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Note

Extension of Dutch Reprocessing:

Upholding the Plutonium Industry at Dutch Society's Expenses?

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Main Findings and Conclusions [1]

Dutch reprocessing: a Countercurrent Strategy

From the early years, the Dutch nuclear utilities have participated in the development of the European plutonium industry. Major setbacks in its successive programs have not yet undermined the commitment of the Dutch nuclear industry to reprocessing. Nevertheless, the status of the Netherlands' spent fuel and waste management strategy must be placed in the broader context of nuclear decline and reprocessing crisis in Europe.

Altogether, the Dutch utilities have signed contracts for 383 t with the French operator of La Hague, COGEMA, covering roughly all the spent fuel unloaded from Borssele up to now, and 56 t with the British operator of Sellafield, BNFL, covering all the spent fuel unloaded from Dodewaard up to its shutdown in 1997 (in addition to 8.5 t of Dodewaard fuel reprocessed earlier in the Belgian plant of Dessel/Mol). These quantities represent the smallest foreign reprocessing contracts for commercial reactors fuel.

Although "recycling", especially that of plutonium contained in spent fuel, is the basis of the original rationale for reprocessing, the Netherlands did not develop this option. After the failure of the fast breeder program, in which they participated by providing Dutch plutonium for the fabrication of fuel for the German reactor Kalkar (that never operated) and the French reactor Superphénix (that was shutdown in 1998), they envisaged the use of mixed oxide fuel, or MOX (made of plutonium and uranium) in light water reactors, a solution that other utilities developed as a stopgap.

But the plan to burn MOX fuel in Borssele, that was once used as an argument for the reactor to be left running past the 1st January 2004 deadline, is now declined by the operator, EPZ, on the ground that the new deadline set for the reactor's shutdown, 2013, is too short for developing the required program. Nevertheless, EPZ announced on 1st March 2004 an "extension" of its reprocessing contracts, pursuing a fait accompli strategy based on announcements with no implementation perspectives.

[1] **Based on a Report commissionned by GREENPEACE® – Netherlands**

However, the strategy pursued by EPZ seems to ignore serious problems encountered by the European plutonium industry. None of the four other historical foreign clients (Germany, Japan, Switzerland and Belgium) of reprocessing with COGEMA is to sign new reprocessing contracts, leaving the French company with an actual quantity of foreign oxide fuel (i.e. fuel from light water reactors) left to be reprocessed under contract of 1,300 t. This corresponds to less than one year of the plants' capacity, and is the lowest quantity ever in the order book since La Hague first reprocessing contract 30 years ago. The same is likely to apply to MOX fuel fabrication in the coming years.

Even the French national utility, EDF, which will remain up to 2007 under current contracts the overwhelming client of COGEMA reprocessing and MOX services, is now considering scaling back its program under economical pressure, linked to the opening of the electricity market and the planned privatization of the company. In the UK, economic pressure was already disastrous for BNFL, now faced with even darker perspectives for its reprocessing and MOX activity.

The strategy now developed by EPZ, which consists in reprocessing without any prospect for plutonium re-use, is therefore countercurrent to the European context, where the Member States of the European Union that used reprocessing services tend, mostly driven by active or latent policies of nuclear phase out, to give up this option and turn to a direct disposal strategy, and try to manage their own stock of separated plutonium through limited MOX fuel programs.

EPZ's commitment to the reprocessing option should also be assessed in the framework of a comprehensive strategy for present and future spent fuel and nuclear waste management. The Netherlands have developed an interim storage site, the COVRA facilities, destined to receive and store in a safe way, over a century, Dutch radioactive waste – including that arising from the spent nuclear fuel management.

However, the design of COVRA is in some ways inconsistent with the current status of the nuclear policy and spent fuel management in the Netherlands. In first place, the existing capacities are not sufficient to include high level waste (HLW) arising from the extension of Borssele's lifetime to 2013. Also, the choice for reprocessing, leading to enclose radioactive residues in a glass matrix, is somewhat contradictory with the objective of retrievability that COVRA is about. Finally, it is not clear whether the COVRA's facilities are prepared to receive all the kind of material arising from reprocessing waste that may be returned.

Reprocess to Recycle: the Broken Myth

The decline and dark perspective of the reprocessing industry in Europe and worldwide is linked to problems encountered with the reprocessing and "recycling" industry, most of them applying in the specific case of Netherlands. In fact, most of the assumptions supporting the "plutonium dream", from the nuclear energy and uranium resources outlook to the assessment of safety, security, environmental impact and economical cost of the reprocessing option, have proven dramatically flawed.

Because recycling is the most important, if not the only, justification for reprocessing, it should be assessed in details. The use of MOX fuel in light water reactors was developed as a stopgap after the failure of the original program commercial reprocessing was about, i.e. the perpetual mobile of plutonium "recycling" in fast-breeder reactors. However, using MOX as reactor fuel is a very inefficient and limited way to re-use the plutonium. In fact, the real balance of materials in the European plutonium industry shows the "recyclable" materials, plutonium and uranium, actually pile-up. None of the reprocessing clients has been able to at least stabilize its stocks of separated plutonium and uranium since the beginning of the reprocessing activities. In fact, the most advanced countries, France – which operates 20 of the 35 reactors using MOX in the world – and the United Kingdom – which does not even use MOX fuel in its reactors –, are those with the highest plutonium stockpile.

From the point of view of waste management, the presentation by the reprocessing industry that it reduces the 100% of irradiated spent fuel to a mean 3 or 4% of waste, i.e. the minor actinides and fission products that remain once the plutonium and uranium have been separated, is misleading. When taking all the waste produced in the reprocessing process, and the secondary waste of the MOX fuel chain into account, reprocessing of spent fuel appears to make the waste management more complicated by multiplying the categories of waste to be dealt with. In fact, experience in both the

French and the British reprocessing industrial centres confirm the difficulties encountered in the management of the wastes arising from the reprocessing processes.

As a general rule, the usual safety, security and environmental problems linked to nuclear power and radioactive waste are heightened by the reprocessing option, as it introduces the separation of some of the most dangerous nuclear materials and multiplies the operations of handling, transport, conditioning and storage.

In first place, the separation of plutonium is a threat to international security. Contrary to an argument regularly put by the reprocessing industry and its clients, the plutonium of so-called "reactor grade", is perfectly usable for the making of bombs, as is unambiguously stated by international and national agencies such as the International Atomic Energy Agency (IAEA) or the US Department of Energy (DOE). Regarding accidents, especially due to external hazard, and potential terrorist attacks, the industrial development of specific storage and transport operations linked to the reprocessing option exposes European populations to higher risks. Also, reprocessing operations release considerably larger volumes of radioactivity than other nuclear activities, typically by factors of several 1,000 compared with nuclear reactors.

Finally, reprocessing and plutonium re-use are very costly options. Savings due to reprocessing – reduced consumption of natural uranium and enrichment services – as compared to direct disposal are very questionable when examined at global level (i.e. for a given number of nuclear reactors over their lifetime) and under real industrial conditions. The comprehensive study of the economics of the entire nuclear fleet completed for the French Prime minister in 2000, which offers very valuable results for the comparison of fuel cycle costs, clearly concludes from the economic point of view, the French industry should change its strategy for direct disposal, and the earlier the better – with savings estimated to 11-12% of costs that remain to be covered, even though France has massively invested in the reprocessing industry.

Dutch Spent Fuel Management: at the Crossroads

The end of historical reprocessing contracts provides the Netherlands with the opportunity to consider several management alternatives for the spent fuel that will arise form Borssele's operation until the end of its lifetime, currently planned by the authorities in 2013. This should combine with an open assessment of the legacy of past and present reprocessing options and the way it could be managed.

While only part of the Dutch spent fuel has been reprocessed, , the Netherlands are already faced with the legacy of the reprocessing option: the long term management of separated plutonium and uranium on one hand, and of various radioactive waste on the other hand.

Out of a total quantity of about 580 t of Dutch spent fuel expected over the two reactors lifetime, a little more than 50% has been reprocessed, around 25% has yet to be reprocessed (of which around 15% already stored in reprocessing plants, and 10% to be delivered) and less than 25%, still to be unloaded, is not covered by disclosed contracts. Large quantities of high level waste, intermediate level waste and low level waste from reprocessing, as well as separated uranium and plutonium, has already been produced and is to be produced through ongoing reprocessing.

One of the biggest challenges facing the Dutch nuclear industry will be the management of the separated plutonium stock that it has accumulated. EPZ's statement that the company will get rid of its stock by selling it to other companies is totally unsubstantiated in view of the long term trends in the so-called plutonium industry: separated plutonium (as well as reprocessed uranium) is given a nil value in official books of asset of EDF in France or BNFL in the UK, while EDF clearly stated a few years ago that there was no market for plutonium and that, even if there was, the plutonium value would be rather negative.

The main other issue with reprocessing legacy is the great uncertainties that remain as to the type, quantity and quality of the waste to be eventually received from reprocessing countries, and on the schedule for those returns. No waste from reprocessing has up to now been returned to the Netherlands, and the only public plan for return concerns the vitrified waste. However, as long-term storage of foreign waste is illegal in France, under a 1991 law, it must therefore be taken into account

in the Dutch waste management policy that some, possibly all of reprocessing waste corresponding to the quantities reprocessed at La Hague shall eventually be returned.

As all the rationale of the origins has vanished, and the other European clients step out, the relentless pursuit of the Dutch reprocessing option is a risky policy, when COGEMA already faces the economical pressure of its prominent client EDF. Moreover, the example with BNFL shows that there is a real risk of a financial crisis of the French reprocessing industry, which could leave EPZ with high stranded costs and technical headache.

The stand-alone choice of EPZ for the reprocessing option in the coming years also represent a political risk that is not inconsiderable in Europe and on the international scene. The Netherlands could be blamed for their continuing support to the reprocessing industry and its huge radioactive discharges into the atmosphere and into the see, contrary to their commitment to the binding objectives of the OSPAR Convention, which they approved. Regarding international security, the Netherlands could bear some political responsibility in the case some nuclear materials be diverted to military programs or terrorist groups, as reprocessing is under growing focus of the international community for increasing proliferation risks. The Netherlands could also be challenged on their support to reprocessing on the grounds of the safety and security issues, and bear some of the liabilities in the case of a severe accident in the European reprocessing industry or a terrorist attack against it.

It is therefore time to re-assess the spent fuel management strategy, taking full account of the legacy from past choices. Considering the limits in the design of COVRA, that require new storage capacities to be developed anyway, the international trend in spent fuel management, and the feasability and economics of spent fuel dry interim storage, this option should preferably be assessed and implemented, on the basis of operational experience in North America and current developments in European countries such as Germany or Switzerland.

In addition, regarding the task of managing the reprocessing legacy, the options for the disposal of the Dutch stockpile of separated plutonium should be discussed as a matter of urgency. In view of international experience, one option of particular interest may be the use of the MOX fabrication plants to produce so-called “mis-MOX”, or bad MOX, i.e. MOX fuel assemblies using separated plutonium and possibly reprocessed uranium, and to store it together with spent uranium fuel so as to use the physical protection of its heat and radioactivity, in accordance with safeguards and so-called “spent fuel standard”.