Radioactive Waste Management and New Nuclear Power Stations

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Summary and Recommendation:

This report provides a summary of the current position on proposals for managing radioactive wastes and spent fuel from new nuclear power stations.

Recommendation:
That the contents of the report are noted and that members support NuLeAF in their calls for the Office for Nuclear Regulation (ONR) to take account of the views of the Royal Society on reviewing the proposed methods of storage of spent fuel storage.

1. Introduction

This report looks at the current position on proposals for managing spent fuel, Intermediate Level Waste (ILW) and Low Level Waste (LLW) from new nuclear power stations. The developer of Hinckley point C EdF explain that strategic planning of waste management would be implemented at Hinkley Point C through the development of an Integrated Waste Strategy (IWS). .

This report also outlines the Royal Society's argument in favour of dry storage as opposed to wet storage. The NuLeAF steering Group meeting in January agreed to write to the ONR asking it to take account of the views of the Royal Society on methods of spent fuel storage when requiring future new build licensees to undertake actions to underpin their approach to such storage.

Following the events in Fukusima further investigation has been carried out into the most effective methods of storing spent fuel. The Royal society has concluded that there is a case for preferring dry storage of spent fuel in the long term rather than pond storage as wet storage requires high maintenance. However the ONR has been more cautious in its conclusions on the implications of the Fukusima accident and the subsequent UK review into storage methods.

It is recommended that Copeland Borough Council should support NuLeAF in their calls for the ONR to review the benefits of dry storage methods of spent fuel.

EDFs current proposal for the storage of Hinkley Point C Spent fuel is through wet storage. During 2010, EdF expressed the view that there is no clearly superior technology for the interim storage of spent fuel from new nuclear power stations, with both wet and dry storage systems having strengths.

Since the Fukushima accident and the following UK review it is arguable that this should be revised, especially in the light of the conclusions by The Royal Society that there is a case for preferring dry storage systems.

2. Wet Verses Dry Storage

Spent fuel is intensely hot and radioactive due to the natural decay processes of the fission products and minor actinides it contains. It is initially cooled under wet conditions in storage ponds located in the immediate proximity of the reactor. Water provides an effective coolant and radiation shielding. With more than 50 years of experience, wet storage is considered to be a mature technology. However, it requires relatively high maintenance, especially tight control of the water's chemistry to prevent the fuel or its cladding from degrading. In addition, the pond is actively cooled. Pumps circulate water from the pool to heat exchanges so that the heat generated by the assemblies is continuously removed. The environment above the pond in the storage facility is carefully monitored and treated, including the detection of hydrogen gas.

Most of the spent fuel generated in the UK has been stored wet at the site of arising, prior to transport to Sellafield for reprocessing.

The Royal Society (RS) has recently published a report entitled, 'Fuel Cycle Stewardship in a Nuclear Renaissance' (October 2011).

The RS report states the following on the "resilience of dry storage":

- If spent fuel is to be stored pending reprocessing, then it would be less complicated to continue to wet store it.
- If there is no intention of reprocessing, then the high degree of passive safety and security provided by dry storage should be exploited.

Dry storage involves surrounding spent fuel assemblies with inert gas inside a large cask, typically a steel cylinder that is welded or bolted closed. This inner canister is surrounded by an outer cask made of steel, concrete or other material to provide extra radiation shielding. Cooling channels in the outer cask allow air to circulate naturally around the inner canister so that heat is removed by natural convection processes. In some cases, the casks are stacked vertically or horizontally in concrete vaults to provide further radiation shielding. Dry storage requires larger storage facilities than wet storage.

3. Interim storage of waste

The application for Hinkley Point C includes proposals for the interim storage of spent fuel at site pending geological disposal.

At the NuLeAF January 2011 Steering Group, Nuclear Industry Association (NIA) representatives presented the outcome of the industry study on options for new build spent fuel management and disposal. Much of the discussion focused on the potential process for moving from the base case (spent fuel storage at each new build site) to a centralised approach.

In contrast to the NIA view, DECC stated that the nuclear industry is free to consider moving towards centralised or regional storage for spent fuel from new nuclear stations, but they would have to go through a process of discussion with relevant parties.

There are two types of uncertainties that could impact on the duration of interim storage:

- the cooling period needed for spent fuel before it could be disposed of;
- the potential for delays to the development of a Geological Disposal Facility (GDF) that includes new build spent fuel in its inventory.

In the best case scenario spent fuel from Hinkley Point C could be disposed in a GDF approx. 2130 after all legacy waste has been dealt with. However this is based on the assumption that storage of spent fuel can be reduced by 50 years. If the proposed 2130 date for the GDF to be available slips or the methods for reducing storage is unsuccessful then the duration of on-site interim storage could be lengthened. The Generic Design Assessment process should explicitly address the implications of scenarios were the storage of ILW is for much longer than the best case.

4. Encapsulation and Disposability of Spent Fuel.

The Government's current base case is that an encapsulation plant would be built at each new nuclear power station site, but NDA acknowledge the possibility of a centralised encapsulation facility at a GDF site. Because of the complexity and expense of such a facility, in their application for Hinkley Point C, EdF say that a "more realistic assumption would be for a single UK facility to be developed to encapsulate both legacy and new build spent fuel and HLW." They add that "such a facility could be co-located with the eventual repository site"

EdF reports that the NDA Radioactive Waste Management Directorate (RWMD) has undertaken an assessment of the disposability of (European Pressurized Reactor) EPR spent fuel to a GDF and concludes that no new issues arise, compared with existing spent fuel, that challenge its fundamental disposability. They add that "Given a disposal site with suitable characteristics, the spent fuel from the UK EPR is expected to be disposable.

For each type of LLW that would arise at Hinkley Point C, EdF provide an estimate of annual raw LLW arising's, the preferred waste management approach, and alternative arrangements. The preferred waste management approaches include conditioning and packaging for disposal to the LLWR, the off-site disposal of VLLW to landfill, transfer for incineration and transfer for metals treatment.

5. Implications for Copeland

The process for moving from base case to a centralised approach needs to be clearly identified and consulted on. The prospect of a centralised approach for the storage of spent fuel management and disposal is something that Copeland Borough Council would require early and meaningful engagement on. Sellafield is already under increased pressures to receive the nuclear waste / spent fuel from other power stations e.g. Exotic fuels from Dounreay. It is recommended that a joined up systematic approach to the management of spent fuel is established from the beginning to ensure that the full implications of all the potential scenarios are investigated.

The NDA have acknowledged the possibility of a centralised encapsulation facility at a GDF site. There is a potential that in the future there could be a shift towards centralised storage and or a centralised encapsulation facility for spent fuel therefore there needs to be further examination of the social, financial and environmental implications of hosting such facilities.

The royal society report states that if fuel is not going to be reprocessed it should be dry stored. A holistic approach needs to be taken to the management of the spent fuel with a definitive end point. If the fuel is not intended to be reprocessed then facilities needed to handle the effective and most efficient means of storage need to be identified.

Furthermore the current timelines for storage of ILW, before it could be disposed, are based on the best case scenario with disposal to a GDF in 2130. This assumption is based on the GDF being delivered on time and the cooling period need, of spent fuel, being reduced. Scenarios where the GDF is not delivered on time or the cooling period is not reduced also need to be given due consideration as these as very real possibilities.

If the intention is to store the spent fuel until such time as a GDF becomes available then a robust assessment of the most effective storage methods is necessary. Therefore the ONR should be urged to reexamine the potential of dry storage. All new nuclear power stations should produce an IWS which clearly identifies were the ILW will be stored and eventually disposed of.

Way Forward

The proposed way forward is for the Council to:

- Through NuLeAF to urge the NIA and DECC to clarify the position on the process for the movement from base case to centralised or regional storage for spent fuel from new nuclear stations.

- Support NuLeAF in its calls for the ONR to reconsider the merits of dry storage in light of the advice from the Royal Society on the merits of dry storage particularly if it is not intended to be reprocessed.

- Encourage consideration to be given to what the impact might be of a central encapsulation facility should there be a shift in the current base case.

- The EA and EDF concluded that spent fuel is likely to be suitable for disposal in a geological repository. It needs to be considered what impact these assumptions will have on the MRWS process.

6. List of Appendices – None

7. Consultees