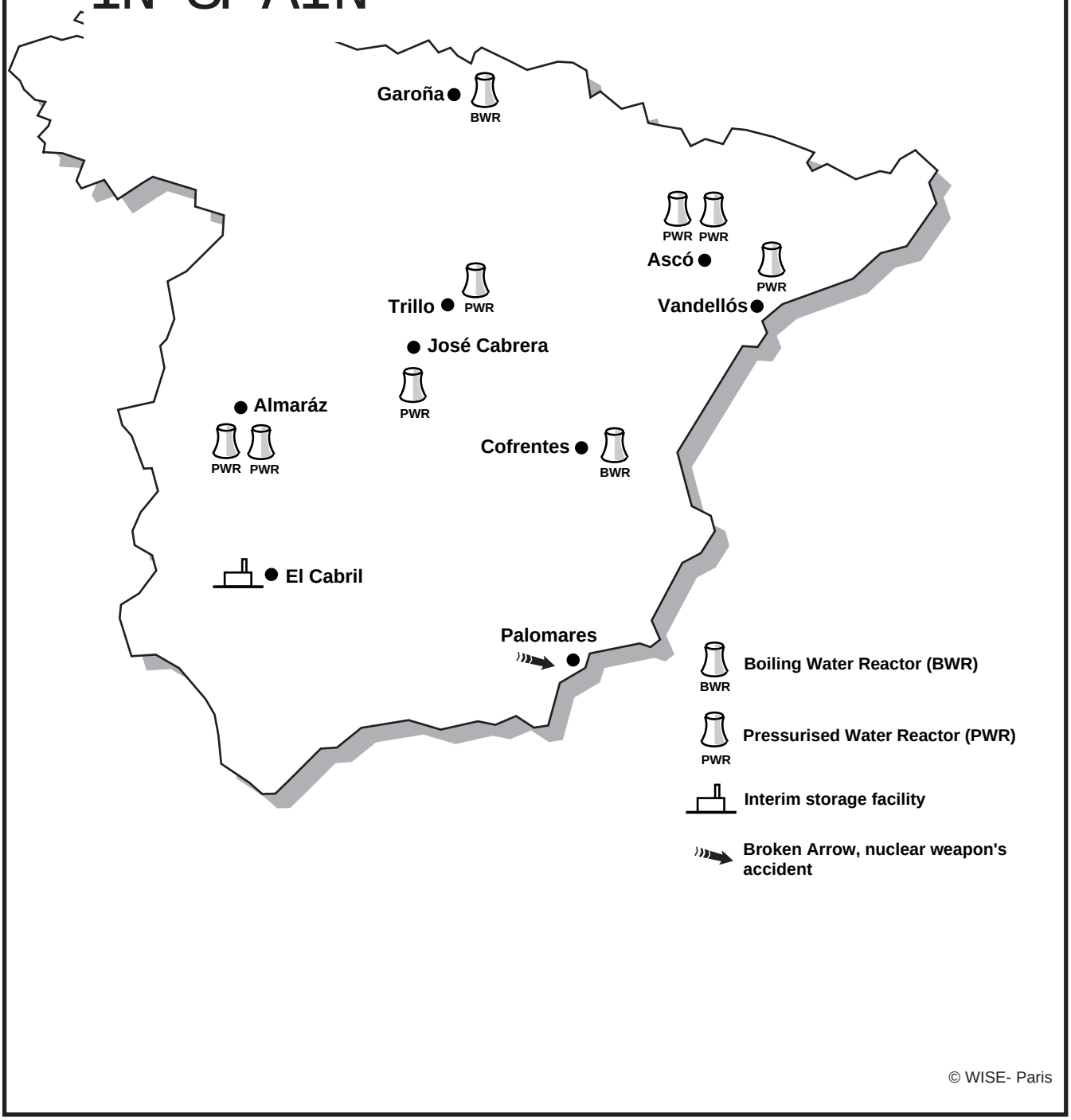
e-mail: jaume.morron@mx4.redestb.es

Plutonium IN SPAIN



7 OPERATING NUCLEAR POWER PLANTS
- 7 Pressurized Water Reactors (PWR)
- 2 Boiling Water Reactors (BWR)

1 SITE FOR STORAGE OF LOW AND INTERMEDIATE LEVEL RADIOACTIVE WASTE
- El Cabril

NO REPROCESSING PLANT

NO MOX FABRICATION PLANT

Plut'Info

FIGURES OF THE MONTH

PLUTONIUM STOCKS IN RUSSIA

Annual figures for civil unirradiated plutonium	As of 1st July 1996	As of 31st Dec. 1998
1. Unirradiated separated plutonium in product stores at reprocessing plants	27,200 kg	29,200 kg
2. Unirradiated separated plutonium in the course of manufacture or fabrication and plutonium in unirradiated products at fuel or other fabricating plants or elsewhere	included in para. 1 total	-
3. Plutonium in unirradiated fuel or other fabricated products at reactor sites or elsewhere	64 kg	200 kg
4. Unirradiated separated plutonium held elsewhere**	870 kg	900 kg
TOTAL (this line does not exist in the official document)	**28,134 kg**	**30,300 kg**

** : rounded for 100 kg*
*** : separated plutonium used for research purposes*

Estimated quantities of plutonium contained in spent civil reactor fuel	As of 1st July 1996	As of 31st Dec. 1998 rounded for 1 ton plutonium
1. Plutonium contained in spent fuel at civil reactor sites	up to 40 tons	42 tons
2. Plutonium contained in spent fuel at reprocessing plants	up to 30 tons	9 tons
3. Plutonium contained in spent fuel held elsewhere	included in 1 total	16 tons
TOTAL (this line does not exist in the official document)	**up to 70 tons**	**67 tons**

(Source : Permanent Mission of the Russian Federation to IAEA, 22 March 1999)

It can be noted that while the International Guidelines for the Management of Plutonium - which have been adopted by the Russian Federation - explicitely call for the plublication of figures on plutonium inventory covering two following years (as of 31 Dec. of one year, and in parentheses the previous year's figures), the Russian Federation has published two separate years (in fact 1997 is missing), and for 1996, as in the middle of the year.

WORD OF THE MONTH

«I am going to tell you something: The biggest threat in the world is the chemical, biological and nuclear weapons' proliferation. If we don't address this question, humanity will soon be extinguished. (...) I am very annoyed with the fact that other countries don't consider seriously the link between terrorism and weapons of massive destruction.»

Madeleine Albright
United States Secretary of State
in an interview by Der Spiegel, 26th of July 1999

WHAT A WASTE

Will Trillo's nuclear waste repository in Spain be brought to light?

The Council of Ministers gave its go ahead 31st of July 1999 to the high level radioactive waste repository at Trillo, in the center of Spain. The government used the «urgency or exceptionnal public interest» article of the Soil Management Law to circumvent Trillo's laws which forbid the implementation of radioactive waste storage. This storage center would have a capacity two times bigger than the amount required by Trillo's nuclear power plant. The town is associated with 127 other cities of Castilla la Mancha in an initiative led by Ecologistas en Acción and Greenpeace, and sustained by the president of Castilla la Mancha Jose Bono to prevent the construction of the repository in the area. It makes it clear therefore why the Council of Ministers, facing a large opposition just before the next general election, and even if the plant will have its irradiated fuel pool saturated by the year 2003, preferred to approve the 5th General Plan which postpones from 2000 to 2010 the construction of a storage facility.

EDF has a stockpile of 6,700 t of spent fuel

According to EDF, the quantities of stored spent fuel at the La Hague site reached 6,700 t of heavy metal at the end of 1998, that is to say 700 t more than the quantities of EDF spent light water reactor fuel reprocessed at the La Hague facilities by the same date. EDF's fuel department declared to **Plutonium** *Investigation* that this stockpile is planned to be reprocessed, but stated that the storage capacity of the La Hague's cooling ponds would allow the increase of the stockpile for 30 years more according to the current annual rate (300-350 tons/year).

Hidden increase of production capacity of the MELOX facility or decrease of French MOX use?

Dominique Voynet, the French minister of Environment, finally co-signed the decree allowing COGEMA to operate a new production line at the MELOX facility at Marcoule which could have an annual capacity of about 50 tons of MOX for boiling water reactors. This extension is aimed at new foreign contracts, especially with Japan, but the nominal total production capacity remains limited to its present level of 115 tons (oxide) per year, corresponds to the amount currently produced for the French reactors. Should it be deduced from this that EDF's reactors would load less MOX from now on or would COGEMA try to reach its aim of 250 tons per year capacity for the MELOX facility in a step by step approach trying to circumvent the necessary public inquiry?

WORTH READING

C. Küppers, W. Liebert, M. Sailer, "Realisierbarkeit der Verglasung von Plutonium zusammen mit hochradioaktiven Abfällen sowie der Fertigung von MOX-Lagerstäben zur Direkten Endlagerung als Alternativen zum Einsatz von MOX-Brennelementen", Öko-Institut, 1999, 113 pages, 20 DM.

Considering the dangers and costs of MOX use, the Öko-Institut has investigated the possibilities and feasibility of the final storage of plutonium.

The total amount of plutonium in Germany by the end of 1997 came to 74 tons, with an annual increase of about 4.5 tons, of which 36 tons in separated form (26 to 29 tons are stored). The use of plutonium in MOX fuel increases technical risks as well as higher costs than uranium oxide fuel. Four methods for the final storage of plutonium have been investigated in this study:

Two methods call for vitrification, one direct vitrification process called "can-in-canister" (planned to be used in the USA for excess weapon grade plutonium treated in ceramic form inside special steel made canisters) and one vitrification process with fission products (requiring the construction of a new facility).

The two other methods, so called storage rods, are based on mixed oxide ceramic rods associated with spent fuel rods within designed storage elements. These two latter methods have the advantage of being feasible in the existing MOX facilities, using the MOX transportation structures, and therefore provide reduced costs. They would allow the treatment of 3,3 to 7 tons of plutonium each year, using only the existing amount of irradiated fuel in Germany.

The feasibility of final storage is claimed to be guaranteed with regard to the safety and criticality levels in all these processes; the future final storage repository has to be designed anyway for vitrified plutonium as well as for storage rods.

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❑ "La France Nucléaire 1997", Mary Byrd Davis, WISE-Paris, 256 pages; 120 FRF + 25 FRF for postage

❑ "Comprehensive Impact Assessment of the Use of MOX Fuel in Light Water Reactors", Jinzaburo Takagi, et al., CNIC, Tokyo, 335 pages; 400 FRF (NGOs 160 FRF) + 60 FRF postage + VAT for Europe (contact CNIC for US and Asia, fax: 81-3-53 30 95 30).

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