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ONR Assessment of the Wylfa Power Station Periodic Safety Review 2014-24

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EXECUTIVE SUMMARY

Title

ONR Assessment of the Wylfa Power Station Periodic Safety Review (PSR) 2014-24.

Permission Requested

This Office for Nuclear Regulation (ONR) Project Assessment Report sets out the regulatory justification for issuing ONR's Decision letter to confirm that Magnox Limited (MxL) has carried out an adequate PSR of Wylfa Nuclear Power Station Safety Case for the period 2014-24.

Background

A PSR is submitted to comply with Nuclear Site Licence Condition 15: Periodic Review. The purpose of the review is to revalidate the existing safety case to confirm that it is adequate for maintaining nuclear safety. This is achieved by reviewing the previous 10 year operation together with considering any changes in activities that may impact on nuclear safety over the next 10 years. The review takes into consideration compliance with modern standards and potential impact of ageing and obsolescence. The Wylfa 2014-24 PSR submitted by MxL to ONR covered:

- Reactor 1: power generation until the end of December 2015; and
- Reactor 2: maintained under extended outage conditions, until de-fuelling commences.

Following this, both reactors will be de-fuelled, decommissioned and then placed into care and maintenance.

Assessment and inspection work carried out by ONR in consideration of this request

ONR carried out Licence Condition (LC) compliance inspection against LC 15: Periodic Review together with detailed assessment of the Wylfa PSR. This was based on requirements set out in ONR's Nuclear Safety Technical Assessment Guide for Periodic Safety Review and relevant good practice set out in ONR's Safety Assessment Principles for Nuclear Facilities. The scope of ONR's assessment was considered proportionate to risks, given the remaining generating life of the station and activities planned.

Matters arising from ONR's work

ONR considered that the PSR provided an adequate review of safety given the planned activities on the Wylfa licensed nuclear site over the period 2014-24. This is based on MxL's assessment identifying no significant nuclear safety findings, which was confirmed by ONR's own assessment.

ONR's inspection findings confirmed that Wylfa's Site arrangements for LC 15 were adequate and had been followed in the production of the 2014-24 PSR.

ONR's own assessment of the PSR raised a number of findings. None of these impacted on power generation of Reactor 1 to December 2015 or Reactor 2 in extended outage conditions. ONR's points focused on strengthening aspects of Wylfa's safety case for post-generation, transition into de-fuelling, decommissioning and care and maintenance. MxL has given ONR a written commitment to address all outstanding work, including ONR's assessment findings to agreed time-scales.

Conclusions

ONR considers MxL's Wylfa PSR is adequate to demonstrate safe operation for the period 2014-2024. This view is based on: both MxL and ONR finding no significant nuclear safety issues for the activities to be carried out on the Wylfa nuclear licensed site over the period 2014-24; together with, MxL's commitment to address both their own and ONR's PSR findings within agreed timescales.

Recommendations

It is recommended that ONR issues a Letter confirming the decision that the Wylfa power station PSR for the period 2014-24 is adequate. Conditions will be contained within the letter requiring MxL to address outstanding findings within defined timescale.

LIST OF ABBREVIATIONS

ALARP	As Low As Reasonably Practicable
BSL	Basic Safety Level (in SAPs)
BSO	Basic Safety Objective (in SAPs)
C&I	Control & Instrumentation
CM	Care & Maintenance
CNS	Civil Nuclear Security (ONR)
GEM	Generation Extension & Maximisation
GO	Generation Optimisation
HSE	Health and Safety Executive
IAEA	International Atomic Energy Agency
INSA	Independent Nuclear Safety Assessment
LC	Licence Condition
MxL	Magnox Limited
NDA	Nuclear Decommissioning Authority
NSC	Nuclear Safety Committee
ONR	Office for Nuclear Regulation
POCO	Post Operation Clean Out
PSA	Probabilistic Safety Assessment
PSR	Periodic Safety Review
QA	Quality Assurance
RGP	Relevant Good Practice
SAP	Safety Assessment Principle(s) (HSE)
TAG	Technical Assessment Guide (ONR)

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1 PERMISSION REQUESTED

2. This ONR Project Assessment Report sets out the regulatory justification for issuing an ONR Decision letter confirming that an adequate Periodic Safety Review (PSR) of the Wylfa nuclear power station Safety Case has been undertaken by Magnox Limited (MxL).
3. The requirement to carry out a PSR is set out under License Condition 15: Periodic Review, attached to Schedule 2 of the Nuclear Site Licence. International standards (Ref 5) recommend that the periodicity between PSRs should be 10 years. The Wylfa PSR (Ref 38, 13) submitted to ONR by MxL is for the period covering 2014-24.
4. ONR's guidance (Ref 3) states that the purpose of the PSR is to consider all factors that may affect the safety of the plant over its life time and can be summarised under the following bullet points:
 - The degree to which the safety case conforms to modern standards and good practices.
 - The degree to which the safety documentation addresses the remnant life of the facility, given changes in plant status through construction, commissioning, operations, post operations and decommissioning.
 - The adequacy of the arrangements in place to maintain safety until the next PSR or end of life.
 - Safety improvements to be implemented to resolve any identified safety issues.
5. ONR's regulatory process (Ref 3) requires ONR to issue a statement in writing, referred to as a "Decision Letter", on the adequacy of a PSR carried out by licensees. The Decision Letter is issued one year after the Licensee has submitted its PSR to ONR. The duration of 1 year between submission date and issuing a Decision Letter is considered reasonable time to allow the Licensee to address safety findings identified in their review. ONR's Decision Letter also identifies any regulatory requirements / actions from its own assessment of the submitted PSR.

2 BACKGROUND

6. Wylfa Nuclear Power Station is the last remaining operational Magnox station. It has two reactors, Reactor 1 which is still generating, and Reactor 2 which was shutdown on 25 April 2012 and is being maintained under extended outage conditions.
7. The 2004-14 PSR assumed that both reactors would cease power generation in 2010 (Ref. 6). As a result of re-alignment of the Sellafield irradiated fuel reprocessing programme the option to allow power generation at Wylfa to continue until 2012 was identified. MxL requested the option to continue power generation at Wylfa power station for both reactors until 2012. The safety justification made to ONR for this request was based upon the Station's safety case (Ref. 7) and the 2004-14 PSR. ONR accepted MxL safety arguments by letter (Ref. 8) but placed additional conditions on the station for improvements in safety.
8. In 2012, MxL made a request to continue power generation with Reactor 1 as limited new fuel stocks would only support one reactor at power (Magnox fuel manufacture at Springfields ended in 2008 and the last fuel delivery to Wylfa was in December 2011). MxL also identified the ability to transfer lower irradiation fuel elements from Reactor 2 to Reactor 1 to assist in maintaining Reactor 1 at power, under the inter-reactor transfer safety case.
9. The decision to allow Reactor 1 to continue generating electricity was made against a number of factors including:

- Safety requirements e.g. reactor graphite weight loss
 - Plant condition e.g. boiler efficiencies, pressure vessel integrity
 - Nuclear Decommissioning Authority's Magnox Operating Programme and Sellafield's fuel reprocessing operation
 - National electricity generating capacity
10. Considering all these factors led to the decision to allow Reactor 1 to continue producing electricity with MxL declaring cessation of power generation on 31st December 2015.

2.1 LICENSEE'S CASE

11. MxL Outcome Report (Ref 13) of the Wylfa 2014-24 PSR was that there were no significant findings that would impact on nuclear safety given activities to be carried out over the period:
- Electrical generation from Reactor 1 until 31st December 2015.
 - The de-fuelling of both reactors, once a period of cooling had taken place for Reactor 1. De-fuelling of both reactors expected to be completed by 2018.
 - Decommissioning and preparation for transfer into care and maintenance.
12. Wylfa's Nuclear Safety Committee (NSC) reviewed the PSR strategy and structure (Ref. 10, 11 and 12) before work commenced on production of the PSR. The PSR was produced in line with Station arrangements for LC 15 and comprises of 10 topic reports (Ref 14-23) and 4 supporting reports (Ref 24-27). All of these documents were reviewed by MxL's Independent Nuclear Safety Assessment (INSA) organisation (Ref 28-37) as a requirement within Station's process which provides independent scrutiny of safety arguments and claims made.
13. The Wylfa 2014-24 PSR Outcome Report identifies a total of 35 findings requiring resolution. This report was reviewed by INSA (Ref 39) who confirmed safe operations could be justified until September 2024. It noted that further safety case development was required for de-fuelling and care and maintenance activities. The Outcome Report was endorsed by Station's NSC (Ref 38).
14. Of the 35 findings, 4 could potentially impact on operations of Reactor 1 up to September 2014 and a further 10 were not specifically addressed within the existing safety case to cover operations up to December 2015. These findings have been dealt with as a matter of urgency and MxL have confirmed that all 14 have now been addressed (Ref. 42). Of the remaining 21, 16 have also been closed out with only 5 findings remaining which relate to safety case updates. These cover extreme weather conditions, internal flooding, internal hazards, dropped loads, and radioactive waste management. MxL intends to report closure of these findings to the NSC by December 2014.
15. MxL has given a commitment to provide a progress report to Wylfa NSC and the ONR Nominated Site Inspector by the end of 2016 confirming close out of all outstanding findings.

3 ONR'S ASSESSMENT AND INSPECTION WORK

16. ONR engaged with MxL prior to submission of the 2014-24 PSR in September 2013, to confirm the PSR met the overall agreed scope (Ref 44). Some minor deviations from the original schedule of document submission to the NSC were noted. These were

addressed by letter (Ref. 42) with MxL committing to submit a PSR Progress Report before the end of 2014 and a Safety Case Strategy Overview Report prior to entering the Post Generation de-fuelling phase.

17. MxL has also provided a high level overarching strategy paper which sets out the timeline of activities and a safety case route map to ONR in April 2014 (Ref. 43). This detailed how MxL is to manage changes in the Station's safety case, people, processes and plant requirements during Wylfa's transition between the different operational phases for the period of the PSR.
18. The ONR Nominated Site Inspector undertook two routine planned LC 15 inspections in June 2013 and August 2014 (Ref. 44 & 45) in support of ONR's assessment of the 2014-24 PSR. The first inspection focused on confirming the adequacy of the Licensee's arrangements for production of a PSR. The second focused on close-out of PSR findings, with the Inspector sampling a number of the licensee's close out reports of PSR findings. ONR also undertook extensive assessment of the Wylfa 2014-24 PSR submission covering 16 specialist discipline areas.

4 MATTERS ARISING FROM ONR'S WORK

19. From inspection and assessment of the Wylfa 2014-24 PSR, ONR considers an adequate review of safety has been carried out based on:
 - MxL's PSR assessment of the Wylfa nuclear power station's safety case found no significant safety findings for the period of assessment (2014–24) and the independent nuclear safety assessment review of the PSR supported this.
 - ONR Wylfa Site Inspector confirmed adequate arrangements for LC 15 compliance and that these were followed in the production of the PSR. Sample inspection of close-out reports for individual PSR findings were confirmed as suitable and sufficient in addressing the matters identified.
 - ONR's assessment of MxL's safety documentation from the Wylfa 2014-24 PSR found no significant findings that could affect nuclear safety (Ref 47 to 62), and that could adversely impact on operations on site, including storage of radioactive material or waste during the period of the PSR.
20. ONR's assessment of the Wylfa 2014–24 PSR confirmed MxL's view that the safety case for electrical generation with Reactor 1 and maintenance of Reactor 2 under extended shut-down was adequate. In the case of post generation activities, covering de-fuelling, decommissioning and, care and maintenance of both reactors, ONR Specialist Inspectors considered that the safety arguments made could be developed and strengthened. As a result of this, a number of ONR findings were raised. In the case of Structural Integrity a finding was raised regarding the maintenance of boilers to secure post-generation cooling. MxL responded to this and provided additional information which the Specialist Inspector considered addressed the matter. In the case of Radiological Protection it was the opinion of the Specialist Inspector that additional work should be carried out for post-generation operations to confirm the claims for radiation doses to operators, and that these were As Low As Reasonable Practicable (ALARP). In the case of Mechanical Engineering further analysis work has been requested on fatigue assessment of equipment within Wylfa fuel routes given its increased utilisation during de-fuelling. A list of findings is provided in Table 1. MxL has given written commitment to address all of ONR's findings within agreed time limits (Ref 42). Taking into consideration the level of hazard and risk identified with each of ONR findings I have formed the overall judgement that the Wylfa PSR is adequate for the period 2014-24. This judgement takes into account that after December 2015 the overall hazard posed by the site to the public will be significantly reduced, following

cessation of electricity generation. I judge that adequate permissioning controls are in place to protect the work force and the public from radiological hazards arising from operations on site, including storage of radioactive material or waste.

21. The MxL PSR sets out how changes in the way the station is to be managed after electrical generation ceases in December 2015, with reactor de-fuelling, decommissioning and care and maintenance taking place. Station's arrangements require all changes that may affect safety to be categorised based on their potential nuclear safety impact. This covers both physical alteration to plant and equipment as well as modification of safety documentation, demonstrating how potential hazards are controlled and risks reduced to ALARP levels. Where the potential impact on safety is considered significant, MxL is required, under its own arrangements, to inform ONR. In the case of changes to Operating Rules (conditions and limits identified in the interests of safety), MxL is required to seek ONR's permission before these changes can be implemented. This situation will also be the case when MxL wishes to implement its de-fuelling safety case. ONR carries out regular compliance inspections of LC arrangements as part of routine business. Inspection of Wylfa's LC22: Modification or Experiment on existing plant arrangements were last inspected in April 2014, (Ref 65) and deemed to be adequate.

5 VIEWS OF OTHER GOVERNMENT AGENCIES

22. Natural Resource Wales did not raise any issues that could prevent ONR issuing its Decision letter for the Wylfa PSR (Ref. 64), accepting operation for the period 2014 – 2024.

6 CONCLUSIONS

23. I consider that an adequate review of safety of the Wylfa nuclear power station safety case has been undertaken by MxL for the period 2014-24. This view is based on the evidence gathered from ONR's inspection and assessment of the site and PSR documentation forming the following:
 - MxL's assessment of safety for the activities to be carried out on the Wylfa nuclear licensed Site over the period 2014–24 identified no significant nuclear safety findings. This was supported by MxL's independent nuclear safety assessment function and the NSC. Most findings affecting safety have been addressed and any remaining will be closed out by December 2014.
 - ONR's inspection of Wylfa's arrangements for LC 15 Periodic Review found these to be adequate and the Station has followed them in the production of the 2014-24 PSR. Inspections of close-out reports produced by MxL to address their PSR issues found these suitable and sufficient.
 - ONR's assessment of the Wylfa 2014-24 PSR found no serious findings that could impact on nuclear safety. ONR's assessment of the Safety Case for the period covering Reactor 1 electrical generation (until 31st December 2015) and Reactor 2 being maintained under extended outage conditions was considered adequate. Findings raised by ONR focused on de-fuelling, decommissioning and care and maintenance. These findings require MxL to carry out additional work to clarify and justify their claims. MxL has given a written commitment to address all of ONR's findings within agreed timescales.
 - Where MxL is to make changes to physical plant or to the Safety Case, these will be carried out in line with the LC22 modification arrangements. This process requires the impact on safety from all changes to be categorised. Where a change is considered to have a significant impact on safety, MxL is required to seek

ONR's permission before the change can be implemented. ONR's permission will be required for changes to Operating Rules and in the implementation of the de-fuelling safety case. ONR will undertake additional scrutiny of safety claims before granting permissions. ONR considers that adequate regulatory controls are in place to ensure that high levels of safety are maintained through the phased transition in moving the Wylfa nuclear licensed site from electrical generation to a state of care and maintenance for final decommissioning.

7 RECOMMENDATIONS

24. I recommend that ONR confirms the adequacy of MxL's Wylfa PSR submission by issuing a Decision Letter agreeing to the continued operation of the site in the period 2014-2024.
25. I recommend that conditions are included in the Decision Letter with timescales, to address the outstanding findings.

8 REFERENCES

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14. TRIM 2013/370741 Topic Report 01 (TR01) Leadership and Management of Safety & Environment Issue (WYA/2/600/5106 Add 1 Issue 1)
15. TRIM 2013/370759 Topic Report 02 (TR02) Reactor Faults (WYA/2/600/5106 Add 2 Issue 1)
16. TRIM 2013/370776 Topic Report 03 (TR03) Hazards (WYA/2/600/5106 Add 3 Issue 1)
17. TRIM 2013/370789 Topic Report 04 (TR04) Electrical Systems (WYA/2/600/5106 Add 4 Issue 1)
18. TRIM 2013/370800 Topic Report 05 (TR05) Civil Structures (WYA/2/600/5106 Add 5 Issue 2)

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21. TRIM 2013/370843 Topic Report 08 (TR08) Cooling & Related Water Systems (WYA/2/600/5106 Add 8 Issue 1)
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59. TRIM 2014/237341 NGL - Wylfa - Assessment Report - 14-028 - Civil Engineering Assessment of Wylfa Periodic Safety Review 2014-2024 - August 2014
60. TRIM 2014/305597 CNRP - Wylfa - Assessment Report - 14-043 - Assessment of the graphite structural integrity aspects of the Wylfa Periodic Safety Review 2014 - July 2014
61. TRIM 2014/203903 Magnox-Wylfa-Assessment Report-14-024-Wylfa PSR 2014-2024 - Structural Integrity

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63. TRIM 2014/342886 Wylfa PSR 2014-24 - Comment on site security to be included in PAR supporting the decision document
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65. ONR Intervention Record ONR-WYF-IR-14-002 TRIM Ref 2014/0176349 14 – 17 April 2014

TABLE 1 SUMMARY OF ONR FINDINGS

Summary of ONR Assessment Findings from Wylfa PSR

ONR Finding Reference	Topic	Finding Summary Description	TRIM Reference
WYF-PSR-001	Electrical	Identification of electrical plant & equipment requirements post generation	2014/343016
WYF-PSR-002	Electrical	Electrical plant Safety Cases for post generation phases	2014/343027
WYF-PSR-003	Electrical	Consideration of electrical plant Safety Cases for post generation phases	2014/343034
WYF-PSR-004	Fuel	Management of fuel route plant to meet post generation demands	2014/343043
WYF-PSR-005	External Hazards	External hazards consideration of aircraft traffic levels	2014/343046
WYF-PSR-006	External Hazards	External hazards consideration of off-site noxious and explosive substances	2014/343056
WYF-PSR-007	External Hazards	External hazards consideration of extreme wind affecting the Pile Cap crane and support structures	2014/343059
WYF-PSR-008	External Hazards	External hazards management of the effects of humidity	2014/343060
WYF-PSR-009	External Hazards	Review of external hazards assumptions for biological fouling	2014/343063
WYF-PSR-010	Civil	Completeness of Fuel Handling Crane seismic assessment	2014/343066
WYF-PSR-011	Civil	Completeness of Pile Cap crane seismic assessment	2014/343069
WYF-PSR-012	Civil	Identification of civil structures relevant to post generation	2014/343071
WYF-PSR-013	Mechanical	Identification of the POCO, C&M and decommissioning strategies relevant to post generation phases	2014/343077
WYF-PSR-014	Mechanical	Fatigue assessment of crane's load path components within the station's fuel route	2014/343082
WYF-PSR-015	C&I	Identification of Control and Instrumentation systems and condition post generation	2014/343083
WYF-PSR-016	C&I	Control & Instrumentation organisational resilience	2014/343085
WYF-PSR-017	LMfS	Station organisational resilience during post generation phases	2014/343086
WYF-PSR-018	HF	Procedures and instructions quality, effectiveness and control of procedural adherence	2014/343087

ONR Finding Reference	Topic	Finding Summary Description	TRIM Reference
WYF-PSR-019	Radiation Protection	ALARP radiation protection post generation	2014/343088
WYF-PSR-020	Chemistry	Review of chemistry related activities	2014/343090
WYF-PSR-021	Structural Integrity	Maintenance and inspection of post generation of cooling systems	2014/343093
WYF-PSR-022	Structural Integrity	Prevention of reactor internal degradation from water ingress etc. post generation	2014/343094
WYF-PSR-023	Structural Integrity	Maintenance and inspection of cooling system pipework	2014/343095
WYF-PSR-024	Radioactive Waste	Provision of suitable radioactive waste management facilities post generation	2014/343096