COMMENTS BY ELECTRICITE DE FRANCE ON THE INITIAL SCOPING NOTE, PREPARED BY THE PIU ENERGY REVIEW TEAM, ON NUCLEAR POWER

Electricite de France (EDF) comments below on some of the issues raised by the Review Team's scoping note on nuclear power. The commentary follows the appropriate section headings and paragraph numbers in the scoping note.

Prospects

With regard to existing power stations in the United Kingdom, it is difficult for EDF to make any comment. However, we would mention experience with EDF graphite gas reactors which have been shut down before completing 30 years' service, and would be happy to discuss the implications of this experience with the Review Team in detail.

23. To what level could nuclear generation costs fail for plant designs likely to be available over the next ten years?

One of the ways to cut construction costs is by launching a series of standard phases. A further solution would be to develop improved designs. To this end, EDF, in conjunction with Framatome, Siemens, and other electrical companies, has developed an evolutionary EPR reactor which should prove competitive in relation to combined cycle and coal designs. In other respects, certain designers (BNFL-Westinghouse and General Electric) are each developing AP 1000 and ESBWR reactors, with simplified circuits based on the use of passive systems, where the construction time can be reduced using modular construction: BNFL has announced a construction cost of 1,000$/kWe which has yet to be confirmed.

· **What level of confidence can be placed on such cost estimates?**

With regard to an evaluation of EPR costs, the calculations have been made in relation to the recent construction cost of N4 reactors. With regard to the AP 1000, EDF is working on a means of confirming costs (EDF/BNIFL agreement recently signed for the AP 1000). The risks of error are limited for water reactors as the corresponding advanced designs are based on known components. For the HTR, uncertainties as to cost are greater in view of the technological problems that still remain to be resolved.

· **Does past experience enable new stations to be built more cheaply?**

It is not past experience which dictates this, but the proposed development of the advanced light water reactors provides scope for hope of lower costs with limited risks (the components of EPR and AP 1000 reactors are tried and tested).

24. Are the above estimates of lead times for nuclear realistic ?

A process taking 15 years would seem pessimistic if the British safety authority agrees to take into account safety analyses undertaken by the Franco-German safety authorities on the EPR and NRC certification for the AP 600 (and soon perhaps the AP 1000). A period of ten years (including end to end construction time) seems more likely for the first of a series. For the following phases, the process could be faster.

· **Could more be done to reduce lead times by harmonising UK licensing procedures with those of other countries?**

Harmonisation will take time, based on experience with the EPR. We would also draw attention to the initiative taken by European electrical engineers with the FUR (European Utility Requirement).

Environmental Impacts

31. EDF notes, in connection with this paragraph, that most of the short-lived waste products are permanently managed today, while the long-lived and high-activity waste products are temporarily stored.

32. EDF points out, in connection with this paragraph, that the HLW vitrifi- cation process is a well-recognised advantage of the reprocessing option. It works very well in France and, up to now, COGEMA has produced more than 2,000 cubic metres of glass (equivalent to some 20,000 MT of spent fuel). BNEL seems to have difficulties in vitrifying HILW at Sellafield.

34. **How can nuclear generators set aside adequate sums to meet eventual waste disposal costs ?**

· **If a generator were to set aside sufficient funds to meet highly pessi- mistic estimates of waste disposal (and interim storage) costs, what fraction of total generating costs would this represent?**

The fact of the matter is that techniques for permanent deep storage already exist. Experts agree that it is feasible in technical terms. Estimates could therefore be obtained from the cost of permanent storage technique work. EDF's budget to the year 2020 for these future costs is based on an estimate produced by AINDRA. Another solution would be to assign dedicated funds to the same amounts. For EDF, there is no problem from a technical point of view in setting these sums aside either in the form of reserves or in the form of dedicated funds. Of course, if political expediency results in an increase in costs, it is difficult to predict the magnitude of that.

38. If active consideration were to be given to compensating local communities for accepting nuclear waste facilities, would this significantly alter the acceptability of nuclear waste storage and disposal facilities ?

This point needs to be addressed with the greatest care. Based on work carried out at EDE Research and Development, EDF would say that financial compensation is considered by those operating waste storage sites to be the only positive aspect that a local community can derive from this type of operation. However, it does tend to raise a number of contentious issues, especially with regard to legitimacy, legality, and redistribution of money. For example, it is easy for opponents to characterise it as a cynical attempt to 'buy consciences. And, as well as asking the questions, to whom? why? and how ?, we also have to ask the question when? (i.e., before or after the decision, whether the decision is to start storage, or build a laboratory, or whatever).

In summary, financial compensation is a source of controversy. However, it is evident that,

without it, there would not even be any question of finding a site for permanent or interim

In this respect, the extract below taken from the Granite mission report says much (this mission was sponsored by the French government to assist in finding a waste storage site in granite rock terrain):

> 'Acceptance of a laboratory likely to open the way to storage is a *service* rendered to the nation by a local community, and the nation must recognise this within the framework of an agreement covering conditions for the provision of information and management of risk, and technical and economic support mechanisms for related operations, while ensuring that the conditions for updating the agreement are closely watched'.

Nuclear and Security of Supply

> **What,** if any, is **the economic case at present for reprocessing spent fuel from new reactors?**

There is no longer an economic case for reprocessing, but when the spent fuel is reprocessed, the HLW (fission products, minor actinides, hulls, and end-fittings) can be durably conditioned in dedicated packages (a glass matrix to incorporate the fission products and the mmor actiides, for example) which have a small volume (less than 0.5 m3/ton HIM in LaHague). The THORP Plant in Sellafield is recent and many contracts exist with foreign generators.

UK Capability to Build New Nuclear

> **Are there** good energy policy grounds **for ensuring that the UK retains the local expertise and capability to build new nuclear plant?**

It will be easier to maintain the capability if decision makers give a signal, such as the construction of new power stations. This will give nuclear the image of a developing industry, one that is attractive for skilled labour.

· **Would it be practicable for UK nuclear** safety **regulators to rely on using foreign personnel if the relevant** skills **were not available in the United Kingdom?**

The best solution would be for the UK safety regulator to recognise the sound basis of work already completed by foreign regulators.

· **Are there stronger grounds to ensure local nuclear capability than for other energy technologies ?**

The sole factor which requires special consideration is that relating to nuclear safety: the operator has to master this point himself.

· **Is** it likely that the UK **would** wish to proceed with new nuclear plant if other OECD countries **were not doing so?**

A number of OECD countries *are* continuing to build nuclear plants (eg, Japan, Korea, and Finland), so the question seems to answer itself.

· **If it were felt important to retain a local nuclear build capability, what would be the best way of doing so, short of ordering new stations?**

A partial solution entails participating in construction projects abroad or obtaining feedback from experience in modifying existing phases. An improvement in fuel management could also enable work to be done on the overall design of construction phases.

Public Attitudes to Nuclear Power

How far **would a declaration that fuel from any new reactor would not be** reprocessed improve the public acceptability of nuclear power by avoiding **further separation of plutonium and breaking the link with nuclear weapons?**

Plutonium recycling in current PWR is an industrial reality in France, Germany, Switzerland, and Belgium. EDF recycles fully separated plutonium in the 900 MW PWR, with adaptation of reprocessed quantities of U02 fuel to the recycling possibilities. This strategy avoids storing separated plutonium on shelves, and when the plutonium is in spent fuel (MOX or U02) it cannot be used for military purposes.

During the last 30 years, around 40 metric tons of plutonium have been successfully recycled in the French PWR reactors, with constantly improving performance and significant feedback on fuel fabrication and behaviour.

Research and Development

Is there a realistic prospect of new **reactor designs emerging that could allay**

public concerns about safety, waste, and proliferation?

- Can we expect the private sector **to come forward with new reactor designs?**

- Is **there a case for further UK public investment in new reactor designs?**

· **What** is the appropriate role for international collaboration in nuclear research **and develeopment?**

In the present decade, one can envisage advanced evolutionary water reactors (such as EPR) or passive types (AP 1000) using innovative fuels and, by 2015/2025, industrial gas reactors:
in short, new concepts making progress or breaking away from existing reactors, meeting the principal criteria of improved safety, more competitive economics, minimisation of waste-related problems, and low proliferation capability. These criteria should contribute, overall, to better acceptance of nuclear by the public. It is a reality shared widely by a large number of players in the nuclear sector today.

In the private sector, manufacturers and bankers can see the value of such projects. This is the case with the two HTR projects: PBMiR with BNEL, ESKOM, EXELON, and a South African company, and the GT-MHR with Framatome, OKBM, and FUJI. In the United States, some electrical engineers have apparently set up a consortium to study the construction of new phases.

The public sector is more interested initially in following up the development of these projects with technological monitoring to identify an opportune moment for possible financial involvement in private projects after evaluating their feasibility, industrial viability, industrial

risk, and realistic planning for the emergence of a prototype. Its involvement also has to be guided by a commercial and industrial strategy with regard to these new products.

The value of international co-operation in the nuclear R&D sector rests firstly on sharing the necessary research costs to bring advanced technologies to 'maturity' and, secondly, on obtaining a consensus on the part of international experts as to the suitability of the new designs for meeting the stated criteria. This is, in fact, one of the objectives of the 'Generation IV' initiative launched by the DOE: hence its heavy international emphasis and the contribution of laboratories, research centres, and industrial concerns. A good example of international co-operation was the advanced light water reactor, which was financed jointly ly the DOE and American, Asian, and European electrical companies.

EDF, October 2001