Comments on the Sellafield MOX Plant Consultation

July 21, 1999

To: Roger Mendonca, DETR
From: Arjun Makhijani, Institute for Energy and Environmental Research (IEER)
Subject: Comments for MOX consultation on Sellafield MOX plant
Date: 21 July 1999
By e-mail: roger_mendonca@detr.gsi.gov.uk

Before allowing the commissioning of plutonium operations at the Sellafield MOX plant, the British government should fully consider

1. the drastically changed world situation in regard to plutonium as a fuel since the decision to build the SMP
2. the alternative courses of action in regard to commercial plutonium from the economic, non-proliferation, and environmental viewpoints.

There is today no credible analysis that shows plutonium to be an economical fuel either for light water or for breeder reactors. Japanese electricity customers would be heavily subsidizing the SMP if it is commissioned. The assumption that Japan will continue to pour money into MOX fuel in the face of its cost and other problems is highly questionable, especially given that offshore wind power is currently considerably more economical in Japan that MOX fuel use. [1] Nor is any other country likely to take the place of Japan in replacing lost MOX fuel orders.

The meager SMP order book in terms of firm contracts is only a partial testimony to the fact that plutonium is a failing business. (That there are any orders at all is evidence of continuing, but unsustainable, subsidies to plutonium.) Pressures created by de-regulation of the electricity sector, which is sweeping major electricity markets throughout the world, are likely to accelerate the decline of plutonium as a fuel. Within the next several years, and possibly sooner, commercial pressures arising from electricity de-regulation are very likely to put additional heavy pressure for cancellation of MOX contracts. It is essential that the value of BNFL's "order book" for MOX fuel, which includes letters of intent and orders that are "under offer", be evaluated in that context. The present worth of such "orders" is highly questionable, given that plutonium is uncompetitive as a nuclear fuel.

Other factors pushing in the direction of an end to the use of MOX include:

- The failure of MOX fuel to make it economically (that is, without taxpayer and/or ratepayer subsidies) in any country [2]
- The German decision to phase out nuclear power
- The Belgian decision to phase out MOX fuel
- The fact that BNFL itself puts a zero value on its plutonium store
- The fact that Electricite de France, the world's largest MOX customer, in the world puts a zero value on plutonium even though it spends hundreds of millions of dollars a year on reprocessing to acquire that fuel

- The U.K. House of Lords Science and Technology Committee declaring that plutonium is a waste
- The fact that a large part of the world's separated plutonium stock is now so old that it would have to be reprocessed again at considerable expense in order to be fabricated into MOX fuel.

A decision to open SMP as a MOX plant should also be considered in light of its potential alternative uses. Britain has the world's largest store of separated commercial plutonium, and there is no realistic prospect that any significant portion of it can be used a MOX fuel. Even if Sizewell B, the only reactor in Britain that could possibly use MOX fuel, were to use MOX, it would use only a small fraction of the present British plutonium stock (to say nothing of the increase of this stock due to continued reprocessing). The House of Lords Science and Technology Committee report did not say what might be done with British plutonium in light of its finding that plutonium is a waste. Yet a decision on British plutonium disposition and the commissioning of SMP should be taken in light of that finding, given that storage of separated plutonium is costly.

Moreover, Britain cannot dispose of its separated plutonium stock in a repository its present form of a plutonium oxide powder. This would be completely unacceptable for both environmental and security reasons. Hence, it will be necessary to treat the plutonium in some way prior to its disposal. The safest, fastest, and most economical method to accomplish that end would be to immobilize the separated plutonium. While there are many approaches to immobilization, one approach readily suggests itself for Britain. It is one, which would, moreover, be compatible with BNFL's decision to rely on foreign decommissioning markets, notably the US market, for an increasing share of its business.

Before giving the go ahead to the SMP as a MOX plant, the British government should carefully evaluate the possibly of converting the plant to the task of the ceramic immobilization of separated plutonium. Ceramic immobilization of plutonium has been selected as the disposition method for at least 17 metric tons of US surplus weapons plutonium. [3] In this process, a ceramic-forming mixture of powders, consisting of a few percent plutonium dioxide, about ten percent uranium dioxide and non-radioactive titanate materials, would be pressed into hockey-puck-size shapes in a machine similar to the ones used to make MOX fuel pellets. [4] The resulting pucks would then be sintered in a process similar to that used for sintering MOX fuel pellets. Subsequently, several of the ceramic pucks are to be put into metal cans that would be positioned in a structure inside the canisters into which high-level waste is poured and vitrified. These canisters and high-level waste vitrification process are similar to the ones used by BNFL at its vitrification plant at Sellafield. This process puts plutonium into a form that is proliferation-resistant and suitable for storage in a manner similar to vitrified high-level waste.

The conversion of SMP to plutonium immobilization, if it is technically feasible, would solve some problems for Britain, and give it some important advantages:

1. It would provide a way to put Britain's plutonium store into a non-weapons-usable form suitable for storage for several decades. Hence, it would reduce British plutonium storage costs.
2. It would preserve the jobs in the SMP.
3. If the ceramic pucks are put into the canisters and made part of the vitrified glass logs that BNFL is producing, it would eliminate the problem of disposing of separated plutonium as a distinct and potentially very costly issue in British waste management.
4. It would make Britain the world's leader in immobilization technology at a time when surplus

plutonium stocks of commercial and military origin are becoming a major environmental, security, and economic issue. Given the pressures of electricity de-regulation, it is possible, and even likely, that more and more of the countries that own separated plutonium will turn to plutonium immobilization as the cheapest way to address the problem of unwanted, uneconomical separated plutonium stocks.

5. It would free up BNFL from pressures to justify a failing plutonium business, thereby allowing it to focus its efforts on decommissioning from which it expects to derive a larger share of its business. The immobilization of plutonium can and should be seen as part of the global nuclear decommissioning process.

In sum, the SMP is a plant that would make a highly uneconomical fuel. The plant's order book for MOX is of dubious value and is likely to become even more questionable in the future. A reliance on continued subsidies from foreign electricity ratepayers, which would be essentially its only source of revenue, is an unwise and unjustified business risk whose costs may eventually be bore by British taxpayers and those who might buy BNFL stock, if a part of BNFL is privatized. The business risk should be economically quantified as part of the consultation process. The risk of commissioning the SMP as a MOX plant is even more unwarranted, given that it may be possible to convert the SMP into a plutonium immobilization plant. The feasibility of such a conversion should be thoroughly examined and publicly discussed before any go ahead is given for the operation of the SMP as a MOX plant, especially since conversion prospects would be compromised by the start of plutonium operations.

Endnotes:

Notes:

1. Marc Fioravanti, Wind Power Versus Plutonium: An Examination of Wind Energy Potential and a Comparison of Offshore Wind Energy to Plutonium Use in Japan, Institute for Energy and Environmental Research, January 1999. ? Return
2. In France, Germany, and all other countries where MOX fuel is used, there exist some combination of ratepayer and taxpayer subsidies. These subsidies are usually hidden in electricity charges, but can be calculated by estimating the difference between uranium fuel and MOX fuel costs. For instance, see the 1994 and 1995 reports on plutonium of the US National Academy of Sciences. ? Return
3. The likely US government's decision to build a MOX plant (with which IEER disagrees) for the rest of the surplus plutonium stock is not based on commercial considerations. Like the UK House of Lords Science and Technology Committee report, the US National Academy of Sciences (NAS) has recognized that plutonium has no commercial value as a fuel. Two NAS reports (in 1994 and 1995) analyzed the net costs of using plutonium in some detail. If the US MOX plant were built, the design and construction would be carried out by a consortium that includes the French company Cogema. The consortium does not include BNFL. ? Return
4. It should be noted that the MOX fuel pellets are much smaller in size than the proposed forms for US immobilized plutonium. ? Return