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## **Note on a Meeting with NDA on Spent Fuel and Nuclear Materials 20<sup>th</sup> March 2015**

CoRWM's Workplan for 2014<sup>1</sup> includes:

### ***“Uranium, Plutonium and Spent Fuel Management***

*CoRWM will plan its work to provide timely advice to DECC and other sponsors on the current status of spent fuel and plutonium management and the implications for a GDF. This work will include the review and scrutiny of the NDA and other nuclear site Licensees' current and future plans, and any necessary R&D programme to underpin these plans”.*

CoRWM recognises that neither spent fuel or plutonium have been designated as being radioactive wastes. However, given that it is possible that these materials may be designated as being radioactive wastes in the future CoRWM maintains an interest in the context of robust interim storage.

It was decided to review the plutonium and spent fuel in the custody of NDA, and to that end a meeting was held on 20<sup>th</sup> March 2015. This note records the main points discussed and conclusions reached.

**Members Present:** Gregg Butler, Helen Peters, Janet Wilson, Francis Livens

**NDA:** Danny Fox (Head of Nuclear Fuel Cycle), Glenn Vaughan (National Programme Manager, Spent Fuels), Matthew Buckley (HAW strategy and manages RWM interface), Paul Gregson (for uranics)

### **Spent fuel – Magnox**

The current UK policy is to reprocess all Magnox fuel. Spent Magnox fuel is not currently declared as being as a waste and as such is not currently covered by a Letter of Compliance for direct disposal in a GDF. Since the success or otherwise of the Magnox Operating Programme could have a substantial impact on the inventory of HAW for disposal, CoRWM was interested in whether ‘total reprocessing’ was in fact assured, and if not what contingency plans were being put in place. NDA discussed its assumptions on Magnox reprocessing, and the plans for inventory items such as intact fuel, corroded fuel, and fuel currently held in the First Generation Magnox Storage Pond and Dounreay Fast Reactor.

NDA's strategy remains to reprocess all Magnox fuel but it is examining a range of ‘tolerable end states’, all of which aim to fully empty the Magnox stations of fuel. This includes some scenarios where relatively small amounts of Magnox fuel remain unprocessed, while ensuring that contingencies are in place to deal with each outcome. This involves:

- contingency plans to recover from plausible reprocessing failure breakdowns within a 6 month window;
- an extension of dry in-reactor temporary storage;
- trials to underpin extended wet storage of Magnox fuel (it is thought this could be extended to ~15 years in optimum conditions); and
- storage of corroded fuel in ullaged<sup>2</sup> containers so that contamination does not spread into the storage pond.

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<sup>1</sup> <https://www.gov.uk/government/publications/corwms-programme-of-work-2014-17>

<sup>2</sup> In this context, ullaged containers are deliberately left less than full of liquid, so that the air that remains can form a seal preventing contact between the water of the storage pond and that in contact with the fuel elements in the container.

For unprocessed fuel, NDA is investigating options such as vacuum drying and dry storage in a sealed canister and use of self-shielded boxes and expect that these could be implemented in time, to be used on fuel already wet at the time of reprocessing failure. Alternatively, NDA is looking at an option to treat unprocessed fuel using a Bulk Uranium Fuel Treatment Plant (BUFT). This specification for this plant is to treat a wide range of waste streams at Sellafield and its specification could be developed further to cover the end state scenarios for Magnox reprocessing. BUFT is scheduled to be on line in 2028.

CoRWM is reassured by the 'defence in depth' approach being taken by the NDA, and by the openness with which potential problems are being confronted and planned for.

### **Spent fuel – Oxide**

NDA's plans for AGR fuel are now being set to cover a range of plausible futures including further AGR reactor life extensions, while keeping to the 2018 closure date announced for THORP. With the maximum credible AGR life extensions (with the last AGR reactor shutdown in 2033), AGR spent fuel deliveries to Sellafield are expected to 2037 with the last fuel placed into interim storage in the THORP pond in 2039. The intention is to complete the ~1300te AGR part of the ~1,600teHM of THORP reprocessing programme.

Long term AGR spent fuel storage will be in the THORP Receipt and Storage pond (TR&S), which has sufficient capacity for the 6,000teHM expected with the maximum likely AGR life extension and minimum likely reprocessing. In the long term AGR fuel will be stored at pH11, as in Fuel Handling Plant (FHP) and the First Generation AGR Storage Pond. Notably, the First Generation AGR Storage Pond has had no AGR corrosion failures over 25 years, in spite of having several pond chemistry 'transients'. TR&S is currently transitioning to pH9 pending the removal of some Multi-Element Bottles (MEBs) which would react at high pH, but will move to pH11 when these MEBs are removed. Some corrosion trials on spent fuel held in containers are in progress in TR&S with 2.5te AGR fuel, with the backstop of reprocessing the fuel should corrosion start to occur.

Overall contingency plans are being developed by Sellafield Ltd to cover a range of '*problems in pond*', including degradation of the pond itself, degradation of the spent fuel, and degradation of the storage environment. Contingencies are also being maintained against changes in policy. There is a technical road map, with underpinning research at ~£600k p.a. undertaken through NDA's Direct Research Portfolio. A range of contingencies is being examined including:

- storage of AGR fuel in containers that can be ullaged, isolating the contents from the pond water;
- skid-mounted ion exchange units for pond water purification; and
- drying and dry storage similar to that being developed as a Magnox contingency.

The focus of the work on dry storage of AGR spent fuel is to establish a sound technical and safety case basis such that a decision could be made in the unlikely event that the current pond storage approach was not sustainable out to 2075. The earliest any decision to move to dry storage could be taken was around 2027 (for implementation by 2040), and this contingency is being examined with RWM, who are also examining early disposal of AGR fuel in the period 2040-2075.

CoRWM is reassured by the approach being taken by the NDA, but notes that, should the availability of the GDF become delayed, then the option of long-term storage of spent fuel in ponds may need to be revisited. CoRWM also notes that the planned closure of THORP will remove one proven option of dealing with the stored spent fuel.

CoRWM will scrutinise the arrangements for the storage of spent fuel and the implications of the planned closure of THORP in its 2015-16 work programme.

### **LWR Fuels**

CoRWM did not allocate any time in 2014-15 to look at the storage of LWR fuels. CoRWM plans to include the storage of LWR fuel in its 2015-16 work programme when the complete picture including Sizewell B and new build fuel will be examined and when current work known to be taking place on storage policy options will have been completed. This study will also cover the fuels (apart from AGR) which are scheduled to be unprocessed when THORP closes in 2018.

### ***Plutonium***

As has been publically stated, NDA has been tasked by Government to review three options for the re-use of the UK civil plutonium stockpile and is also examining the possibility of large scale immobilisation of plutonium, effectively treating the material as a waste. CoRWM agreed with the NDA's approach of waiting for these recommendations to be finalised before embarking on the scrutiny of developments in the workplan for plutonium. CoRWM will review plutonium storage and disposition in its 2015-2016 work programme.

### ***Uranium***

The UK's stock of reactor depleted uranium from reprocessing and depleted uranium from enrichment present both a potential waste challenge and a potentially huge energy resource if used in fast reactors. However, CoRWM is only concerned with the implications of this uranium being declared a waste and its potential impact on the GDF safety case. NDA established an Integrated Project Team on Uranium in 2012 and this is scheduled to complete its work in March 2016. Consequently CoRWM did not spend any time scrutinising the storage of uranium or its potential impact on a GDF. 2015-16 would be a more opportune time for CoRWM to examine the storage and potential disposal of uranics.