Nuclear Decommissioning Authority

Magnox Fuel

Strategy Position Paper

July 2012

Contents

Executive Summary

The use of reprocessing technology to manage spent Magnox Fuel has been ongoing for over 50 years and is continuing in accordance with UK Government policy and the NDA's strategy.

As part of routine activities, the NDA has assessed historical, recent and likely future performance of the Magnox Operating Programme (MOP) against credible failure modes and potential recovery plans and considered the implications to the Magnox strategy. This report describes the results of this assessment which coincides with the publication of the latest Magnox Operating Programme, MOP 9.

Currently, no case for change exists with regard to the Magnox strategy and thus reprocessing continues to be the route by which the safe management of spent Magnox fuel is delivered. The NDA recognises, however, the overall performance of the facilities required to manage spent Magnox fuel has been inconsistent and unpredictable for a number of reasons and the programme completion date will be later than originally anticipated. In response, the NDA has expanded the range of technology options being explored in order to manage Magnox spent fuel in the event reprocessing capability is lost unexpectedly. With the exception of reprocessing, all of the technologies capable of managing the spent Magnox fuel inventory will require considerable development effort which could take many years.

1 Background

1.1 Government Policy, NDA Strategy and the MOP

In 2011 the NDA consulted on, and published its Strategy [1] which was approved by the Secretary of State and Scottish Ministers. This effectively provided an update to Government Policy. For spent Magnox fuel, NDA Strategy states the objective of the strategy is to:

> *"Ensure the safe management then ultimate disposition of spent Magnox fuel".*

NDA Strategy goes onto state that of the strategic options possible:

> *"Our strategy is to reprocess all spent Magnox fuels in line with the Magnox Operating Programme (MOP)."*

For over a decade the co-ordination of Magnox fuel deliveries to the reactors, fuel loading, irradiation, defuelling schedules, transportation to Sellafield *etc.*, has been safely and effectively carried out according to the Magnox Operating Programme.

The MOP Mission [2, 3] is to:

> *"Optimise the Magnox closure programme making best use of the assets associated with management of the Magnox fuel cycle and enabling national and international environmental obligations to be supported.*
>
> *Be challenging to deliver the MOP schedule in a safe, efficient and innovative manner."*

1.2 Current Status of the MOP

The Magnox Operating Programme has recently been updated and published (MOP 9) [3]. As of April 2012, approximately 3800 tU of spent Magnox fuel remains out of a total of ~50,000 tU. Approximately 3000 tU of Magnox fuel is held in-reactor/dry storage with the rest (~800 tU) being interim stored under water either in reactor site ponds or in Sellafield's ponds prior to being reprocessed.

For the year 2010/11 the amount of fuel reprocessed was low (~230 tU) compared to the target of 700 tU. For 2011/12 performance improved markedly with ~600 tU being reprocessed. The performance of the Magnox reprocessing stream between 1996/97 and 2010/11, shows that the average rate of reprocessing was ~570 tU per annum (Figure 1). More recently this average has decreased to ~450 tU per annum.

*tU refers to mass of uranium metal measured in tonnes.

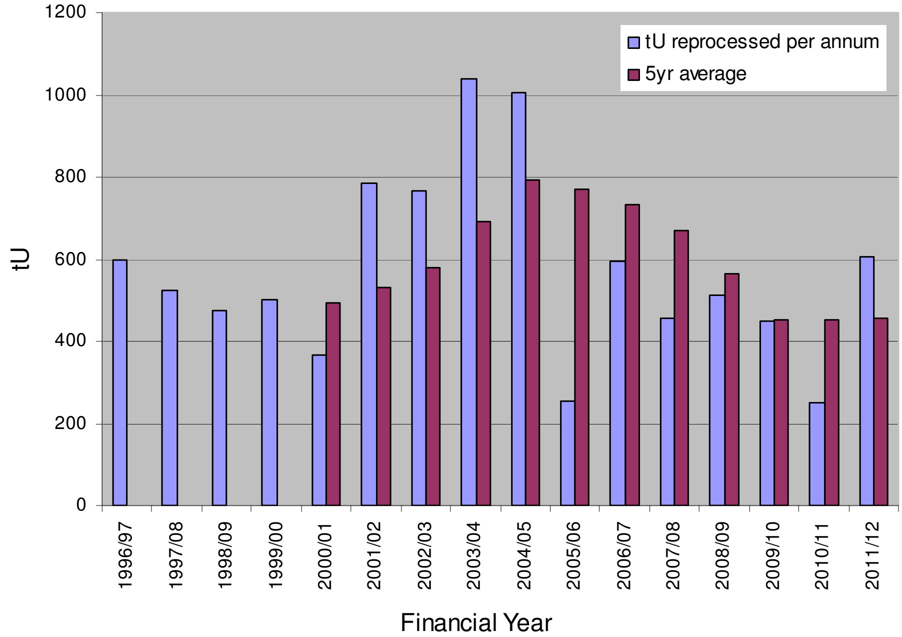

Figure 1: Total Magnox Reprocessing in the Financial Years 1996/97 to 2011/12

In MOP 8 Revision 2, published in August 2010 [2], the target date for the completion of reprocessing was stated as March 2016 on the *proviso* performance improvements could be delivered. Without improvements MOP 8 Revision 2 proposed that an end-date of March 2017 was more likely.

Immediately following the publication of MOP 8 Revision 2 the performance of the MOP was unusually low. As a consequence, completion of reprocessing operations by March 2016 and March 2017 appeared increasingly unrealistic. The levels of performance required to meet these dates would need to be considerably above those averages seen in recent years.

A range of reviews and initiatives to improve MOP performance were undertaken and Sellafield Ltd, as of March 2011, initiated the Magnox Throughput Improvement Plan (MTIP). This plan recognised that:

> *"Based upon the throughput performance for the last 5 years, if no throughput improvements are realised, then the P80 confidence level for completion of the MOP is September 2020".*

The MTIP thus identifies a number of key improvements which are considered to be essential. At the time of writing, the ~600 tU performance of the last 12 months, if sustained, would result in the MOP completing in mid-2018.

In conclusion, the overall average performance of the facilities required to manage spent Magnox fuel has been inconsistent and unpredictable for a number of reasons over a number of years. Initiatives are in place to improve performance and consistency and, therefore, predictability. In due course, the effectiveness of these initiatives will become clear.

2 Strategic Case

2.1 Current Strategic Position

Reprocessing of Magnox spent fuel has taken place for over 50 years generating electricity and nuclear materials suitable for a variety of uses. Completion of reprocessing operations as soon as reasonably practicable using the existing assets continues to be the NDA's preferred strategic option for the management of spent Magnox fuel. However, the long-term inconsistent nature of MOP performance, which has been seen to vary year-on-year, has impacted upon the ability of the Site License Companies (SLC) and the NDA to accurately predict future performance. The latest version of the MOP (version 9) recognises this characteristic and describes how this variability will be managed. From an NDA Strategy perspective, variability in performance impacts upon the NDA's ability to assess the "health" of the strategy which, in turn, might constrain the NDA's ability to demonstrate to Government, in a timely fashion, that a strategic change is or is not required.

Improvement initiatives at Sellafield and reactor sites seek to improve this situation and the NDA strongly supports the work currently underway. Approximately 12 months after starting the MTIP, there is preliminary evidence of performance improvement. In the coming months and years it will become clearer whether these can be sustained.

The NDA is mindful of the strategic uncertainties described and a precautionary approach towards the management of spent Magnox fuel continues to be taken. In particular, the NDA has focused additional attention on to exploring management options in the event of loss of reprocessing capability. Two modes of failure are being considered:

(i) irreversible sudden loss of reprocessing capability (acute) and,
(ii) irreversible gradual loss of reprocessing capability (chronic).

It is important to recognise that irreversible sudden, acute loss of reprocessing capability - as opposed to gradual chronic loss - present two very different sets of issues♣. In the former, it is implicit that there will be little warning of failure, minimal prospect of management intervention, and a need to manage an as-yet unknown quantity of wet and dry spent Magnox fuel irrespective of location. In the latter, the gradual loss of performance should allow greater opportunity to manage the quantity and location of the inventory holistically. Ideally, under this failure mode only dry fuel at reactor sites will need to be managed. Table 1 summarises the key features associated with sudden and gradual loss of reprocessing capability.

♣A *contingency* provides for management of the near-term risk due to radiological and environmental hazard associated with storage of wet and dry Magnox fuel in the event of sudden, irrecoverable loss of reprocessing capability - acute failure.

An *alternative* provides a complete long-term lifecycle solution, with the potential to replace reprocessing as the selected delivery approach for the Magnox strategy, in the event of gradual, irrecoverable loss of reprocessing capability – chronic failure.

Failure Mode	Inventory to be Managed	Strategic Response
Acute (Sudden)	in-reactor fuel at Magnox reactor sites and Calder Hall (dry) in-pond fuel at Magnox reactor sites (wet) in-pond fuel at Sellafield (wet)	Deployment of contingency technology to 'buy' time through use of interim storage technologies. Move wetted fuel from station ponds to Sellafield (assumes transports can proceed) Implement steps to maintain integrity of Magnox fuel (improve in-pond storage regime or remove fuel from water) Secure interim storage capacity for the inventory held at Sellafield (either FHP or other store should dry storage be required). Fuel held in-reactor at stations to remain in-reactor. In parallel with contingency development work, develop lifecycle options for the management of the spent Magnox fuel post interim storage at Sellafield and reactor sites (NOTE: the wet stock and dry stock may require differing technologies in order to make disposable packages).
Chronic (Gradual)	in-reactor fuel at Magnox reactor sites and Calder Hall (dry) (It is assumed that wet stocks would be reduced to minimal levels in the event that long-term chronic failure of the reprocessing stream occurred)	Provide interim storage capability for in-reactor fuel Look to minimize number of fuelled sites Develop lifecycle options for the management of the spent Magnox fuel post interim storage in-reactor Decide on timing of alternative options development (non-foreclosure of options)

Table 1: A summary of the inventory to be managed and the candidate strategic responses arising from acute and chronic gradual loss of Magnox reprocessing capability.

Although in recent years MOP performance has been affected by a range of issues good progress continues to be made. The Springfields fuel fabrication facilities have closed having successfully manufactured over 5,000,000 fuel elements. In excess of 90% of the Magnox inventory has been reprocessed, only 5 sites out of the original 11 currently hold fuel (and a further three are due to be defuelled in ~3 years), and there is now less than 3800 tU of fuel remaining.

Despite variable performance and the resulting programme delays, no reason has yet been found that would indicate these delays materially affect the desire to continue reprocessing. Indeed the delays have provided an opportunity for extra income to be generated from extended electricity production and additional material located elsewhere in the NDA-estate to be managed using existing facilities (Dounreay Fast Reactor material).

The types of 'factors' which might change the NDA's strategic position include: robustness of plant infrastructure, the status of non-reprocessing technologies, cost profiles, current/anticipated performance levels and discharges to the environment.

Analysis of each of these factors has been undertaken by the NDA and the SLCs and will continue to be tested and refined in due course. In summary, an infrastructure assessment of Magnox and down-stream facilities indicates that major investment, over and above that which is all already anticipated, is unlikely to be required prior to 2020. Post 2020, the accuracy to predict future requirements is reduced. Further work is thus underway by NDA and the SLCs to develop an improved picture of the assets needed to support management of spent Magnox fuel beyond 2020.

An assessment of the technologies and plant available at Sellafield for the management of spent Magnox fuel concluded that the only proven lifecycle approach for the management of irradiated Magnox fuel remains the Magnox Reprocessing plants. Other options that could condition fuel for final disposal are at the 'studies phase' and are many years away from being deployed should they be required.

From a ‘cost’ perspective, the delivery of the MOP utilises approximately 10% of the NDA’s annual expenditure. As the quantity of fuel, and the number of reactor sites holding fuel, decreases with time the forecast cost of the MOP will fall gradually. An extension of the MOP by ~1 year adds approximately 5% to the *total* discounted cost of completing reprocessing in 2017. Completion of the MOP in 2021 adds ~11% to the *total*. Compared with the other theoretical options (which are not available and carry unquantified risk) the incremental cost of extending the MOP is tolerable albeit undesirable.

Predicting future performance levels of the Magnox reprocessing stream carries risk, hence the NDA and SLC’s commitment to developing robust fall-back arrangements. However, based on historical evidence, a throughput of 450 tU per year seems a reasonable value to select when examining strategic implications. It is neither unduly optimistic or pessimistic and there is a body of evidence to suggest this throughput rate can be maintained, if not improved. An average rate of ~450 tU per year would mean MOP would complete *circa* 2020 which is within the limits of the other ‘factors’ presented.

The implications of extended Magnox reprocessing operations on the discharge profiles from the Sellafield site have been considered and will be kept under review. Preliminary analysis indicates that the dissolution of fuel up to 2020 is unlikely to result in discharges to the environment that are outside the obligations set out in the UK Strategy for Radioactive Discharges.

In summary, the approach being taken by the NDA is presented in figure 2.

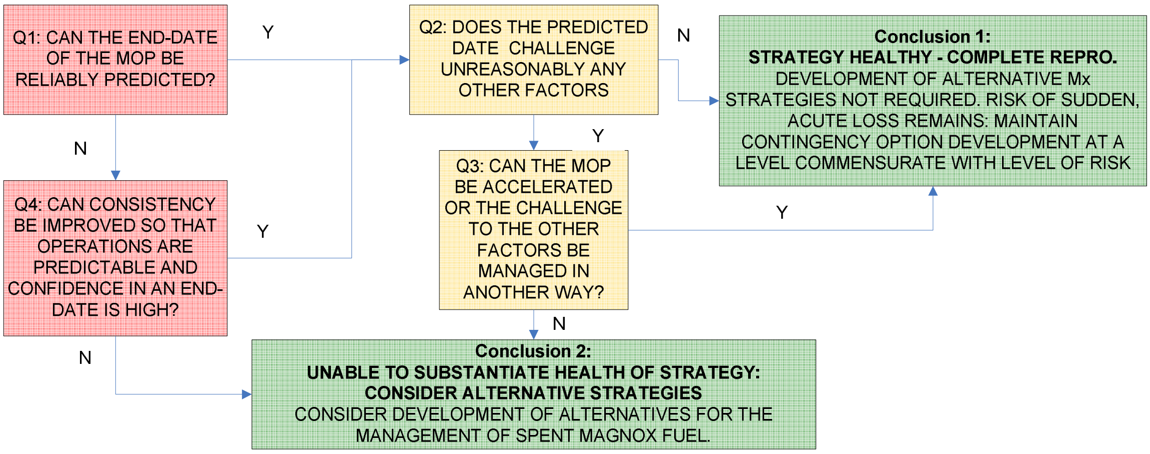

Figure 2: High-level logic for the Magnox spent fuel strategy and the conditions for contingency/alternative development

Using figure 2 as a guide, the NDA and MOP 9 recognises the variability in recent performance prevents accurate prediction of the MOP end-date (Q1). Accordingly the NDA and SLC are seeking to improve consistency and levels of performance (Q4) while assessing any potential implications arising from other 'factors' (Q2). Until performance levels are improved and shown to be sustainable the NDA, in partnership with its SLCs, will continue to progress development work on contingency (Conclusion 1) and alternative options for managing spent Magnox fuel (Conclusion 2).

2.2 Strategic Options for Managing Spent Magnox Fuel

In the following sections the options for managing spent Magnox fuel are discussed at a high level in terms of whether they are credible and/or deployable. Evidence has been used from a range of sources, including the SLCs, and is summarised below.

There are 2 top-level strategic options for managing spent Magnox Fuel:

(i) Reprocess and,
(ii) Condition, store and dispose of in GDF.

Nested under these are further strategic sub-options. These can be summarised accordingly:

1. To reprocess the spent fuel using:
    A. New facilities
    B. Existing Magnox reprocessing plant
    C. THORP
    D. Third party facilities (non-NDA)

2. To condition the fuel, store and dispose in the GDF through:
    E. Interim dry storage, conditioning followed by disposal in GDF
    F. Interim wet storage, conditioning followed by disposal in GDF
    G. Condition wetted fuel and dispose of in GDF

Reprocessing Options

Option A: Reprocess Using New Facilities

The construction of new reprocessing facilities would involve the development, manufacture, installation and commissioning of a new inlet building, processing capability and downstream plant.

Depending on the quantity of fuel remaining, and the rate at which it needs to be processed, the new facilities could be smaller in scale. For example, a few hundred tonnes of fuel held safely and securely in interim storage, might be amenable to management within a low capacity, low throughput plant.

Furthermore, a new facility may not be required to generate products to the same specification as those currently being manufactured. This may provide an opportunity to accelerate delivery and reduce cost. The construction of a new facility may also provide an opportunity to process a broader range of materials than currently managed in existing plant. Although, this would increase costs and development time frames, a benefit may be realised from an UK-wide perspective.

Construction of new facilities would, however, be costly in terms of finance, environmental impact, and time to develop and implement. Such a facility could not be justified under the present circumstances. Therefore this option is presently not considered credible.

Option B: Reprocess using Existing Magnox Reprocessing Plant

This is the current strategy which is described extensively elsewhere [2, 3].

Option C: Reprocess using THORP

In this sub-option the intent, at the highest level, is to reprocess metallic fuel in the plant used for reprocessing of oxide fuels. It is an option which is only likely to be applied should the existing Magnox dissolver be compromised and the implications upon the oxide fuel strategy demonstrated to be tolerable.

In many respects there are significant areas of commonality in the high-level processing steps required to reprocess metallic and oxide fuels. However, fundamental detailed design differences mean that it is highly unlikely that this option will be capable of dealing with a significant inventory of spent Magnox fuel.

The reprocessing of metallic material, of various types, through THORP has been the subject of numerous studies. In the main, previous work has indicated this routing to be feasible, but that significant technical and engineering issues will require resolution which will require time and incur significant cost. Even if these could be resolved quickly and affordably, the type and amount of material capable of being reprocessed through THORP appears to be limited and only achievable under some specialized circumstances. Therefore this option is presently not considered credible.

Option D: Reprocess using Third Party Facilities (non-NDA)

This option involves making arrangements with overseas organisation(s) capable of reprocessing metallic fuel. The countries having the historical capability for managing metallic fuel are limited and likely to include only France and Russia. Both would require significant investment in facilities.

To implement this option it would be necessary to meet, amongst other things, regulations for the transport of bulk quantities of fuel to overseas plant(s) and also the subsequent return of nuclear materials and wastes. It is unlikely that this strategic option would be considered whilst an indigenous management option for spent Magnox fuel was feasible. Therefore this option is presently not considered credible.

Non-Reprocessing Options: Condition, Store and Dispose of in GDF

The second top-level strategic option involves management of spent Magnox fuel by routes that do not involve reprocessing. The timing and nature of the 'conditioning' step have yet to be detailed. In theory, it could occur relatively shortly after the removal of fuel from the reactor (within a 1-20 year timeframe) or at the point where the fuel is about to be transported to the disposal facility. A decision on the optimal time for 'conditioning' and what 'conditioning' entails is dependent upon the storage regimes being considered, the stability of the fuel under various scenarios, transport regulations in the future and the design requirements of the GDF.

Option E: Interim Dry Storage, Conditioning followed by Disposal in GDF

This option involves the interim dry storage of Magnox spent fuel followed by conditioning ready for eventual disposal. Under the conditions of chronic (gradual) failure it is anticipated that wet stocks would be minimised wherever practicable. The bulk of the Magnox inventory would, therefore, be expected to be located in-core at reactor sites and not require a drying stage. Should there be any residual wetted fuel in existence it is anticipated a drying step may be required, near-term, if fuel element degradation was to be problematic. Historical and ongoing studies, initiated by the NDA and delivered by Sellafield Ltd, have shown that a vacuum drying process is technically feasible, with the latter being considered suitable for ~98% of the wetted inventory currently held in-pond.

Options on how best to dry store fuel currently held at reactor sites has also been considered. There are a wide range of scenarios to be examined depending on when reprocessing ceased, and which sites still hold fuel in-reactor. Which option(s) are best will be determined by a wide range of factors and subject to further study. This option is considered as being credible.

Option F: Interim wet storage, conditioning followed by disposal in GDF

This option involves the placement of spent Magnox fuel into wet storage for an interim period. In contrast to the management plans for oxide fuel, where the case for wet storage is supported by many decades of operational experience and technical underpinning, the demonstrated storage lifetime for spent Magnox fuel is presently 5-7 years - although it is generally accepted that the technical case for extending the storage period may be possible.

On the basis of the current assumptions, it is proposed that wet storage of the entire Magnox inventory (currently ~3800 tU) would not present a credible approach for managing spent Magnox fuel. Although no decision has been made that would foreclose options, it is assumed that under the present circumstances, fuel which has not been exposed to water previously will not be subsequently stored in-pond where it is likely to require increased levels of active management. It is worth noting that in order to wet store the Magnox inventory as of today (3800 tU of Magnox), the wet storage capability for Magnox would need to increase three-fold leading to the construction of new ponds.

While wet-storage followed by conditioning and disposal, based on the current technical information, is not seen as a credible alternative to reprocessing operations the NDA supports additional work on wet storage. This is because there is some evidence to suggest the present assumptions on wet storage may be unduly conservative. As a result there may be benefit in exploring whether it is possible to maximize the interim storage time available should a transition between reprocessing and the deployment of a contingency/alternative be required. As indicated previously, wet storage of the entire Magnox inventory is not considered credible as an alternative strategy to reprocessing. Interim wet-storage, however, of already wetted spent Magnox fuel as an option for managing acute failure is considered credible, and has been the basis of contingency arrangements historically.

Option G: Condition Wetted Fuel and Dispose of in GDF

The final sub-option involves the removal of wetted fuel from reactor station ponds and Sellafield ponds immediately followed by a conditioning step such as immobilisation/enhanced corrosion *etc.* It is assumed that fuel which has not been wetted will not be wetted wherever practicable. For dry storage (option E) not to form part of this option it will be necessary for the conditioning step and store to be available within the predicted storage life of spent Magnox fuel stored under water (5-

7 years). On the basis of current demonstrated wet storage lifetimes, and the time required by the nuclear industry to develop new processes and build new plant, this option is not presently considered credible. The NDA recognises this position could change if ongoing R&D and enhanced plant operations demonstrated that extended wet storage of spent Magnox fuel was possible.

2.3 Preferred Option

Taking current circumstances and the latest information into account, two strategic sub-options are considered as being credible:

Option B: To (continue to) Reprocess using Existing Magnox Reprocessing Plant

Option E: Interim dry storage, conditioning followed by disposal in GDF.

Option B is the current reference strategy and continues to be the preferred option. However, there are a number of key areas of uncertainty associated with option B which requires option E to be evaluated further. Additionally there are opportunities, particularly for wet storage, which if realised may allow greater operational and strategic flexibility, mid- and longer-term, respectively.

The key areas of uncertainty associated with option B are (in process order):

i) the capability of reactor stations to defuel and transport as planned

ii) the capability of Magnox infrastructure at Sellafield to receive and process spent Magnox fuel as planned

iii) the ability of the non-Magnox infrastructure at Sellafield to provide the services and support required

iv) the ability of the ongoing improvement plans to deliver sustainable increases in performance

v) implications for environmental discharges

The key areas of uncertainty associated with option E are:

vi) the extent to which wetted fuel stocks can be reduced before reprocessing of spent Magnox fuel ends

vii) the quantity and location of dry fuel requiring management

viii) implementation timescales to develop the capability

ix) the duration of interim dry storage prior to conditioning

x) the identification of a conditioning step to produce a package suitable for disposal

Leadership on items (i), (ii), (iii), (iv) rests with Magnox Ltd and Sellafield Ltd and is managed under the arrangements described in MOP 9. Leadership on items (v), (vi), (vii), (viii), (ix) and (x) rests with the NDA and is being managed jointly by the NDA's Strategy and Delivery functions.

3 Economic Assessment

An economic assessment of the credible Magnox strategic options (B and E) has been undertaken and is described below in general terms. These high-level comparisons have been developed using data from a range of sources and, by necessity, rely upon a range of assumptions which can impact *significantly* upon the final 'cost' calculated. In presenting these figures the NDA seeks to show that from a cost perspective, reprocessing compares well with other options albeit these options are not technically underpinned or considered deployable at the time of writing. A number of the assumptions inherent in this assessment are included in the text below and are captured elsewhere in more detail. Work is already underway to re-visit and refine the assumptions and data-set used in this analysis.

Clearly the development and implementation of any new Magnox strategy, while costs continue to be incurred from ongoing Magnox reprocessing operations, will result in increased spending. Indeed, some of the costs associated with Magnox reprocessing facilities will continue to be incurred for years to come even if reprocessing operations were to end within short timescales (shared infrastructure, ongoing plant maintenance, post-operational clean-out *etc.)*.

The incremental costs of extending reprocessing operations (option B) has been summarised in section 2.1, page 8. This assessment includes a number of assumptions, for example, that the defueling programmes at reactor sites do not change markedly in order of preference and that significant investment in infrastructure is not required.

The total cost of option E has two contributing parts:

(i) the cost of interim dry storage, and,

(ii) the cost of conditioning and disposal.

The cost of each is strongly affected by the amount of fuel requiring management, the period of interim storage, whether decommissioning activities have to be delayed or occur in parallel, and the methodology selected for managing spent Magnox fuel following interim storage. For illustrative purposes, a number of scenarios have been developed based upon the 5 year average reprocessing rate (450 tU per year), an end-date of March 2020, a 20-year interim storage period at reactor sites and a generic 'black-box' processing plant which processes fuel over an arbitrary ten year period prior to eventual disposal (disposal costs are not included to allow comparison with the extended reprocessing scenarios).

Figure 3 shows the relative cost of reprocessing with time when compared to alternative technologies. Also included within this diagram are the order of magnitude costs associated with contingency deployment. The costs arising from deployment of a contingency option are significant and are also sensitive to the assumptions applied. The key contributory factors to the 'cost' include expenditure resulting from continued management of existing facilities and the requirement to manage - on potentially short timescales - the issues associated with Magnox fuel stored within station and Sellafield ponds while simultaneously storing fuel still left at reactor sites. As the data in figure 3 highlights, the relative cost (excluding disposal) of acute failure of the MOP is considerable, although is observed to decrease markedly with time as the number of fuelled reactor sites decrease. The rate of decrease in cost is directly related to the amount of fuel needing to be managed which reinforces the significant, near-term, positive impact continued Magnox reprocessing can have, for example, upon hazard reduction at reactor sites and potential liability to the UK taxpayer. Figure 3 contingency costs are based on performance plan predicted throughput rates.

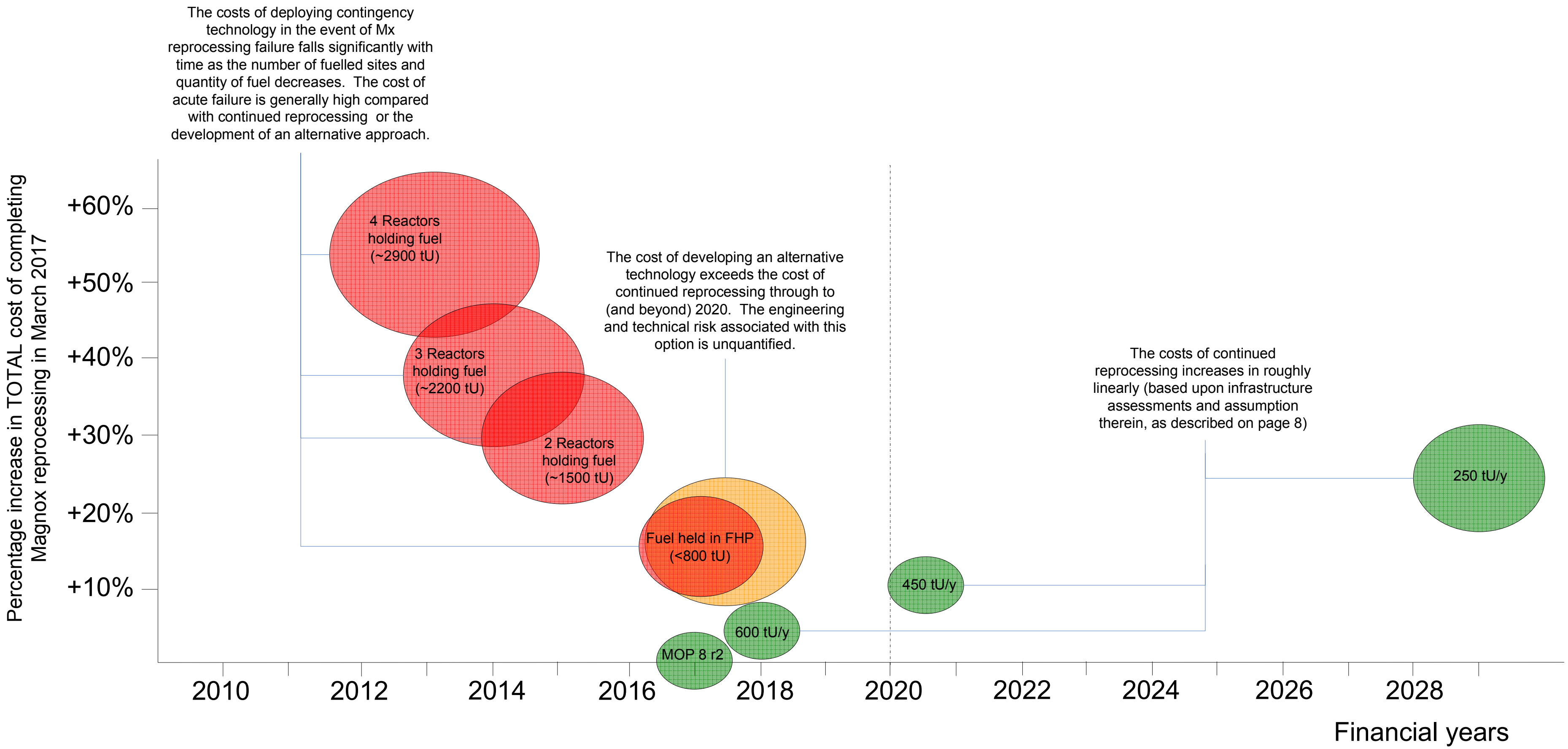

Figure 3: Graphical Representation of the High-level ‘costs’ associated with continued reprocessing, alternative development and contingency plans

4.0 Magnox Strategy Objectives

In terms of the Magnox Strategy and the MOP delivery programme the NDA near to mid-term objectives are:

- Improve consistency and performance of the Magnox value chain and complete reprocessing of the spent Magnox fuel inventory as soon as is practicable using the existing facilities

- Establish robust contingency arrangements in the event of sudden, irreversible loss of Magnox reprocessing capability and improve understanding of the estate-wide implications of acute failure.

- Develop alternative arrangements for the management of spent Magnox fuel in the event of gradual, irreversible loss of Magnox reprocessing capability and establish a position with respect to the scale and timing of investment in alternative approaches

- Maximise opportunities to manage estate-wide spent fuel and nuclear materials using the current Magnox reprocessing facilities recognising the balance of risk to MOP delivery with the estate-wide benefit to be gained

- Consider fallback options for the management of estate-wide spent fuel and nuclear materials that are scheduled for reprocessing but are unable to reprocessed due to unforeseen acute or chronic loss of reprocessing capability.

5. Summary and Conclusions

The performance of the programme to manage spent Magnox fuel has been inconsistent/unpredictable for a number of years for a variety of reasons. The implementation of improvement plans by the site licensees is underway and receiving strong support from the NDA, SLCs and Regulators s but success cannot be guaranteed.

Preliminary analysis indicates that should reprocessing of Magnox be required to continue up to 2020, no reason has yet been found which would indicate this is not credible. Accordingly, no case for strategic change has been identified.

In the event that performance was to deteriorate unexpectedly and irreversibly, the NDA in partnership with its SLCs is exploring a range of contingency and alternative technologies. The level of investment in these programmes is being managed in-line with the level of perceived risk. It is likely that contingency development activities will need to be progressed with some urgency in the near-term. In parallel, alternative options to reprocessing will be developed as a lower priority.

6. References

[1] Strategy II, published by NDA March 2011
[2] MOP 8 revision 2, published 2010
[3] MOP 9 Level 1 document, NDA, published July 2012