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Wylfa – Reactor 1 – 2014 Periodic Shutdown

Assessment of the Wylfa Reactor 1 2014 Periodic Shutdown

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EXECUTIVE SUMMARY

Title

Magnox Limited (MxL) – Wylfa Power Station – Assessment of the Wylfa Reactor 1 2014 Periodic Shutdown and Consent to Return the Reactor to Service under Licence Condition 30(3).

Permission Requested

Magnox Limited (MxL), the site licence company (the Licensee) that operates and maintains Wylfa Power Station, has requested that the Office for Nuclear Regulation (ONR) grants Consent to start-up Reactor 1 following completion of the 2014 biennial periodic shutdown and in accordance with site Licence Condition (LC) 30(3). The Licensee's request confirmed that outage work has been completed and that the reactor is safe to re-start and operate until the next periodic shutdown.

Background

There are two Magnox reactors at Wylfa Power Station designated as Reactor 1 and Reactor 2. Wylfa Reactor 2 permanently ceased generation in 2012 and Reactor 1 is planned to remain operational until December 2015. To continue safe and reliable operation, the reactors and supporting plant require examination, inspection, maintenance and testing under the requirements of the site licence. The arrangements made to address LC 28 require that the reactors are subject to outage every two years, referred to as a periodic shutdown. Outage work also includes work required to address plant obsolescence, improvement and upgrades that can only take place during a reactor shutdown. Following completion of the outage work, the specification issued under LC30(3) requires the Licensee to request ONR's Consent to the start-up of Reactor 1 on confirmation that outage work is complete and the reactor is safe to re-start and operate for a further period.

The current shutdown of Reactor 1 commenced on 6th of January 2014. In accordance with the Licensee's arrangements, ONR and the Licensee's Nuclear Safety Committee were provided with an outage intentions document presenting details of the activities planned for the periodic shutdown. The planned work included maintenance activities in accordance with the station Maintenance Schedule (MS), together with inspections to support the station safety case and other work to comply with statutory requirements. Where the inspection work revealed potential deterioration in plant condition, the Licensee has assessed the results and carried out remedial work as necessary, in accordance with their established arrangements. After completing the periodic shutdown work required for start-up, the Licensee has confirmed to ONR that planned and emergent work has been addressed, and the reactor is safe to start-up and operate for a further period.

During the outage, independent scrutiny of activities was provided by the Licensee's Environment, Health, Safety & Quality oversight group and the MxL company site inspector. In addition, the quality assurance group, MxL specialist staff from the support centre and the major contractors' representatives carried out audits and inspections of outage activities in their areas. They have confirmed to ONR in documentation submitted to support start-up that the planned inspections had been completed and, where the need for emergent work was identified appropriate action has been taken. In addition, inspections were also carried out by the insurance company inspectors (competent persons for the PSSR) and responsible system engineers. Additional inspections by the outage area leads and the station management team to assess outage performance were also conducted.

The station's request for ONR to Consent to start-up of Reactor 1 following the periodic shutdown has been supported by the company (EHSS&Q) site inspector, who undertook a

comprehensive programme of surveillance s an d inspect ions, result ing in him providing a statement of concurrence for start-up of the reactor.

Prior to commencement of the outa ge, it was id entified that section s of the station reference safety statement (RSS) would need to be revised during t he operating period to ensure that the station 's operation al safety case cont inued to cover plant configuration an d planned operational conditions. To address this, the L icensee ha s provided a letter sett ing out a number of commitments to update components of the reference safety statement in support of safe operation until cessation of generation from Reactor 1 in December 2015.

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

The ONR n ominated site inspector, project in spector and specialist inspectors have sampled the License e's arrange ments for controlling, u ndertaking and completing the examination, inspection, maintenance and test ing required by the maintenance schedule, to gether with other plant modificatio ns of nuclear safety significance as identified within the outage documentation. Where appropriate this has included visiting site to inspect implementation of the arrangements for carrying out t he work. These visits in cluded atten dance at the outage intentions m eeting to ag ree the out age scope, the mid outage meeting to discuss progress with work and emergen t issues, an d the start-u p meeting to discuss re adiness to r eturn the reactor to service, including the actions to be resolved prior to recommending that ONR grants Consent for Reactor 1 to be started-up.

Matters arising from ONR's work

The Licensee has confir med to ONR that the outage work has been successf ully completed, the findings from the specialist assessment s of the outa ge activities have been adequately addressed, and all actio ns identified for resolution prior to ONR granti ng Consent have been resolved.

Other less significant actions arising dur ing ONR's interventions have been agreed for response i n the longer term and will be tra cked to completion in a ccordance with the Licensee's arrangements to ensur e risks con tinue to be reduced a s low as r easonably practicable.

During the outage an event occurred which led to an u nplanned radiation exposure of a number of personnel working on th e reactor building roof. The station has investigated the event and considers that the assessed dose to t he affected persons is comparatively small by comparison to the le gal limit. An ONR specialist inspe ctor is following-u p the event and will provide advice on an appropriate ONR regulatory response to the incident in due course.

Overall, the regulatory interventions undertaken by ONR during the current periodic shutdown of Wylfa Re actor 1 have identified no issues of nuclear safety significa nce that have not been resolved in a satisfactory manner.

Conclusions

Following assessment and inspect ion of matt ers arising in relation t o the 2014 periodic shutdown of Reactor 1 at Wylfa power station I have concluded that t he Licensee 's safety case to st art-up the reactor and operate for a further period is adequate, and that consequently ONR Consent to start-up the reactor should be granted.

Recommendations

On the basis of the evidence presented in this report I recommend that, in accordance with the request from the Licensee, with support from its internal regulatory department, ONR should grant Consent for Reactor 1 at Wylfa power station to start-up following the 2014 periodic shutdown, and that Licence Instrument 560 should be signed and sent to the Licensee.

LIST OF ABBREVIATIONS

ALARP	As low as reasonably practicable
APEX	Appointed Examiner
C&I	Control & Instrumentation
CNS	Civil Nuclear Security (ONR)
CNRP	Civil Nuclear Reactor Programme
DAP	Duly Authorised Person
EIMT	Examination Inspection Maintenance Testing
GSRV	Gas Safety Relief Valve
LC	Licence Condition
LI	Licence Instrument
HOW2	(Office for Nuclear Regulation) Business Management System
HSE	The Health and Safety Executive
INF1	Incident Notification Form
INSA	Independent Nuclear Safety Assessment
IPR	Intervention Plan Report
IRR	Ionising Radiation Regulations
IRX	Inter Reactor Transfer
NDT	Non-Destructive Testing
NSC	Nuclear Safety Committee
OID	Outage Intend Document
ONR	Office for Nuclear Regulation
PCPV	Pre-stressed Concrete Pressure Vessel
PSSR	Pressure System Safety Regulations
SQEP	Suitably Qualified and Experienced Person
TAG	(ONR) Technical Assessment Guide

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1 PERMISSI ON REQUESTED

1 This report considers the work carried out by the Licensee, Magnox Limited (MxL), at Wylfa Power Station during the periodic shutdo wn of the Reactor 1 tha t started on the 6th of January 2014. In compliance with th e specification issued under Licence Condition 30(3), MxL is required to obtain the Consent of ONR for th e start-up of Reactor 1 following satisfactor y completion of its periodic shutdown work programme.

2 The Licensee has submitted a "Request for Consent to Start up Reactor One under Licence Condition 30(3)", in its letter dated the 9th of April 2014 (Reference 1). This report summarises ONR's regulato ry oversight of the Rea ctor 1 periodic shutdow n, including the areas of safety significance considered, and provides the basis for the decision to grant Consent to re-start the reactor as requested by the licensee. It has been produced in accordance with ONR guidance (Referen ce 46), and the relevant ONR processes described in HOW2.

2 BAC KGROUND

2.1 General

3 The Licensee is required by its arrangements made under Site Licence Condition 30 to undertake a biennial periodic sh utdown of each reactor in order to enable the systematic examination , inspection, maintenance and testing of all plant that ma y affect safety. This programme of work is defined under the Licensee's arrangements made under Licence Condition 28, and supports the validit y of the Sta tion's Safety Case for continued operation until the next periodic shutdown.

4 The station has completed the programme of work intended to be undertaken during the Reactor 1 periodic shutdown and has requested ONR's Consent to start-up Reactor 1 in a letter dated 9th of April 2014 (Reference 1). The objective of this report is to provide the basis f or ONR gra nting Consent to re-start the reactor. It gives an overview of the work undertaken by ONR at Wylfa d uring the 2 014 periodic shutdown of Reactor 1, and describes how ONR has regulated the out age process, the matters it has con sidered, an d the basis of the decisions it has made. ONR guidance d ocument NS-PER-I N-001 Revision 5 under pins the a dministrative process followed by ONR to issue a Licence Instrument. Other ONR guidance used during the o utage relates to the reg ulation of L icence Cond ition 30 (Re ference 44) and the interaction with the Licensee during the Start-up meeting (Reference 45).

5 The work u ndertaken by the Licensee and sampled by ONR compris es Reactor 1 routine outa ge activitie s, as undert aken in pre vious perio dic shu tdowns of Wylfa Reactor 1. It also incorporates plant m odifications and improvements, previous outage commitments, the requirements of the pressure sy stems safet y regulations and other emergent work.

6 As planned, the Wylfa Reactor 1 periodic shut down commenced on 6 h of January 2014, and had an overall target for completion of 100 days.

2.2 Outage Planning and Management

7 The station's planned outage programme was outlined in the Wylfa Outage Intent Documents (Reference 2). Prior to the initiat ion of the periodic sh utdown, the documents and supporting references were ex amined by ONR Specialist Inspector s who then advised the ONR Site Inspector of any matters requiring clarification during the outage intentions meeting, which was held on 24th October 2014 at Wylfa Power Station (Reference 3). A number of actions were raised at the out age intentio ns meeting (Reference 4), which have been confirmed as completed.

8 A mid-outage meeting was held on 17th of February 2014 to review progress with both planned and emergent work, and to discuss the outcome from work completed at that point (Reference 6). The station reviewed progress with outage work and, where issues potentially affecting reactor safe operation were identified, ONR was informed of the proposed corrective measures. A number of issues deemed to have the potential to affect re-start of Reactor 1 were recorded, and station was informed that these points would need to be resolved prior to granting Consent to start-up of the reactor. Actions were produced and agreed from the meeting, and these were carried forward for review during the start-up meeting (Reference 8).

9 The Reactor 1 start-up meeting was held on 21 March 2014, and chaired by the Station Director, supported by the senior management team and the outage manager. A plant inspection visit took place prior to the meeting and ONR fed back its findings during the meeting. A start-up briefing pack (Reference 7) was submitted in advance of the meeting that was used as the basis of the presentation during the meeting. The company EHSS&Q inspector provided a report to the start-up meeting, describing the work undertaken and supporting return to service of the reactor. The start-up meeting is covered in more detail in section 3.6.

2.3 EHSS&Q and Station Oversight/QA

10 The following work was undertaken by the Licensee's independent site inspector for the Wylfa power station (part of the Company EHSS&Q function) and the station oversight/QA section that are part of the station organisational structure (referred to as Station EHSS&Q).

2.4 Company EHSS&Q

11 During the Wylfa Reactor 1 statutory outage, a programme of surveillance was undertaken covering areas relevant to nuclear, radiological and conventional safety, and the conduct of the outage (Reference 20). The Licensee's EHSS&Q Site Inspector for Wylfa Power Station undertook the surveillance activities supported by the expertise of inspectors from other sites. The surveillances were intended to determine, in the areas sampled, whether the outage arrangements and their implementation complied with company requirements.

12 Their inspection and surveillance programme identified areas for improvement, which were presented to the station management team who agreed to take the necessary corrective action. The EHSS&Q Site Inspector reported the details of the surveillances formally to the Station (Reference 20), and has confirmed that appropriate measures have been put in place to address his findings.

13 Based on outcome from his programme of surveillances during the Reactor 1 periodic shutdown, the EHSS&Q inspector has supported the return to service of Reactor 1 and provided a statement of concurrence to this effect (Section 2 of Reference 20).

2.5 Station EHS&Q

14 The EHS&Q Oversight team's role is to provide the station with assurance that the Licensee's arrangements and the site licence compliance requirements have been followed. The Station's EHS&Q team audited the station revised quality plan arrangements to ensure that the process implemented provided an acceptable auditable trail for completion of the work (Section 3.6 of Reference 7). There is a hierarchy of quality plans, with the overarching Principal Quality Plan needing to be signed-off before the reactor can be considered ready to restart in accordance with the Licensee's arrangements.

15 While the audits identified a number of anomalies requiring corrective action, the inspection work reported that there were no matters arising that should affect a decision to re-start Reactor 1.

3 INSPECTION AND ASSESSMENT WORK CARRIED OUT BY ONR IN CONSIDERATION OF THIS REQUEST

16 The ONR planning process to resource outage work, and the outcome from the areas of work covered during the outage interventions, is described below.

3.1 Planning the Wylfa 2014 Periodic Shutdown Interventions

17 ONR's periodic shutdown activities are planned as part of the delivery of the Civil Nuclear Reactor Programme (CNRP) Strategy. ONR undertakes both routine and specialist interventions during outages. Routine interventions are planned on a yearly basis and recorded on the approved Integrated Intervention Strategy Plan. These interventions include safety system inspections and compliance inspections. During the outage, both system inspections and compliance inspections related to the outage were carried out, and reported in the visit intervention reports. In addition, other relevant aspects such as security, conventional safety and fire safety are also considered during the outage, and reported appropriately.

18 ONR's specialist interventions sample specific technical areas and assess the Licensee's activities within each specialist area which have potential to affect the safety of the plant. The specialist inspections are planned and resourced using an Intervention Project Record (IPR) providing a description of the work to be undertaken. ONR's process requires IPRs to be approved, and the resources allocated, on the basis of the priority of the work within the CNRP and ONR strategy.

19 In line with this process, the work specified in the Wylfa 2014 outage IPR has been carried out before and during the outage to provide assurance that Reactor 1 is safe to start-up and operate for the next operating period. The areas covered by the IPR included: Structural Integrity, Civil Engineering, Graphite, Electrical Systems and Control & Instrumentation Systems. In each case specialist resources to cover these areas was provided, and the outcome from the work is summarised in other sections of this report.

3.2 Planned inspection - Licence Condition Compliance Inspections

20 The nominated site inspector performed a series of planned compliance inspections against licence conditions during the outage. A summary of each inspection is provided below.

3.2.1 LC7 Event Notification

21 During the outage, a number of events were notified to ONR under the generic arrangements to comply with the requirements of Licence Condition 7 (References 6 and 22). A number of these events were followed up by inspections to ensure the station has responded adequately to incidents on the site including those notified to ONR, and has complied with its licence condition arrangements. The station reported events with the potential to affect safety using the formal event notification process (INF1), The ONR inspections confirmed that the station has complied with the arrangements for LC7 in responding to the events, and has taken action to correct adverse conditions where necessary. For the majority of events notified to ONR under their arrangements, no matters have been identified that could affect the start-up of Reactor 1 and operation for a further period. However, in one case, ONR is awaiting further information from the licensee before deciding on the most appropriate regulatory response, although the event is not considered to have a

direct bearing on the return to service of Reactor 1; preliminary details are provided below.

22 During the outage an event occurred which led to the unplanned radiation exposure of a number of personnel working on the reactor building roof. The licensee has investigated the event and considers that the assessed dose to the affected persons is comparatively small by comparison to the legal limit. It has identified a number of areas where arrangements can be improved, and is taking the necessary action to help prevent a re-occurrence. An ONR specialist inspector is continuing to follow-up the matter and will provide advice on an appropriate regulatory response by ONR in due course (Reference 6, section 2.6).

3.2.2 LC9 and LC10 Instruction to Persons and Training

23 An inspection (Reference 11) was carried out of the arrangements to comply with Licence Conditions 9 and 10 concerning making and implementing arrangements to ensure that persons on the licensed site receive appropriate instructions and are given suitable training to undertake work that may affect safety of the plant. The inspection sampled aspects of the arrangements and their implementation that apply during a reactor outage, and confirmed that suitable training and instructions were provided to personnel on site, including contractors, for the purposes of the periodic shutdown. On the basis of the inspection outcome, no matters have been identified that could affect the start-up of Reactor 1 and operation for a further period.

3.2.3 LCs12 & 26 Duly authorised and other suitable qualified and experienced persons (DAP and SQEP) and Control & Supervision

24 The inspections reported (References 11 and 6) focused on the role of DAPs and SQEPs during the outage, and how the work undertaken is properly controlled. The inspectors involved examined the arrangements and sampled the station records. They concluded that the areas sampled were satisfactory, and that overall the arrangements are being implemented in a satisfactory manner during the current outage. Therefore, no matters have been identified that could affect the start-up of Reactor 1 and operation for a further period.

3.2.4 LC18 and Ionising Radiation Regulations 1999

25 Radiological protection inspections are carried out during statutory outages of civil nuclear reactors against the requirements of Licence Condition 18 and the Ionising Radiations Regulations (IRRs) 1999. The intervention (Reference 21) considered the adequacy of radiological protection during the outage.

26 The inspection focused on radiological measures in place to plan, monitor and control radiation dose of personnel undertaking work in the most active areas, the reactor vessel and reactor pile cap. The inspection considered the documentation underpinning compliance with the requirements of Licence Condition 18 and the IRRs with particular emphasis on the application of the ALARP principle, radiation dose control and contamination control. The supporting documentation was sampled and a plant walk down was undertaken concentrating on the pressure vessel entry point and pile cap areas, two areas with higher radiological hazards. No issues were identified that were deemed likely to have a significant impact on nuclear safety at the time of the inspections. An action was placed on the station to update a number of the supporting documents and action follow up and closure will be undertaken as part of future routine inspection.

27 The Licensee reported an event involving uncontrolled radiation dose of workers involved in reactor building roof repairs, and this is covered in more detail in paragraph 24 of this report.

28 No other regulatory actions arising from these visits were considered necessary and no matters were identified that could prevent ONR from issuing a Consent for re-start of Reactor 1 and operation for a further period.

3.2.5 LC30 Periodic shutdown

29 An inspection was carried out of the arrangements to comply with Licence Condition 30 relating to periodic shutdown of the reactor to allow examination, inspection, maintenance and testing of plant which may affect safety (Reference 22). During the inspection, it was confirmed that the station arrangements for LC30 have been revised, to be consistent with an improved outage management structure and process based on that used by other operating sites, and adopted by Wylfa for the current periodic shutdown. The implementation of these arrangements during the current outage of Reactor 1 was examined and it was concluded that they were following the process described in the revised document. The inspection found that overall station has arrangements to address LC30 which meet the requirements of the condition and that on the basis of the plant inspection sample implementation of the arrangements is satisfactory. Therefore, no matters were identified that could prevent ONR from issuing a Consent for re-start of Reactor 1 and operation for a further period.

3.3 Planned Inspection - Safety System Inspections

30 During the outage, ONR inspectors carried out safety system inspections to identify the adequacy of the station arrangements made to ensure the systems will perform their safety function. In deciding if suitable and sufficient measures have been put in place for the safety systems, these inspections consider compliance with a number of licence conditions to test the adequacy of the arrangements implemented. The standard consideration of licence conditions during safety system inspections includes LCs 12, 23, 24, 27, 28 & 34, with conditions added or excluded depending on their applicability. These inspections were carried out while Reactor 1 was undergoing a planned outage, and the inspections included consideration of work that would be undertaken as part of the periodic shutdown, with the following outcomes.

3.3.1 Essential Electrical Supplies System (ESS)

31 The Safety Systems inspection (Reference 22) of the ESS found that the station has made arrangements to ensure that the essential electrical supplies system is maintained and operated in accordance with its safety case, and the arrangements were deemed to be implemented in an adequate manner. The inspection identified a number of opportunities for potential improvement, and although none gave rise to significant safety concern, the station has agreed to take action to address them. On the basis of the areas sampled by the inspection, no matters were identified that could prevent ONR from issuing a Consent for re-start of Reactor 1 and operation for a further period.

3.3.2 Pre-Stressed Concrete Reactor Pressure Vessel (PCPV)

32 The safety systems inspection (Reference 48) of the PCPV found that the station has made arrangements to ensure that the pre-stressed concrete pressure vessel system is maintained and operated in accordance with its safety case, and the arrangements were deemed to be implemented in an adequate manner, including the work that is carried out during outages to underwrite continued operation of the vessel. The inspection recommended that the description of the vessel inspection regime contained in the station documents could be made clearer and the licensee has agreed to take action to address this. On the basis of the areas sampled by the

inspection, no matters were identified that could prevent ONR from issuing a Consent for re-start of Reactor 1 and operation for a further period.

3.4 Other Planned inspection

3.4.1 Conventional Safety

33 A conventional safety inspection was carried out (Reference 23) during the outage by a specialist safety inspector to assess the station's arrangements for managing conventional health and safety. The inspection looked at the safe management of work, including the management of contractors' work.

34 The scope of the inspection covered the designation of high and low risk areas, work control systems and the control and monitoring of lifting operations. The inspection incorporated interactions with staff, review of supporting documentation and a plant walk down. A number of actions resulted from this inspection. In response, the station proposed a number of improvements to address the inspection's findings (Reference 24) which will be followed-up as part of routine site inspections. While the station was requested to undertake improvements, overall the arrangements were deemed to be adequate. The outcome of the inspection was that no conventional health and safety issues were identified that could prevent the return to service of Wylfa Reactor 1 following completion of the outage work.

3.4.2 Fire Protection

35 A fire protection inspection was carried out during the Wylfa Reactor 1 periodic shutdown. The inspection focused on the existing arrangements to maintain adequate fire protection during the current outage and improvements made since the previous fire safety audit. It covered a selection of fire safety themes to assess compliance with the Regulatory Reform (Fire Safety) Order 2005. The intervention recognised some examples of good practice and encouraged the station to seek continual improvements in fire safety. During this intervention, no issues were identified that could adversely affect the Wylfa Reactor 1 return to service on completion of the periodic shutdown work (Reference 46).

3.4.3 CNS security inspections

36 ONR Civil Nuclear Security (CNS) conducted a security inspection at Wylfa during the outage that sampled aspects of site and information security (Reference 26). The inspection highlighted that security was properly maintained during the outage in accordance with the station security arrangements. The inspection noted that the station increased security measures appropriately in response to the increase in personnel entering the site during the outage. Overall, the intervention concluded that there were no security issues identified during the inspection that could prevent ONR granting Consent for the start-up of Reactor 1 on completion of the 2014 periodic shutdown.

3.5 ONR Specialist Inspections

3.5.1 Steel Structural Integrity

37 ONR structural integrity specialists undertook interventions that sampled and assessed the outcome from plant inspections, repairs and replacements, together with the Licensee's process for managing these activities and for identifying corrective action as appropriate (Reference 10).

38 Two unexpected structural integrity defects were identified when undertaking the planned outage inspection work on the guide tube assembly tubes and the boiler supports.

39 During a visual inspection of the guide tube assemblies (GTA), the operators identified a defective weld in several of the compound tubes present on a number of GTAs. The affected guide tubes are used for the loading of fuel elements fitted with temperature monitoring thermocouples. On identifying this unrecognised defect, the station examined earlier inspection video recordings and identified that similar indications may have been seen previously. They considered that the cracks were confined to the tube axis and were of no structural safety significance. The inspections did not identify defects on the circumferential welds supporting the extremities of the guide tubes. The Licensee submitted a Matter of Special Report to its Nuclear Safety Committee (Reference 11) on the findings and the action proposed to address them. Following further investigations, and in accordance with its arrangements, the Licensee produced a safety justification in support of the return to service of Reactor 1 with the defects remaining in place (Reference 27). ONR's Structural Integrity specialists reviewed the submission and judged the action taken and the justification provided to be adequate (Reference 13).

40 The operators also identified an unexpected defect on one of the boiler support brackets during their inspection of the support structural welds. While similar cracks had been seen in the past on bolted brackets, resulting in an extensive programme of surveillance and replacement, this defect was found on a welded boiler support bracket which had not been recorded previously. They carried out inspection to visually assess other bracket supports of this particular type. The defective bracket weld was examined using Non Destructive Testing techniques to better characterise the nature of the defect and allow assessment of its structural significance.

41 From the additional work, no additional defects could be identified on the accessible population of this type of welded bracket. Analysis of the identified defect showed that the bracket has retained structural integrity, and that the development of the defect is sufficiently slow to ensure that structural integrity remains acceptable during the next operational period. The Licensee submitted a Matter of Special Report (Reference 12) to its Nuclear Safety Committee on the findings and the action proposed to address them. The station emphasised that the design includes redundant support and that in the case of complete failure of all boiler supports assessments showed the safety impact to be tolerable. In addition, the station claimed that the benefit of undertaking bracket repairs would be marginal considering the radiation dose rate, the slow progression of the defect in service, and limited remaining Reactor 1 operational life.

42 During the start-up meeting, an action was placed on the station to provide a justification for the return to service with the defects identified on the boiler bracket and guide tubes. The station provided these documents (Reference 27 and 29) together with the INSA statement in advance of granting the Consent (Reference 28 and 50).

43 ONR's Structural Integrity specialists considered and sampled the licensee's submissions and reported their findings in an Assessment Report (Reference 13). The report concurred with the findings of the licensee's INSA (Reference 49, 51, 52, 53). Following consideration of the information available, ONR's structural integrity specialists found no structural integrity issue that could prevent Wylfa Reactor 1 from being allowed to return to service, and recommended that a Consent for Reactor 1 start-up should be issued.

3.5.2 Civil Engineering

44 Magnox Ltd employ an appointed examiner for the pre-stressed concrete pressure vessel (APEX), to provide an independent assessment of the structural condition of the vessel (Reference 14). The assessment report presented to the Licensee incorporates the results of the 2012/2013 biennial vessel inspections that are part of

the station's Maintenance Schedule and compliance with the PSSR written scheme of examination. It considers the structural condition of the pre-stressed concrete vessel and concludes that its condition is fit for continued service for a period of up to August 2015.

45 ONR's civil engineering specialist inspector reviewed and sampled the findings of the APEX report and assessed them against the relevant standards and good practices (Reference 15).

46 The scope of the assessment included the findings of the inspections and tests of a number of key safety related components of the reactor pressure vessel. The areas covered included tendon loads, tendon anchorages, tendon corrosion, concrete surfaces, foundations tilts and settlements, vibrating wires strain gauges, vessel concrete liner temperatures, reactor coolant leakage, top cap deflection, tendon tensile strength and pressure vessel cooling water leakage.

47 In addition, other inspections were carried out on the vessel during the outage. These included the Main Access Corridor and the vessel Top Cap, two areas only accessible during periodic shutdown. The ONR specialist inspector considered this work and added his findings to his original report. The ONR specialist inspector made no finding that contradicted the APEX assessment report and identified no issues that could prevent return to service of Reactor 1 (Reference 15).

48 However, the specialist noted that the validity of the APEX report only extends to August 2015 and the examination would need to be repeated after this date. Therefore, a further APEX report will be required to demonstrate that the integrity of the Pre-stressed Concrete Pressure Vessel remains valid after August 2015 for the remaining period of generation until December 2015.

49 In summary, from the results of the surveillances, inspections and tests as reported in the documentation provided, the specialist inspector is content to support the return to service of Wylfa Reactor 1 pre-stressed concrete pressure vessel for a period of 2 years. This judgement is based on the assessment of the data and information presented in the documents provided, and an acceptance of the judgements made by APEX.

50 A further APEX report will be required to continue operation after August 2015 until the end of Wylfa Reactor 1 operational life. The Licensee has provided commitment (Reference 16) that future requirements for examination of the pre-stressed concrete pressure vessel will be fulfilled during the next period of operation.

3.5.3 Mechanical Systems

51 ONR's mechanical engineering specialists attended an inspection during Reactor 1 outage on 18/02/14. The intervention objectives were to sample the maintenance of the Reactor Control Rod System and the Gas Circulators, two important safety related systems. The targeted intervention sampled the safety case requirements underpinning the maintenance activities undertaken on these systems and incorporated a plant inspection (Reference 17). ONR's specialists discussed the work and challenged the station on the outcome of the Reactor 1 Gas Safety Relief Valves (GSRV) test, and on the finding of unexpected damage on one of the gas circulator motor cooling fan blades.

52 The GSRV test protocol requires the test to be carried out shortly after the safe shutdown of the reactor to closely replicate the cooling gas temperature and pressure conditions. Bursting discs are a recent modification of the original GSRV to prevent over pressurisations in the event of clogging of the discharge filters during a valve lift. During the test, one of the bursting discs ruptured below its nominal rating. The Station investigated this failure and its consequences on the validity of the

GSRV test (Reference 29). ONR's assessors reviewed the response (Reference 30) and confirmed that they are satisfied with the validity of the test and that there are no safety implications that were not addressed.

53 ONR's mechanical engineering specialists investigated an emergent issue concerned with finding distortion on one of Gas Circulator 2 electric motor fan cooling blades. The station investigated the damaged blade and assessed the remaining blades using NDT techniques. The investigation confirmed the absence of defects or damage on the other blades, and postulated that the damage may be historical. The findings were recorded in a separate modification proposal in accordance with the station's arrangements and the submission has received INSA clearance. ONR's assessors have considered the outcome and have raised no further issues (Reference 32 and 33, 53).

54 The station provided evidence to support the closure of these emergent issues and ONR's specialists identified no remaining significant mechanical engineering issues following consideration of the information provided by the station. The Licensee's request for Consent to re-start Reactor 1 (Reference 1 and 34) confirms the completion of the maintenance schedule work. ONR's mechanical engineering specialists have reviewed the scope of the completed activities during the outage and have concluded that that there are no mechanical engineering issues that could prevent ONR granting Consent for the start-up and operation of Reactor 1 (Reference 17).

3.5.4 Graphite

55 The graphite core inspections undertaken as part of Wylfa Reactor 1 periodic shutdown support the Reactor 1 safety case, which stipulates established limits for the safe operation of the reactor core. The graphite monitoring regime incorporates the collection of graphite samples to assess graphite weight loss, core geometry measurement and visual inspections to identify potential core defects. The results of the inspections contribute to the review of the graphite safety case which is undertaken on a yearly basis.

56 ONR's graphite specialists undertook inspection samples of the graphite core examinations carried out during Wylfa Reactor 1 outage to ensure that the activities followed the Outage Intent Documents, and that the initial findings are consistent with the existing safety case. An Intervention Report (Reference 35) provides the outcome from the intervention and an Assessment Report (Reference 36), provides the judgement of the specialists as to whether the findings are acceptable for the return to service of Wylfa Reactor 1.

57 An action (Reference 37) was placed on the station to demonstrate the sufficient quality of the trepanned graphite samples collected during the outage graphite examination. This action was closed in advance of the Licensee's application for a Consent to re-start Reactor 1 (Reference 38).

58 The analysis of the trepanned specimens will provide additional data informing the weight loss predictions. The dimensional measurements support the claim that there is no evidence of any distortion that would impede the free movement of fuel or control rods or inhibit cooling of the fuel. ONR graphite specialists concluded that the Reactor 1 graphite core safety case requirements and the outage commitments have been met.

59 In accordance with the Licensee's arrangements, the results of the graphite inspections in support of the safety case have been reported in a licensee's report and summarised in the 2014 outage inspections PMP, which has completed INSA (Reference 53). The Licensee has confirmed that the results from the work support the safety case and are considered to be within the stated limits. ONR's graphite

specialist inspectors are content that the outcome from the campaign does not affect the suitability of the core for further service (Reference 36).

3.5.5 Electrical Systems

60 ONR's electrical engineering specialist considered the scope of the electrical systems work identified within the outage intentions document (Reference 2), and carried out a site inspection (Reference 39), to review compliance and progress against these activities. The assessment of the outage activities is provided in an Assessment Report (Reference 40). The inspection and assessment were undertaken against LC28, relevant Safety Assessment Principles (SAPs), and ONR's technical assessment guides.

61 The site inspection focused on the essential electrical system with attention given to the activities in these specific areas relevant to Reactor 1 safety:

- 3.3 kV Essential System.
- 11kV circuit breaker maintenance.
- Station transformer cable grating repairs.
- Electric Overlay System 440V batteries.
- Unit auxiliary transformer maintenance.

62 In addition, the inspection covered plant modifications on the Electrical Overlay System and also the General Instrument Motor Alternators.

63 The outcome from the intervention is that the specialist inspector concluded that the periodic shutdown activities sampled were undertaken in a satisfactory manner, and noted that the Station addressed emergent issues in accordance with established arrangements.

64 The specialist inspector concluded that all activities were completed that are relevant to the electrical systems and identified in the Outage Intentions Documents (Reference 2). From this work, no issues, in relation to the electrical aspects of the Reactor 1 outage at Wylfa, have been identified that could prevent ONR from issuing a Consent for re-start of Reactor 1 and ONR's electrical specialist supports granting Consent for the start-up of Reactor 1.

3.5.6 Control and Instrumentation Systems

65 ONR's specialist Control and Instrumentation (C&I) inspectors considered the activities included in the Outage Intent Documents (Reference 2) and undertook an inspection (Reference 41) of outage related maintenance activities, covering reactor safety circuits and other C&I systems relevant to Wylfa Reactor 1 safety functions.

66 The specialist inspection sampled, assessed and reported the outage activities relevant to the reactor safety and trip functions (Reference 42). Based on the activities sampled, which included maintenance, calibration, instrument setting, inspection and equipment testing, ONR specialists concluded that Reactor 1 C&I equipment and systems are suitable for further use.

67 The inspection and assessment work did not identify any significant safety issues in relation to Wylfa Reactor 1 C&I systems that could prevent ONR granting Consent to start-up Reactor 1.

3.5.7 Fault Studies

68 ONR's fault studies specialist undertook a review (Reference 43) of the fault studies underpinning the safety case and safe operation of Reactor 1. The review sampled and assessed activities associated with the Inter Reactor Transfer (IRX) of partially irradiated fuel elements that will take place during the next period of operation. ONR's specialist has accepted the suitability of the existing fault studies and that the Station has sufficiently substantiated the key safety aspects of its operation. ONR's fault studies specialist has supported granting Consent to start-up Reactor 1.

3.6 Reactor 1 Start-Up Meeting

69 The Reactor 1 start-up meeting was held on 21 March 2014, and chaired by the Station Director, supported by the senior management team and the outage manager. A plant inspection visit took place prior to the meeting and ONR fed back its findings during the meeting. A start-up briefing pack (Reference 7) was submitted in advance of the meeting that was used as the basis of the presentation during the meeting.

70 During the start-up meeting, the station provided a presentation on progress with outage work, together with confirmation of closure of the actions originating from the outage intent and mid-outage meetings. A number of matters arising mainly from emergent work and outstanding queries raised by ONR's interventions were discussed, and where necessary it was agreed that further information would be provided. A list of actions agreed during the meeting to cover outstanding work was produced, with those requiring completion prior to Consent being captured in the Outage start-up action table. (Reference 8).

71 The station has now confirmed that all actions identified as required to allow ONR to grant Consent to start-up Wylfa Reactor 1 have been satisfactorily resolved (Reference 1). The remaining actions that are not prerequisites for the return to service of Reactor 1 will be tracked and closed as part of normal business during routine inspection work.

72 The company EHSS&Q inspector provided a report to the start-up meeting, describing the work undertaken during the outage and its satisfactory outcome, and supporting return to service of the reactor.

4 MATTERS ARISING FROM ONR'S WORK

73 ONR's site, project and specialist inspectors have sampled the Station's activities and assessed the justifications concerning the resolution of emergent issues. Based on these inspections, assessments and associated findings, I am satisfied that there are no remaining issues of significance for safety that could prevent the safe re-start and operation of Reactor 1 until the next periodic shut down.

74 A number of recommendations and actions have arisen from ONR's inspection and assessment activities, the majority of which were not deemed sufficiently significant for ONR to withhold its Consent to re-start Wylfa Reactor 1. These actions are recorded in the intervention and assessment reports and will be collated and tracked as part of ONR's routine inspections.

75 The Licensee has adequately completed all the actions required prior to ONR granting Consent in accordance with its own arrangements. All other issues not related to Consent will either be addressed after periodic shutdown as a part of ONR's future interventions, or by the licensee using its own action tracking system. The relevant specialist inspectors and the nominated site inspector will track the progress and completion of these actions ahead of the next Annual Review of Safety (AROS) meeting.

76 In addition, the Licensee has committed to carry out the necessary inspections and to provide the safety justifications required during the next operating period (Reference 16).

77 Station has confirmed to ONR (Reference 1) the completion of all outage work with the exception of activities dependent on the re-commissioning and start-up testing of the reactor and its supporting systems. These activities will be addressed in accordance with the Licensee's arrangements (Reference 53), and are incorporated within the Reactor 1 quality plan as part of the re-start process.

4.1 Other Regulator's Comments

78 The ONR Site Inspector sought confirmation from other relevant regulators, that they had no objection to the re-start of Reactor 1 following the periodic shutdown, with details provided as follows.

4.1.1 NRW/EA

79 Natural Resource Wales (Reference 47) reported that there were no issues to prevent re-start of Reactor 1 following its 2014 periodic shutdown.

5 CONCLUSIONS

80 The Wylfa Reactor 1 periodic shutdown has been undertaken in accordance with the work described in:

- the current Maintenance Schedule;
- the outage intention documents; and,
- the Start-up meeting Briefing Pack and related material.

81 All necessary work has been completed, including corrective responses to emergent issues, subject to the work that must be delayed until the reactor is pressurised, or will be carried out during re-start of Reactor 1.

82 The station has provided adequate responses to the actions required prior to start-up, which were identified during the start-up meeting or carried forward from other outage related meetings.

83 The station has confirmed the completion of all work due to be performed in advance of start-up and that the station is safe to re-start and operate until the next periodic shutdown. Furthermore, the Licensee's independent oversight function, EHSS&Q, has issued a statement of concurrence supporting the start-up of Reactor 1.

84 Any remaining information will be included in specific documents and submitted to ONR separately, and where necessary reported to the AROS meeting.

85 ONR's assessment of the periodic shutdown work programme in the areas considered; review of the results from outage examination, inspection, maintenance and testing; , and inspection of outage work activities have not revealed any significant unresolved issues that prevent ONR from granting Consent to start-up Reactor 1 at Wylfa power station, and permitting its operation for a further period, following its 2014 periodic shutdown.

86 This report has been produced by the outage Project Inspector, reviewed by the Site Inspector, and accepted by a Superintending Inspector who has endorsed the recommendation to grant Consent for the start-up of Reactor 1 at Wylfa power station.

87 The Project Inspector has prepared a standard Consent (Reference 9) and will present the Licence Instrument with this report for signature by a Superintending

Inspector who has been authorised in writing to act in this regard on behalf of ONR (Reference 54).

6 RECOMMENDATIONS

88 I recommend that the nominated Superintending Inspector accepts this Project Assessment Report in respect of the technical and regulatory arguments presented, and endorses ONR granting Consent to the start-up of Reactor 1 at Wylfa power station.

89 I also recommend that the Superintending Inspector who has been authorised in writing to act in this regard on behalf of the ONR, should sign Licence Instrument number 560 granting Consent to start-up Wylfa Reactor 1 following completion of the 2014 periodic shutdown, and allow it be sent to the Licensee for this purpose.

7 REFERENCES

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2. *Magnox - Wylfa Power Station Reactor 1 2014 Statutory Outage Inspection Intent WAY/2/600/3975 Addendum 9, Issue1 (TRIM 2014/45686)*

3. *ONR - Wylfa Reactor 1 Outage 2014 OID ONR Specialists Feedback, (TRIM 2013/379548)*

4. *ONR - Wylfa Intervention Report ONR WYF-13-008 Oct 2013 (TRIM 2013/430801)*

5. *ONR - Wylfa Intervention Report WYF-IR-13-010 Resolve questions and clarifications on the inspection of steel components detailed in the OID (TRIM 2013/454580)*

6. *ONR - Wylfa Intervention Report WYF-IR-13-015 Feb 2014 (TRIM2014/107502)*

7. *Magnox - Wylfa Reactor 1 2014 Start up meeting briefing pack final (TRIM 2014/121408)*

8. *ONR – Wylfa Reactor 1 2014 Outage Start up action table (TRIM 2014/123353)*

9. *Wylfa Reactor 1 Outage 2014 WYF Outage Consent LC30(3)-LI560 (TRIM (2014/145408)*

10. *ONR - Wylfa - Intervention Report ONR-WYF-13-016 - On Site Inspection of Structural Integrity Activities as Part of the 2014 Reactor 1 Periodic Shutdown Intervention (TRIM 2014/81796)*

11. *Magnox – Matter for Special Report – Defective weld in tube guide assembly (TRIM 2014/83862)*

12. *Magnox – Matter for Special Report – Identification of a defective weld in a boiler support bracket (TRIM 2014/83855)*

13. *ONR-WYA-AR-13-125-Wylfa Reactor 1 2014 Outage – Assessment of the results of the Inspection of Metal Components and Structures (TRIM 2014/141916)*

14. *Magnox - Statutory examination of the prestressed concrete pressure vessel of Reactor 1 September 2013 M/EF/WAY/REP/011/13 (TRIM2013/439850)*

15. *Magnox - Wylfa - Assessment Report - Assessment of the Wylfa Reactor 1 Pre-stressed Concrete Pressure Vessel Statutory Examination (TRIM 2013/467060)*

16. *Magnox - Wylfa Reactor 1 2014 Outage - ONR Letter WYF 52416N - Letter of Commitment (TRIM 2014/130207)*

17. *ONR – Wylfa – CNRP-AR-13-116 Mechanical Engineering Specialism – Licence Condition 28: Examination, Inspection, Maintenance and Testing – R1 Outage Assessment Report (TRIM 2014/98496)*

18. *ONR - Wylfa Reactor 1 – Email Structural integrity concurrence on INSA 5B certificate for R1 RTS with Boiler Support Bracket 113 (TRIM 2014/134412)*

19. *ONR - Magnox - Wylfa - Assessment Report - 13-120 - Reactor 1 Statutory Outage 2014 Control and Instrumentation Inspection and Assessment - 13 March 2014 (TRIM 2014/112343)*

20. *Magnox – Wylfa 2014 R1 outage EHSSQ Site Inspector Report (TRIM 2014/135900)*

21. *Wylfa - Intervention Report - 13 - 013 - Wylfa Reactor 1 2014 Outage Inspection - 17 - 18 February 2014 (TRIM 2014/84161)*

22. *Wylfa - Intervention Report - ONR-WYF-IR-13-012 - 20-23 January 2014 - IIS Inspections (TRIM 2014/63336)*

23. *ONR – Email (TRIM Document : 2014/86206) : Visit report for Magnox Wylfa inspection undertaken by Debbie John February 2014 during the statutory outage. (TRIM 2014/138866)*

24. *Magnox Ltd - Wylfa - WYF52418N - Inspection of Industrial Safety Arrangements During Wylfa Reactor 1 Statutory Outage - 28 March 2014 (TRIM 2014/133206)*

25. *ONR Email Reactor 1 Wylfa 2014 Outage - Fire inspection 5/2/14 (TRIM 2014/138993)*

26. *ONR Email Reactor 1 Wylfa 2014 Outage - Security inspection 11-13 Feb 2014 (TRIM 2014/139022)*

27. *GTA Longitudinal Weld Defect - section of PMP 3701 Add 20(2) (TRIM 2014/132330)*

28. *INSA 5B for Cat 2 PMP 5325 for R1 Return to Service with Boiler Support Bracket 113 (TRIM 2014/134331)*

29. *Wylfa - M-EF-WYA-EAN-0008-14 - EAN re 1G GSRV bursting disc failure (TRIM 2014/94039)*

30. *ONR Wylfa - email from G Frackelton to I Davies re assessment of 1G GSRV EAN and findings as at 06 March 2014 (TRIM 2014/95282)*

31. *Wylfa - Re GC 2 Main Motor Drive End cooling fan - 27 February 2014 (TRIM 2014/94023)*

32. *ONR - Email Wylfa GC 2 Main Motor Drive End cooling fan (TRIM 2014/139991)*

33. *ONR - Email Wylfa GC 2 Main Drive End Cooling Fan Specialist concurrence on INSA Cat 2 submission (TRIM 2014/140016)*

34. *Wylfa Reactor 1 Outage 2014 'Bucket ' PMP 3285 Add 20 Iss 1 (TRIM 2014/140058)*

35. *ONR-WYA-IR-13-014 - Wylfa R1 2014 Outage Graphite Inspection rev 001 (TRIM 2014/74953)*

36. *Magnox - Wylfa - Assessment Report - 13 - 122 - Wylfa Reactor 1 2014 Outage - Assessment of the results of the graphite core structural integrity inspections - March 2014 (TRIM 2014/126327)*

37. *Email from Bryan Banahan agreeing to include an explanation of the trepanning shortfall within the graphite section of the RTS EC: RE: Update on Wylfa Outage (TRIM 2014/109269)*

38. *Wylfa 2014 Outage WYA 9868 Graphite Sampling &Inspections Issue 1 Final (TRIM 2014/122137)*

39. *Magnox - Wylfa - Intervention Report -2013-017 - Reactor 1 Periodic Shutdown Inspection of Electrical Related Aspects - 19 Feb 2014 (TRIM 2014/119910)*

40. *Wylfa, Reactor 1, 2014 Periodic Shutdown: Electrical Engineering Assessment Report (TRIM 2014/136839)*

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44. *NS-INSP-GD-030 Revision 2 (TRIM 2013/221768)*

45. *NS-INSP-IN-001 Revision 2 (TRIM 2013/161316)*

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49. *ONR Email RE: INSA Statement for WYA/2/140/3701 Add.20 (TRIM 2014/144269)*

50. *Wylfa R1 outage 2014 INSA Statement for WYA/2/140/3701 GTA inspection (TRIM 2014/144297)*

51. *Review of Draft EC 5325 - Boiler Bracket Weld 113 - Defect Assessment (TRIM 2014/143026)*

52. *Review of PMP3725 - GTA Kidney Tube Assessment (TRIM 2014/143025)*

53. *Magnox Wylfa R1 Outage 2014 Bucket Final INSA WYA-PMP-3285-A20-5B (TRIM 2014/145138)*

54. *Delegated Authority Grant Consent LI 560 Wylfa R1 Outage (TRIM 2014/148609)*