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The dependence of nuclear energy expansion on national and multinational progress in waste management

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For many years, nuclear supporters have been talking of a possible nuclear power renaissance. Today there are definite signs that this is finally beginning to happen. New plants are being built or planned in China, Japan, Korea, Finland, France and even the USA. Phase-out policies are being rethought in countries like Sweden, Belgium and Germany. Countries like Vietnam, Indonesia, the Baltic States and Australia are choosing or debating initiating a nuclear programme.

Support for these nuclear power developments will be strongly influenced by the progress of waste management programmes, especially final disposal. Conversely, the growing realisation of the potential global benefits of nuclear power may well lead to increased support, effort and funding for initiatives to ensure that all nations have access to safe and secure waste management facilities. This implies that large nuclear programmes must make progress with implementation of treatment, storage and disposal facilities for all of their radioactive wastes. For small nuclear programmes (and for countries with nuclear applications other than power generation) such facilities are also necessary. For economic and other reasons, these small programmes may not be able to implement all of the required national facilities. Multinational cooperation is needed. This can be realised by large countries providing back-end services such as reprocessing and disposal, or by small countries forming regional or international partnerships to implement shared facilities for storage and/or disposal.

Experience throughout the past decades has made clear the mutual interactions between programmes in nuclear power and in waste management. The relevant issues of concern for both include radiological safety, environmental impacts and, most topically, non-proliferation and security. Debates on these issues have strongly affected national efforts to implement power plants and repositories, and also influenced the international debate on multinational cooperation in each area.

In waste management area, the impulses given by reactor supporters to disposal programmes have been both positive and negative. A positive example was in Sweden and Switzerland where political or legal requirements to demonstrate that safe disposal was feasible were established already in the 1980s and this led to a rapid expansion of technical waste disposal work in these countries. More recently, state or industry pressure to move ahead with planning of new nuclear build have led to disposal programmes being initiated or accelerated – e.g. in South Africa with its PBMR reactor plans or in the USA where the Bush Government pushed the Yucca Mountain ahead towards licensing.

Negative consequences of the controversial nuclear power plant debate on the progress of waste management programmes are widespread. The absence of operational deep disposal facilities has been very often used as an argument against nuclear power. Opponents of

nuclear power, not wishing to relinquish this very effective argument have blocked waste management programmes – especially during the most sensitive phase of repository. This has led some countries, such as Spain or the Netherlands, to simply move off all disposal plans in the hope that the societal challenges will become less with time.

Today, it is clear that future expansion, or even continued use, of nuclear power will become increasingly difficult or indeed impossible if there is not a broad enough acknowledgement by the public and the politicians that safe and economic methods are available for the long-term management of the wastes. This implies that storage and disposal facilities must be planned, financed and constructed. Fortunately, a few countries are doing a very good job of showing that this is possible. The best examples are Finland and Sweden, where facilities for multiyear storage of spent fuel have been implemented and, for final disposal, technical concepts, funding mechanisms and potential siting areas are all in place. Other large nuclear nations must push ahead with programmes aimed at achieving all these milestones. Several are doing so – France is a good example – but others have been moving slowly or not at all.

Even if the large nuclear programmes do progress, however, serious problems remain with ensuring that safe and affordable long-term management options are available to all users of nuclear power – large or small. Multinational efforts will be needed. The problem is not with storage. Because of the relatively comfortable situation with availability of national stores, multinational storage of spent fuel is not, in itself, a technical necessity. Multinational *disposal*, on the other hand, is a topic which has become increasingly prominent over the past several years and is a development that may well be necessary, if all of the world's SNF or HLW is to be disposed of safely in geological repositories. Numerous countries with small nuclear programmes would welcome multinational disposal projects that allowed them to profit from the potentially large economies of scale in repository implementation. In a few countries, the possibility of hosting such a multinational repository has been discussed (most clearly in Russia but also in China, Australia and, recently, in the USA). In recent times, increased concern about international nuclear terrorism has led to greater readiness to consider such options.

In its publications in this area and in recent statements of representatives of the IAEA, two potential routes to achieving international disposal have been described. The one of these which does not require global strategic developments and agreements, is the partnering scenario, in which a number of most probably small countries agree to look for a common disposal solution involving one or two shared repositories. These should be sited in locations to be decided by the multinational participants in the same democratic, consensual approach that has been used by potential siting communities in the more successful national programmes. The SAPIERR project funded by the EC in 2004-5, examined this option for the case of potential regional repositories in the EU and the follow on study SAPIERR-2 which is soon to commence will take this work further.

The other strategy for multinational cooperation is the inclusion of disposal within a broader scheme of internationalised fuel-cycle services provision. The GNEP proposal (the security-inspired, US proposal for a Global Nuclear Energy Partnership) and recent Russian proposals for accepting SNF from other countries are examples of this. The Russian proposals are explicitly for the back-end, i.e. they involve acceptance of foreign spent fuel for storage, reprocessing and possibly disposal. The chief focus of GNEP is on reducing the scope for “latent” proliferation by restricting the spread of enrichment and reprocessing technologies. But this implies that countries that do not have access to these must be supplied with reactor fuel – and, if the spent fuel is not to pose a later security risk, it must be taken back by the supplier (leasing) or be accepted by a third party for reprocessing or disposal.

Both projects, if they are able to resolve the matter of the ultimate fate of SNF (or its waste by-products) accepted from other countries, *could* offer an attractive international service, as well as addressing global security concerns. A total back-end service might be offered to a country, either alone or to complement front-end services. Russia or the USA would take away that country's existing SNF backlog, take ownership, making a charge for the service, place the material in a centralised (effectively, multinational) store and would then be free to recycle as and when they consider convenient. New fuel produced either through the conventional reprocessing route or using advanced proliferation-resistant technologies would be used to supply both their own national reactor programmes and also those of a pool of international users.

At the moment, of course, none of the elements of such a back-end system truly exist, and unless this is recognised, nuclear risks can rise. In particular, the over-optimism amongst the US supporters of GNEP concerning the ease with which one can implement a commercially viable US reprocessing and fast reactor programme may have a high potential to impede practical progress towards enhancing global security. The really urgent tasks are collecting SNF and other sensitive materials for secure international storage – and significant progress has been made by both Russia and the USA in this regard. Nevertheless, there is a long way to go to turn GNEP from a high-minded concept into any kind of reality. The Russian proposals seem more likely to offer short-term realisation. Russia already takes back NPP fuel but this is currently legally possible only for storage or for reprocessing with return of HLW. Efforts are underway at Government level to change this situation since it is recognised that the offer to accept SNF is unlikely to be universally attractive until a total solution is available.

The overarching messages that this short presentation has tried to present are as follows:

- The future of nuclear power is strongly dependent on progress being made with long-term management of the radioactive wastes that result.
- Progress is being made by some nations – but by too few. Other major users of nuclear energy need to move ahead.
- The key issue is planning for deep geological repositories that will be safe and also affordable without making nuclear power an uneconomic approach to energy production.
- For some small countries, the economics of disposal can only be right if multinational cooperation is intensified – leading to shared disposal facilities.
- This can be achieved in two ways: partnering of small countries or provision of services by operators of large repositories.
- For both options, credible concepts are being developed today and their realisation in the near future will remove a serious obstacle to the benefits of nuclear energy being made available to a wide range of nations of the world.