



The Magnox Operating Programme (MOP 9)



Contents

Index	
1 Foreword	1
2 Executive Summary	2
3 Introduction	5
4 The UK Strategy for Spent Magnox Fuel and Associated Asset Use	6
Reprocessing Magnox Fuel	6
Discharges and Safety	6
Magnox Reprocessing Asset Utilisation	7
Processing of Dounreay Fast Reactor (DFR) material	7
Interim Storage of First Generation Magnox Storage Pond (FGMSP) fuel	7
5 MOP Management	8
Organisational Changes	8
Performance Range, Scenario Outputs and Planning Guidance	8
The use of a Performance Range	8
Planning Guidance	9
Management Arrangements	9
Programme Management	9
Underpinning	9
Assurance	9
Annual Review	10
Risk Management	10
Identification and Mitigation of Risks	10
Critical Programme Impacts Tracker (CPIT)	10
6 MOP Contingencies	11
Acute Failure	11
Chronic Failure	11
7 Summary	12
8 MOP Status Update	13
9 References	14

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1 Foreword

The Nuclear Decommissioning Authority (NDA) is pleased to publish the ninth edition of the Magnox Operating Programme (MOP 9). This is the fourth full issue to be published under the NDA's ownership of the civil nuclear assets and, in-line with our policy of openness and transparency, is published in a form suitable for release to a wide audience.

NDA strategy continues to be to "Reprocess all spent Magnox fuel" as presented in the NDA Strategy April 2011. The MOP presents the delivery programme to meet this strategy. Detailed discussion and evaluation of strategic alternatives, although briefly discussed is beyond the scope of this document.

The NDA continues to seek safe underpinned programmes of work which realistically reflect what is achievable with the resources and plant available. Considerable efforts have been made by our contractors to examine and underpin plant performance and ensure continuing hazard reduction. The programme reflects achieved reprocessing rates and acknowledges the challenge this presents to previously declared milestones.

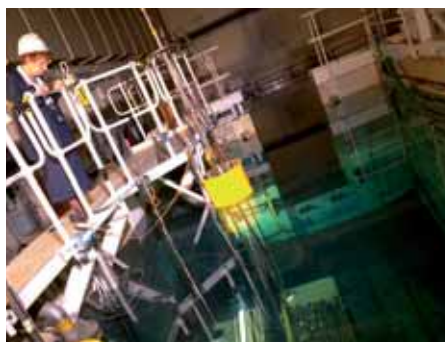
A performance range approach has been adopted for the first time, allowing increased focus on achievement of the programme outcomes, both encouraging and facilitating effective long term programme management and stakeholder engagement.

Recent operational performance has been variable and below that assumed in MOP 8. Our contractors have successfully addressed flask availability issues and spent fuel delivery capability has been returned to historic levels. Reprocessing and supporting operations are currently rate limiting, and a structured improvement programme has been established. It will however take some time to demonstrate the benefits derived.

Interdependencies between the lifetime plans for the Site Licence Companies are firmly established in the programme and Site Licence Company plans. It continues as an exemplar in terms of the cross-site integration required to deliver the NDA mission and balances demands across the NDA estate.

The logistical and process challenges discussed in these pages illustrate the complexity of the process. It is a tribute to the professional dedication of all involved, across a number of Site Licence Companies, to recognise the challenges facing the programme and their efforts to deliver a safe, optimised and cost-effective programme as we strive to clean up our nuclear legacy.

Sara Johnston
NDA Head of National Programmes



2 Executive Summary

The programme of electricity generation using Magnox fuel is drawing to a close; however important work remains to bring the programme to a successful conclusion. The Nuclear Decommissioning Authority (NDA) strategy for Magnox fuel¹ is to discharge spent fuel from reactors, transport it to Sellafield for reprocessing, conditioning and/or storage of the reprocessing products.

The scope of the Magnox Operating Programme (MOP) is:

- Management of new and spent Magnox fuel on Magnox sites, including the generation interface and interim storage
- Transport of spent fuel from Magnox sites to Sellafield Fuel Handling Plant (FHP)
- Transport of spent fuel from Calder Hall to FHP
- Transport of Dounreay Fast Reactor Material to FHP
- Interim storage at Sellafield
- Decanning and reprocessing²
- Contingency planning to ensure spent Magnox fuel is always handled and stored in a safe manner in the event that there are significant unplanned interruptions to the programme

¹ NDA Strategy, April 2011

² Downstream plant issues are only considered to the extent necessary for risk analysis and ensuring reprocessing is not unnecessarily restricted

Whilst reprocessing continues there are opportunities to continue electricity generation at Wylfa using existing fuel and to use existing facilities for other hazard reduction activities, providing these do not significantly delay the completion of reprocessing. Removal of all spent fuel from a Magnox site facilitates decommissioning of reactor systems and spent fuel handling facilities, and this is an important milestone. Completion of spent fuel reprocessing at Sellafield allows closure of a number of plants, facilitates decommissioning of reactor systems and spent fuel handling facilities.

The previous version of the MOP³ contained substantial detail on the processes required to deliver the programme. This information is largely unchanged and is not repeated in this publication. The most significant difference between MOP 8 and MOP 9 is the explicit recognition of the uncertainties associated with Magnox reprocessing, primarily the age of the plants involved which has led to variable delivery performance.

Rather than assuming a single level of reprocessing performance, MOP 9 has considered upper and lower bound performance levels based on historic performance and commitments to improvement plans. The performance of plant and systems over the MOP 9 performance range has been underpinned to improve confidence in delivery of the overall programme.

³ MOP 8





To sustain and improve reprocessing performance levels a Magnox Throughput Improvement Plan (MTIP) was launched by Sellafield in April 2011, this is a continuing and developing programme.

A “very low” reprocessing rate below the underpinned performance range has also been considered. The aim of this “very low” rate is to explore any constraints which would prevent continued reprocessing if anticipated performance proves to be optimistic (outside the range). The Critical Programme Impacts Tracker process (described on page 10) is designed to provide early warning of issues that threaten completion of reprocessing.

The use of a MOP 9 Performance Range, rather than a single delivery schedule, is a significant change from MOP 8 reflecting the real uncertainty in delivery and more clearly showing the range of possible outcomes. The range of defuelling completion dates for individual sites is shown in Table 5.2 on page 10, and Table 2.1 summarises the dates for completing reprocessing in MOP 8 and MOP 9.

Managerial arrangements have been revised and refined to support the performance-based approach adopted by MOP 9. These managerial arrangements are briefly described in this document.

Performance and programme risks are reviewed to provide and update planning guidance to sites and facilities for management and financial planning purposes.

From its launch in 2001, the MOP has recognised the risk that, in spite of the best efforts of all parties involved, it may not be possible to reprocess all spent Magnox fuel. This may be due to sudden and irrecoverable failure of a key plant item or due to chronic performance issues which make it difficult to complete reprocessing. Fall back plans and options for these eventualities are being considered by the NDA.

The aim of this MOP 9 document is to provide a self-contained and point-in-time summary of the NDA strategy for spent Magnox fuel and the Site Licence Companies (principally Magnox and Sellafield) plans to deliver that strategy.

The current NDA strategy for Magnox fuel is available on the NDA website and this should be consulted alongside this summary document.

Table 2.1 The dates for completion of reprocessing as presented in MOP 8 (Revision 2) and MOP 9

	Reprocessing Rate	Completion of Reprocessing
MOP 8 Revision 2	–	March 2016
MOP 9 – Upper Bound of Performance Range	740 tU/year	March 2017
MOP 9 – Lower Bound of Performance Range	450 tU/year	December 2020
MOP 9 – Very Low Rate	250 tU/year	~2028

tU – tonnes of Uranium

The Nuclear Fuel Journey

From pilecap at a station



to a Magnox pond



Flasks are then loaded onto train



To be delivered to Sellafield



Decanning and reprocessing at Sellafield



3 Introduction

In 2001 the MOP was established to manage the spent fuel related activities required for a satisfactory conclusion to the Magnox reactor generating programme and closure of the Magnox fuel cycle. The MOP scope includes new fuel supply, optimisation of generation lifetimes, reactor defuelling and the subsequent reprocessing of spent Magnox fuel. MOP 8 and its two revisions are updated by this document. In particular, a status update is included in the Appendix.

The detailed processes within the MOP, as described in MOP 8, have not changed significantly and are not repeated here. They can be summarised as follows.

Magnox fuel was manufactured by Springfields Fuels and delivered to sites⁴.

During the generation phase new fuel is loaded into the reactors as required and a corresponding quantity of spent fuel is discharged to interim storage allowing cooling and decay of fission products prior to despatch to Sellafield. Following the generation phase bulk defuelling commences.

Spent fuel is transported from sites to Sellafield in fuel transport flasks. Transport is by rail and road and the rate of fuel transport approximately matches the rate of reprocessing.

On receipt at Sellafield the spent fuel is stored in the FHP until the decanning schedules call for it to be retrieved. The elements are decanned with the outer Magnox can removed and encapsulated in cementitious grout for long term storage. The uranium bar is sent to the reprocessing plant where the products consist of uranium and plutonium oxides for storage, high level waste for interim storage and vitrification and various waste streams for further treatment.

The MOP is a complex process⁵ which requires careful management to ensure it is delivered in a safe and compliant manner, as soon as practicable, with least cost to the UK taxpayer.

Since the issue of MOP 8, reprocessing and spent fuel deliveries have both experienced difficulties and this has led to a review and strengthening of the MOP management arrangements. These arrangements, described on page 8, are designed to put a greater emphasis on anticipating problems and ensuring more rigorous underpinning of planning assumptions. The MTIP has been developed to mitigate known risks at Sellafield and to identify and mitigate future risks. Magnox has reviewed site performance and capability to ensure assumed reprocessing rates can be matched by fuel deliveries.

The plants at Sellafield carrying out and supporting reprocessing are complex and many have been in use for a considerable time. Age, complexity and interdependencies lead to the reliability issues that the MTIP seeks to address. The variability of reprocessing rates introduces uncertainty in forecast milestone completion dates, such as completion of reprocessing or defuelling on a particular site. The approach adopted for this update of the MOP is to model scenarios based on different assumed reprocessing rates and assess the impact of the different rates on defuelling and reprocessing completion dates.

Contingency plans for difficulties with reprocessing are discussed on page 11.



⁴ All new fuel has now been delivered to sites

⁵ For a detailed process description see MOP 8 which is available on the NDA website

4 The UK Strategy for Spent Magnox Fuel and Associated Asset Use

Since the inception of the Magnox reactor programme, reprocessing has been the technology employed to transform spent Magnox fuel into a series of products suitable for interim storage pending disposal or reuse. This strategy has been reviewed both when considering the need for replacement plants at Sellafield and by a number of high level reviews.

More recently, reprocessing of spent Magnox fuel was confirmed as the preferred option by the NDA in the strategy document that has been endorsed by the Department of Energy and Climate Change (DECC).

Reprocessing is carried out using a number of plants on the Sellafield site and, in spite of the asset care programme and the installation of some new plant, overall performance is variable.

Figure 4.1 shows the annual reprocessing achieved over the last 12 years together with the rolling five-year average. This variable performance makes forecasting difficult and is the reason for the change within MOP 9 to a performance range approach.



4.1 Reprocessing Magnox fuel

Magnox fuel is composed of a metallic uranium bar enclosed in a fuel can made from a magnesium alloy called Magnox. Although spent Magnox fuel is commonly stored in water (fuel ponds), it cannot be stored indefinitely in these conditions and must undergo some form of treatment to convert it into stable forms for long-term storage pending disposal.

In April 2012 there remained 3,800 tU of Magnox fuel to reprocess. Figure 4.2 shows the dates at which reprocessing will complete for the two bounding performance levels used for MOP 9.

Assuming reprocessing rates remained at recent averages of about 450 tU each year then it would take eight to nine years to complete, which is comparable to the time it would take to introduce a different management option. The NDA have reviewed alternatives to reprocessing to establish whether there are other credible options which present a better solution.⁶

⁶ Magnox Fuel: Strategy Position Paper

4.2 Discharges and Safety

One of the main drivers for establishing the MOP was to ensure compliance with the UK Strategy for Radioactive Discharges, which reflects commitments to the OSPAR Convention. The treaty requires discharges of radioactive substances to the North East Atlantic to be subject to progressive and substantial reduction, such that by 2020, concentrations of radioactive substances in the marine environment are close to zero, in comparison to historical levels.

Since 2000 there have been considerable reductions in liquid discharges arising from Magnox reprocessing operations, most notably as a result of diverting the technetium-99 isotope into a waste stream for vitrification. As shown in Figure 4.2, even if reprocessing performance rates remain at recent averages and no benefits are realised from the improvements made or being made, reprocessing will be completed around 2020.

The UK Strategy for Radioactive Discharges sets out how the UK will continue to meet its OSPAR Convention commitments. The performance of the MOP and other significant programmes, such as the reprocessing of oxide fuels through the Sellafield THORP plant, is kept under review by the NDA to ensure that these programmes continue to meet their objectives.

A study of the implications of extended Magnox reprocessing operations on the discharge profiles from the Sellafield site is ongoing. 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.

Discharges will continue to be minimised through the use of Best Available Technology (BAT). The use of As Low As Reasonably Practicable (ALARP) methodology ensures that risks to the workforce are managed effectively.



Figure 4.1 Annual Reprocessing Performance since 2000

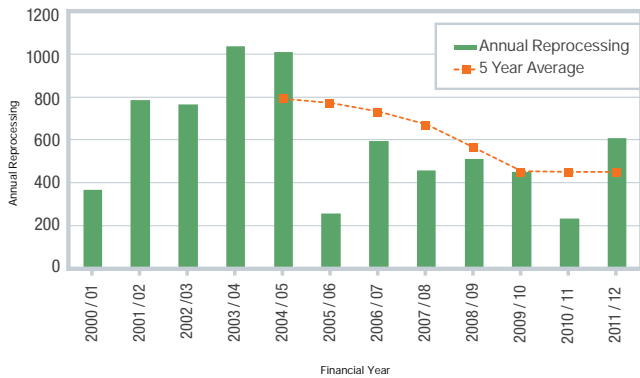
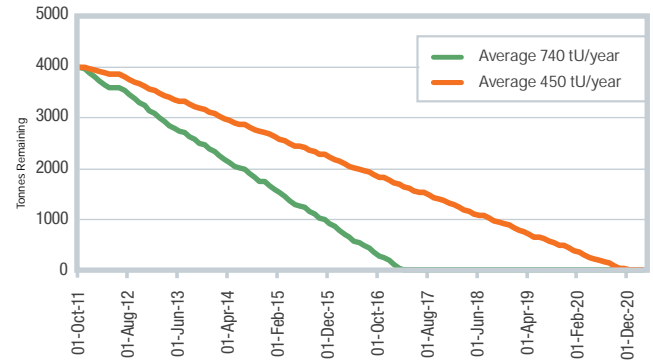


Figure 4.2 Bounding Reprocessing Performance Levels Used for MOP 9



4.3 Magnox Reprocessing Asset Utilisation

The Sellafield site is complex with many interconnected and interdependent facilities. Where there are competing demands the priorities will be determined through Sellafield prioritisation processes. Magnox reprocessing has a high operational priority since this is a key hazard reduction process and wet stored Magnox fuel has a limited life. In addition, reprocessing is a key enabler for the removal of spent fuel from Magnox sites allowing subsequent decommissioning activities to progress.

There is capability and capacity within the Magnox reprocessing suite of plants to undertake other hazard reduction activities alongside Magnox spent fuel management. Two activities, described in more detail here, have been identified which have significant hazard reduction potential but could also impact on Magnox reprocessing operations if not carefully managed.

4.3.1 Processing of Dounreay Fast Reactor (DFR) Material

The DFR was a 60MWt research reactor located at Dounreay in Caithness. Its purpose was to investigate the technology and fuel cycles for fast reactors which would both produce and burn plutonium significantly increasing the energy which could be extracted from the original natural uranium. On the Dounreay site there remains approximately 44 tU of irradiated natural uranium elements.

Since this material is in metallic form it can be fed through the Magnox reprocessing plant to produce products which can be co-managed with Magnox spent fuel. The benefits to the UK are a substantial cost saving achieved by the use of existing MOP assets.

The programme for the first campaign of material from Dounreay to Sellafield should commence in 2012. Transport logistics and flask availability have been assessed and there is a high degree of confidence that the additional transport operations will not impact on Magnox spent fuel movements.

There is a recognised risk that Magnox reprocessing may complete before it is possible to ship all DFR material. Overall the priority is completion of Magnox reprocessing and the DFR material will not be allowed to significantly extend the MOP without a strategy review.

4.3.2 Interim Storage of First Generation Magnox Storage Pond (FGMSP) Fuel

The FGMSP contains Magnox fuel put into interim storage prior to the commissioning of the new FHP. Most of this fuel is in a poor physical state. The Sellafield Performance Plan baseline is to move fuel into FHP for storage pending conditioning for disposal; it is not intended to reprocess this fuel. First transfers from FGMSP to FHP are planned for 2015/16. A preliminary investigation shows there should be no direct impact on the MOP, although the ability to recover from an interruption to spent fuel deliveries may be compromised.



5 MOP Management

The MOP needs to be carefully managed to monitor performance, anticipate performance problems and look for opportunities to accelerate delivery. A key aspect of effective governance is ensuring safe and compliant operations.

5.1 Organisational Changes

Since the issue of MOP 8 in October 2007, four significant changes have been implemented:

- Magnox Ltd has been formed by the re-integration of Magnox North Ltd and Magnox South Ltd
- The Management and Operations (M&O) contract for the Sellafield Site has been awarded to Nuclear Management Partners (NMP)
- Dounreay Site Restoration Limited (DSRL) has been brought into the MOP management arrangements
- MOP management and oversight from within Magnox has been strengthened and a MOP Director appointed.

5.2 Performance Range, Scenario Outputs and Planning Guidance

5.2.1 The use of a Performance Range

Previous issues of the MOP have taken a single assumed reprocessing rate and presented a single defuelling and reprocessing schedule based on that rate. In MOP 9 it is recognised that performance is likely to be variable and unpredictable and a single schedule does not adequately test all assumptions or expose the range of possible outcomes.

Detailed scenario modelling has been performed for two reprocessing rates shown in Table 5.1, which were chosen to be the upper and lower bounds of a likely range of MOP performance (the MOP 9 Performance Range), in order to:

- ensure that the performance required for each of the two reprocessing rates can be underpinned by the capabilities of plants and infrastructure and that constraints are not breached to achieve these rates
- provide forecast end dates for the sites and reprocessing.

It is anticipated that average reprocessing performance will be between the upper and lower bounds of the MOP 9 Performance Range although it is likely that actual performance will include periods of low performance and periods of higher performance to recover and catch up.

As a result of the uncertainty in reprocessing rates a further scenario of only 250 tU/year has been considered, the principal interest in this scenario is consideration of the impact of very low performance on plant lifetimes and inter-national obligations regarding discharges.

Engineering judgement indicates that there are currently no identified life limiting plant issues which would prevent reprocessing continuing until this date. However due to the complexities and age of the plant it is not possible to rigorously underpin this.

The scenarios shown in Figure 4.2 on page 7, provide a visual representation of the reducing quantity of spent Magnox fuel for the upper and lower bounds of the MOP 9 Performance Range. Table 5.2 provides the forecast completion (last fuel off-site) dates for the sites and the date for completion of reprocessing.

Table 5.1 The bounding performance levels for the MOP 9 Performance Range are:

Average Annual Reprocessing rate	Commentary
740 tU/year	Upper Bound – A relatively high rate chosen to investigate the ability of all other MOP processes to match this rate. It also reflects the requirements of the Sellafield Performance Plan
450 tU/year	Lower Bound – A low rate chosen to investigate the capability of plants and the availability of resource to operate for the longer period of time required for this rate



Table 5.2 MOP 9 Performance Range Schedules – Average Annual Reprocessing Performance

	Upper Bound 740 tU/year	Lower Bound 450 tU/year
Site	Forecast Completion Dates	Forecast Completion Dates
Chapelcross	Mar 2013	Nov 2013
Sizewell	Jun 2014	Oct 2015
Oldbury	Oct 2014	Feb 2017
Wylfa	Dec 2016	Jul 2019
Calder Hall	Mar 2017	Mar 2019
Reprocessing Complete	Mar 2017	Dec 2020



5.2.2 Planning Guidance

Whilst recognising that actual performance is likely to be variable and unpredictable, it is necessary to provide a basis for financial and management planning purposes. Planning guidance will be issued and then reviewed annually against past performance and the current risk profile of the programme to inform sites of forecast performance.

5.3 MOP Management Arrangements

5.3.1 Programme Management

The MOP is an integrated programme which links multiple locations and multiple organisations. Magnox is responsible for the overall management of the MOP and its interfaces, on behalf of the NDA. The Magnox Operating Unit at Sellafield manages the interfaces with other Sellafield plants and services required for MOP delivery. Dounreay manages the removal and despatch of fuel from DFR.

Management of the MOP is carried out through a number of forums. The MOP Steering Group provides the forum for overall governance and decision making.

The Steering Group includes representatives from the key organisations directing and monitoring the detailed execution of the MOP, reviewing plans, assessing risk and initiating remedial actions. It is responsible for:

- Overseeing and ensuring the effective management and execution of the Magnox Operating Programme

- Determining and endorsing delivery strategies, commissioning work and placing the actions necessary to ensure the successful completion of the MOP
- Aligning priorities by ensuring targets are aligned or compatible
- Examining risks and agreeing appropriate mitigation
- Monitoring delivery performance and seeking recovery or acceleration opportunities
- Operating an assurance programme to support safe and compliant operations.

Individual projects are established as required. The MTIP is an overarching project with the objective of identifying the causes of losses, identifying risks and initiating mitigation and remedial activities at Sellafield. The MTIP regularly reports to the MOP Steering Group.

5.3.2 Underpinning

An important feature of MOP 9 is a more secure planning basis. To this end each organisation has carried out an exercise to examine the planning assumptions used in schedule development, the risks to delivery and any acceleration opportunities. Particular focus has been given to:

- a) slow reprocessing performance rates where the challenge is to maintain operational systems and appropriate resources for extended periods
- b) faster reprocessing performance rates where the challenge is to maintain high and sustained levels of performance.

5.3.3 Assurance

The MOP 9 schedules which bound the MOP 9 Performance Range have been compiled from a comprehensive list of priorities, constraints and capabilities for plants, equipment, infrastructure and people. These have been underpinned by the individual organisations contributing to the MOP. However these underpinning assessments only have a limited period of validity. Quarterly reviews and assessments will:

- Allow judgements to be made on the continuing validity of the underpinning information used to produce MOP 9
- Monitor progress with defuelling preparation works at Oldbury and Wylfa and improvement plans at the sites that have already commenced defuelling
- Promote an understanding of the issues and risks which may threaten the MOP and allow an assessment of the health of the mitigation plans
- Inform the MOP risk processes.



5.3.4 Annual Review

An annual high level review of the MOP will:

- Review performance against the plan to identify the main reasons for any loss of capacity and the effectiveness of any consequential recovery plan
- Consider whether, in the light of performance and an assessment of programme risk, it is necessary to review the guidance provided for financial and programme planning
- Identify any improvement opportunities and the status of plans to deliver improvements
- Review the Risk Registers and whether the extent of mitigation is sufficient
- Review the MOP management arrangements to consider whether they are delivering the required leadership and direction
- Trigger a reissue of the MOP should performance move outside the MOP 9 Performance Range or other factors mean the bounding scenarios are no longer valid.

5.4 MOP Risk Management

5.4.1 Identification and Mitigation of Risks

Delivery of the MOP requires an array of risks to be managed. Risk management has been embedded in SLC management arrangements over the years to effectively manage risks and implement mitigation strategies appropriate to the impact on the programme. Due to the complexity of the MOP and the plants and facilities required to deliver it there are many individual risks which at a particular time could exert significant impact on the programme; however the consequences are largely impact to the schedules and overall programme costs due to an inability to:

- remove fuel from a reactor
- ship fuel to Sellafield
- decan the fuel in FHP
- reprocess the fuel

5.4.2 Critical Programme Impacts Tracker (CPIT)

A long range decision making process has been developed which will ensure potential decisions and long lead time issues are identified and addressed in a timely manner.

In the remaining years of the MOP it is likely that there will be some issues (risks or opportunities) which could critically impact the programme. In order to mitigate against these risks, or realise the opportunities, significant decisions may be required many months or years in advance. In order to ensure decision points are not missed, a Critical Programme Impacts Tracker and supporting process has been developed to capture the potential issues and ensure they are subjected to periodic review.



6 MOP Contingencies

The objective of the MOP is to complete reprocessing as safely and quickly as possible. In the event of an item of plant failing it would almost certainly be the preferred and cheapest option to carry out a repair; there are very few items which could not be repaired or replaced within an acceptable timescale. However, it is prudent to consider the options available for acute or chronic failure and the NDA are leading a review supported by Sellafield and Magnox.

6.1 Acute Failure

Acute failure refers to a situation where reprocessing stops without prior warning and does not restart.

Historically Magnox fuel has not been considered suitable for extended storage in water. Typically, up to seven years was considered tolerable and, for this reason, stocks of wet fuel are limited. NDA-led research is ongoing to test the boundaries of this assumption.

Should reprocessing suffer an acute failure it is most likely that repair of the fault will be both possible and the preferred option. However, it is necessary to have a contingency plan in place to safeguard the remaining spent fuel should a repair not be possible or have extended timescales.

For wetted fuel the contingency plan currently being developed is in two parts:

- Wet fuel in Magnox site ponds will be moved to the FHP pond; this will keep all wet fuel in one location for short/medium-term management
- The possibility of drying and containerising wetted fuel is currently under development. The work is at a stage where the option is considered technically feasible, further detailed design would be required if it were decided to implement this option.

For dry fuel that remains in the reactor, preliminary studies have shown that it can be safely stored in-reactor for decades with negligible degradation as confirmed by experience with storage of several hundred tonnes of fuel in air cooled dry stores at Wylfa. Thus in the event of acute failure, dry fuel in reactors would be held on-site in-reactor until the appropriate conditioning and disposal facilities are in place.

6.2 Chronic Failure

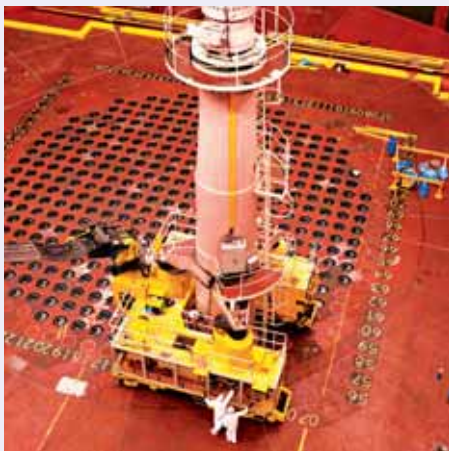
Chronic failure refers to a situation where reprocessing rates fall to such low levels that it becomes impractical, or uneconomic to maintain reprocessing facilities operational for extended timescales. Chronic failure is similar to acute failure but allows some flexibility to manage the impact when reprocessing finally ends.

Section 5.2 considered a scenario where average reprocessing rates fell to 250 tU per year leading to a reprocessing completion date of 2028; although it is difficult to project that far ahead there are no identified plant failures which could not be repaired. Figure 4.1 shows that an average rate of only 250 tU per year is very pessimistic. However even in this extreme scenario it is anticipated that reprocessing could still deal with the remaining spent fuel inventory. The NDA's current strategic assessment (reference 5) is that reprocessing would continue to be the preferred strategy.

Should reprocessing rates deteriorate towards the 250 tU per year average rate then the MOP would be managed to limit the impact of the risk from having to halt reprocessing by:

- Reducing the amount of fuel held in wet storage
- Attempting to reduce the number of locations with Magnox fuel on site
- Considering whether there are alternative management options for the smaller quantities of spent fuel which might remain when reprocessing finally ends.

7 Summary



The Magnox Operating Programme mission 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.

MOP 9 has provided an update to MOP 8 and presented future outcomes in a manner which recognises programme variability and the sensitivity to events. The use of upper and lower bound performance levels provides a realistic indication of the potential range of key dates and means MOP 9 will remain valid provided average reprocessing performance lies within the Performance Range.

Programme management arrangements have been strengthened to underpin performance assumptions and ensure a proactive programme of risk identification and mitigation. New assurance arrangements have also been introduced to ensure the underpinning arrangements remain valid.

As part of the overall NDA hazard reduction programme, assets used in the MOP will also be used to handle other materials, in particular material from DFR and the FGMS. Careful management will ensure these have minimal impact on the overall Magnox programme.

An Annual Review will consider the ongoing validity of MOP 9. MOP Planning Guidance will also be reviewed annually and dependent on performance and the future risk profile it will either confirm the previous year's guidance or provide updated guidance.





8 Appendix - MOP Status Update



Key changes since the issue of MOP 8 Revision 2 in August 2010 are:

- All Magnox fuel has been manufactured and delivered to sites
- Oldbury ceased generation on Reactor Two on 30 June 2011 and Reactor One on 29 February 2012
- Wylfa Reactor Two ceased generation on 26 April 2012. Potentially Reactor One could continue until 2014/15 utilising inter-reactor fuel transfers to utilise the energy remaining in lightly irradiated fuel from Reactor Two. Measures are in place to ensure continuing generation and a consequent late start to defuelling, do not delay MOP completion
- Dungeness A has completed defuelling with all spent fuel despatched off site on 17 April 2012
- Calder Hall started defuelling in October 2011
- A recovery programme has increased the number of Magnox flasks in service back to historic levels
- Reprocessing during 2010/11 was limited to 233 tU as a result of delays in spent fuel delivery, followed by problems with plants required to support reprocessing operations. Reprocessing during 2011/12 reached 607 tU
- At the start of the MOP the FHP pond contained around 600 tU of corroded fuel, by April 2006 this had reduced to 340 tU and at April 2012 the inventory stood at around 210 tU
- Following recovery of the spent fuel delivery capability, stocks of wet Magnox fuel have returned to the target level of about 850 tU (compared to the limit of 1,050tU). Spent fuel deliveries are closely linked to reprocessing with every tonne of reprocessing allowing a tonne of spent fuel to be wet as part of the process for delivery to Sellafield
- DFR material has been included in the MOP schedules and Dounreay have been included in the MOP management arrangements
- Transfer of spent Magnox fuel from FGMSF to FHP pond for storage is included in the Sellafield Performance Plan
- The MTIP was launched at Sellafield in April 2011 to reduce risks to and recover reprocessing performance bringing forward the end of Magnox reprocessing
- MOP management arrangements have been reviewed and strengthened.



9 References

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