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of the French Sustainable Development Commission (CFDD)

On the "Charpin - Dessus - Pellat" report entitled

***AN ECONOMIC SURVEY OF THE FUTURE OF THE NUCLEAR
ELECTRIC INDUSTRY***

An economic survey of the future of the nuclear industry was carried out at the request of the prime minister and published on July 28th 2000. Referring to the existing nuclear stock in France and the need to consider the development of our electricity generation systems, the report revealed that the reprocessing of irradiated nuclear fuel with a view to recycling is not efficient in respect of the treatment of waste, nor is it justified economically.

The government must react to the surveys it commissions

For the time being, the government has not followed up on the report. The CFDD is naturally pleased that Parliament should have triggered numerous surveys on this subject, but deplores the fact that those commissioning them are under no obligation **to debate them or indeed to indicate what conclusions they have drawn from them**, and the impact they may have on public policy. Indeed, the CFDD believes that it is crucial to allow properly-informed public opinion to express its expectations on the subject of energy policy and its views on the world it would wish to bequeath to future generations.

Good structural methodology applied to a report on a controversial issue

The CFDD has been extremely interested in the working methods adopted by the authors of the report, who never at any time sought to conceal their differences on a subject that is inevitably open to extensive debate. **This methodology could usefully be adopted for other controversial issues.** In the beginning, the authors brought together all the data which they then exposed to the criticism of all those involved. Once agreement had been secured on undisputed physical and economic data, a consensus was reached on the rules attached to developing the different scenarios, accepting in advance the unexpected results that might come out of the process. They did not at this point seek to recommend solutions, given that they could not, *in fine*, have agreed on conclusions. The result was a broad factual foundation encompassing all the technical and economic elements on which agreement had been secured. The advantage of this method was that it gave the public authorities undisputed elements on the basis of which informed decisions could be taken without the content of those decisions being dictated to them by the experts who provided the said information. On the other hand, the CFDD regrets that other elements of the debate should have been to some extent ignored, in particular numerous positive and negative externalities: the risk of major accidents, the risk of dissemination, cost of waste monitoring, assessments of any subsidies that might be injected into the nuclear industry, the implications for society, people's lives, employment, etc...

The costs linked to the existing stock are not exclusively historical costs

The report assesses the costs linked to the existing stock (58 power stations), taking their service life into account, the quality of production operations (utilisation coefficients, availability coefficients, etc...) and looks at the cost of continuing production, expanding or stopping the re-processing and recycling of irradiated nuclear fuel. Contrary to what is habitually suggested, it appears that the **operating costs** of nuclear power stations represents a high proportion of overall cost (43%), whilst the **costs attributable to dismantling** are relatively low (something of the order of 5 to 6%).

The advantages of re-processing open to discussion

Since the closure of Superphénix in 1997 (which burned plutonium), the plutonium generated by the re-processing of fuels has been used to manufacture MOX (a mixture of uranium oxides and plutonium). This is used for fuel in some reactors, along with enriched uranium. The report demonstrates the poor level of efficiency of this re-processing / recycling option, since economically, MOX is only recyclable once. The second time, the re-processing cost is too high. Then, the quantity of poisons in the irradiated fuel renders any further recycling technically impossible. And yet, one single re-processing of MOX does not reduce consumption of natural uranium by any more than about 5%, and the production of transuranics (plutonium and minor actinides) by 12 to 15%. The quantity of hazardous waste is therefore only slightly reduced by this operation.

Furthermore, the financial benefit of uranium savings does not cover the cost of recycling. Each tonne of transuranics saved by continuing with re-processing beyond 2010 will cost 0.4 billion francs. In total, re-processing will cost France 40 billion francs to avoid producing something like 100 tonnes of transuranics out of a total of around 500 tonnes forecast by 2050 (when the service life of the present stock ends).

Finally, the report reveals a major difference between the management of irradiated uranium (UOX) and that of radioactive MOX. Before permanent storage of this waste, it has to be put into intermediate storage - and monitored - in pools. UOX has to go into intermediate storage for 50 years before it can be stored permanently, whilst for MOX, the figure is 150 years. At this rate, if intermediate storage takes place from 2020 onwards, arrangements must be made up until 2070 for UOX and until 2170 for MOX - a different scale of organisational headaches.

On the basis of these results, the CFDD has identified three elements:

1) The economic survey of the future of the nuclear electricity industry proves that the positions of the Industry Ministry and the *Compagnie Générale des Matières Nucléaires* (Cogema) which suggest that re-processing divides the quantity of waste generated by six are false. This means that the government **has had a report in its hands for eight months now that contradicts its official justification for continuing with re-processing.**

2) The CFDD judges that the MOX option is not an equitable solution for future generations on account of the fact that it will entail complex, technical waste management for a period three times greater than in the case of UOX (without recycling).

3) This UOX option, which is easier to manage, will save some 40 billion francs between now and 2050, with the sole disadvantage being that it will generate a slightly higher amount of transuranics. The CFDD believes that this very interesting statistic needs to be brought to the attention of the public so that the latter can express some sort of an opinion on the justifications for carrying on with re-processing.

Seven different scenarios, one conclusion: promote energy savings

The second part of the report compares 7 possible projections up to 2050, taking the inertia of the nuclear stock into account. On the basis of an agreed economic growth hypothesis (2.3% of GNP until 2020 and 1.6% from 2020 to 2050), seven possible scenarios (three for high energy demand, four for lower demand) differ in respect of the choice of energy types (nuclear, gas, renewable energies). In the nuclear options, different types of reactors and different types of fuel are envisaged. The report describes the flow of fuels and waste each scenario would generate and the technical operations each would require, presenting a calculation of the cumulative cost at different update rates.

A single piece of important economic data emerges from this evaluation: with low electricity consumption, strong controls on demand would produce savings of the order of 15 to 20% of consumption, or 15 billion francs per year, whatever the price of natural gas. Furthermore, the cost of electricity per kW/h for the "low electricity demand" scenarios is lower than for "high electricity demand". **In other words, energy control provides a level of gain that none of the energy sectors - nuclear, gas or renewable energies - can replace.**

Nuclear energy and the greenhouse gas effect

Nuclear energy is generally presented as the solution which would reduce CO₂ emissions and, in turn, attenuate the greenhouse gas effect; To deal with the problem in such a simplistic way means failing to take into account the problems associated with the storage of waste. In order to move away from this implicit scenario, those involved in the report have put forward a method that the CFDD believes to be of interest: putting a value on each tonne of highly radioactive nuclear waste not produced during the period 2000 to 2050 in the same way as we attribute a value to each tonne of CO₂ avoided, within the framework of the Kyoto agreement, through the setting up of exchange mechanisms, so-called "emissions trading". **This approach allows a more accurate comparison between fossil and fissile activities.** Without this parallel, the nuclear option enjoys a comparative advantage that it shouldn't, on account of the nuisances caused by the nuclear fuels cycle.