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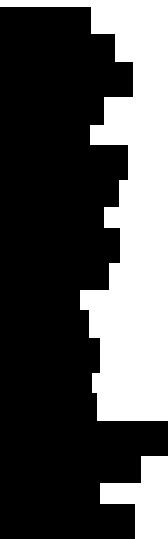
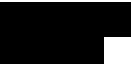
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AWE Aldermaston Site: Project Pegasus

Agreement to Commence Pegasus Main Store Construction (PCSR-2)

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EXECUTIVE SUMMARY

1 AGREEMENT TO COMMENCE PEGASUS MAIN STORE CONSTRUCTION (PCSR-2)

- 1.1 AWE plc has requested ONR's Agreement under Licence Condition 19(1) to commence Pegasus main store construction (PCSR-2).
- 1.2 AWE has undertaken a major project, Project Pegasus, to construct a new processing plant at its Aldermaston site. The project has been divided into stages and each of these is subject to review by ONR. PCSR-1 (Pre-Construction Safety Report) included site preparation and building of a service extension to the main building. PCSR-2, with which this report is concerned, is associated with construction of the Pegasus main store.
- 1.3 The Environment Agency and the Defence Nuclear Safety Regulator have confirmed that there are no matters from their perspective that would prevent the issue of Licence Instrument (LI) 527.
- 1.4 The ONR assessment process has had input from a team of specialist ONR assessors from a wide range of disciplines. In recognition that PCSR-2 essentially comprises construction of the concrete building their levels of assessment have been commensurate with the stage of the project.
- 1.5 The assessment team has not identified any matters that would prevent the issue of the LI agreeing to commencement of the Pegasus main store construction (PCSR-2). As such I am broadly satisfied with the claims, arguments and evidence laid down within the Pegasus PCSR-2 safety case submission and am content that the Licence Instrument for commencement of construction of Pegasus Box A can be issued.
- 1.6 The outstanding recommendations can be appropriately managed as the project progresses. Nevertheless, they will need to be closed-out appropriately and in a timely manner. They do not adversely affect the issue of the Pegasus PCSR-2 Licence Instrument.
- 1.7 The scope of the Pegasus PCSR-2 LI (527) is caveated to exclude the use of welded rebar.
- 1.8 Any use of pre-fabricated welded rebar cages must be subject to further assessment and subsequent agreement by ONR.
- 1.9 AWE needs to ensure that future safety case submissions include a comprehensive set of underpinning arguments and associated documentation that are clearly signposted within the headline documents.
- 1.10 LI 527 agreeing to the commencement of Pegasus Main Store Construction (PCSR-2) should be issued to AWE.
- 1.11 AWE should be informed that use of welded rebar cages requires additional AWE assessment and agreement from ONR and is therefore outside the scope of the agreement provided by LI 527.
- 1.12 The lessons learned during production and approval of the Pegasus PCSR-2 safety case should be reviewed for learning following issue of the Licence Instrument and this information should be shared between AWE and ONR.

LIST OF ABBREVIATIONS

ALARP	As low as reasonably practicable
BSL	Basic Safety level (in SAPs)
BSO	Basic Safety Objective (in SAPs)
CIDAS	Criticality Incident Detection & Alarm System
CNS	Civil Nuclear Security (ONR)
DNSR	Defence Nuclear Safety Regulator
EA	Environment Agency
HOW2	(Office for Nuclear Regulation) Business Management System
HSE	The Health and Safety Executive
IAEA	The International Atomic Energy Agency
LI	Licence Instrument
LPS	Lightning Protection System
NDA	Nuclear Decommissioning Authority
ONR	Office for Nuclear Regulation (an agency of HSE)
PCER	Pre-construction Environment Report
PCSR	Pre-construction Safety Report
PSA	Probabilistic Safety Assessment
PSR	Preliminary Safety Report
RGP	Relevant Good Practice
SAP	Safety Assessment Principle(s) (HSE)
SFAIRP	So far as is reasonably practicable
SSC	System, Structure and Component
TAG	(ONR) Technical Assessment Guide

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2 PERMISSION REQUESTED

- 2.1 AWE plc has requested ONR's Agreement under Licence Condition 19(1) to commence Pegasus main store construction (PCSR-2).

3 BACKGROUND

- 3.1 AWE has undertaken a major project, Project Pegasus, to construct a new processing plant at its Aldermaston site. The project has been divided into stages and each of these is subject to review by ONR. PCSR-1 (Pre-Construction Safety Report) included site preparation and building of a service extension to the main building. PCSR-2, with which this report is concerned, is associated with construction of the Pegasus main store.
- 3.2 AWE wrote to ONR on the 27th March 2013 requesting ONR's agreement to commence construction works on Pegasus main store. This was supported by the issue of the PCSR-2 safety case.
- 3.3 When completed, the overall Pegasus facility will replace an existing facility and provide AWE with new-build plant to modern standards. The Pegasus process includes the handling of radioactive and toxic materials which will be imported, exported and held within the facility as required. The submitted PCSR-2 provides the assessment of the associated hazards relating to Box A which comprises one section of the overall facility.
- 3.4 AWE is using a phased approach to the submission of safety cases that will comprise the overall safety case for the operational Pegasus facility, of which PCSR-2 forms one phase. To assess AWE's work, ONR has considered both the individual safety justifications for each phase, and each phase as part of the overall safety case. Although this report is concerned with PCSR-2, it has considered the submission in the context of the future project phases.
- 3.5 Construction work associated with Pegasus PCSR-2 will take place on an area of site in the vicinity of the existing operational plant. Initial preparatory work, principally clearing and levelling of the ground and installation of provision for services, has already been completed.
- 3.6 Works associated with PCSR-2 comprise construction of the foundations and the erection of the building structure (essentially the laying of the floor slab and the building of the walls and the roof for the store). The safety cases for subsequent phases of construction, including the provision of process plant and equipment and its setting-to-work, will be addressed by AWE in future safety case submissions that will be assessed by ONR.
- 3.7 ONR has consulted with the Defence Nuclear Safety Regulator (DNSR) and the Environment Agency (EA) as part of its consideration of the adequacy of the PCSR-2 submission.

4 AWE'S ASSESSMENT OF THE PEGASUS MAIN STORE BUILDING

- 4.1 For this PCSR-2, hazards which relate to the performance of the main store civil structure and for which a safety claim is made have been assessed. This includes: -
- 4.1.1 Structural performance relating to: -
- Loading i.e. seismic, snow, wind
 - Withstand i.e. vehicle/projectile impact, fire resistance and compartmentalisation
 - Lightning protection
- 4.1.2 Containment (provision of containment boundaries)
- 4.1.3 Shielding, where wall and ceiling structures are performing that function
- 4.1.4 Construction related activities
- 4.2 The external hazards scenario involving malicious aircraft crash is not addressed in the PCSR-2 submission, but is being separately addressed as part of a work programme underway corporately.

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

- 5.1 The process employed by ONR in carrying out its permissioning activities is defined in ONR procedures [1]. As in all aspects of its regulatory activities, ONR employs a sampling regime in the assessment of safety cases. Specialist assessors have applied appropriate national and international standards, the appropriate HSE Safety Assessment Principles [2] and ONR Technical Assessment Guides [3]. The assessment reports produced have been internally peer reviewed prior to formal issue.
- 5.2 ONR's regulation of the project has been in accordance with the ONR/DNSR Integrated Intervention Strategy for the AWE Programme. Early engagement has been undertaken over a period of approximately four years, including proportionate and targeted assessment of safety documentation, site licence condition compliance inspections, and technical meetings with AWE's project teams. As part of ONR's routine interventions we have provided advice and comments to AWE. Technical queries have been closed out through the issue of the safety documentation, or separately through responses to specific intervention findings.
- 5.3 AWE formally submitted its request/safety documentation in December 2012. However, there were a number of omissions which needed to be addressed which allowed them to make a substantial application at the end of March 2013. This report provides the findings of ONR's assessment of that submission, taking into consideration knowledge gained during early engagement and reflected in the Assessment Reports from the specialist ONR assessors. The associated Licence Instrument comprises the formal response to AWE from ONR.
- 5.4 In addition ONR has consulted with the Defence Nuclear Safety Regulator (DNSR) and the Environment Agency (EA) before making a decision as to the adequacy of the PCSR-2 submission.
- 5.5 The assessment process has had input from a team of specialist ONR assessors from a wide range of disciplines which are discussed below. In recognition that PCSR-2 essentially comprises construction of the concrete building (Box A) their levels of assessment have been commensurate with the stage of the project. Where appropriate formal assessment reports have been produced. The assessment findings are summarised below.

5.6 Civil Engineering

- 5.6.1 Following formal assessment of the Pegasus PCSR-2 submission the civil engineering assessor concluded that he was broadly satisfied with the claims, arguments and evidence laid down within the Licensee's safety case although there are a number of detailed items which still have to be clarified. He expressed concern that the interface between mechanical plant and the civil structure may require further work although was satisfied that the technical design is adequate based on current information. In addition a number of issues that need to be monitored by ONR were identified for review as activities progress on-site. The assessor was satisfied that these may be controlled by hold points on the AWE Hold Point Control Plan for the project following issue of the licence instrument.
- 5.6.2 AWE is looking to use welded, pre-fabricated reinforcement cages as part of their construction method for the PCSR-2 works. This came latterly to the attention of ONR who advised AWE to review their safety case accordingly in line with their procedures. The assessment work to-date carried out by ONR does not cover the use of such pre-fabricated cages. The scope of the permission issued by ONR under this assessment and formalised in the LI therefore does not allow the use of welded cages until the revision of the safety case has been submitted by AWE and appropriately reviewed by ONR.

5.7 Electrical, Control & Instrumentation

- 5.7.1 Following formal assessment of the Pegasus PCSR-2 submission the EC&I assessor concluded that he was satisfied with the assessed claims, arguments and evidence presented within the licensee's safety case and that he supports the issue of the LI to allow construction of works specified in the Pegasus PCSR-2 submission.
- 5.7.2 A number of recommendations were made within the assessment and in particular there is a requirement to develop confidence in the adequacy of the electrical performance of the right-angled structural rebar joint as a component of the lightning protection system (LPS). Testing methods have been identified and tests will be undertaken prior to casting the associated components in concrete. This approach has been peer reviewed by the internal ONR specialist lead and has been deemed to be satisfactory.

5.8 External Hazards

- 5.8.1 Following formal assessment of the Pegasus PCSR-2 submission the external hazards assessor concluded that he was broadly satisfied with the claims, arguments and evidence presented by AWE. A number of recommendations have been made which need to be incorporated into AWE's forward action plan to be addressed following issue of the PCSR-2 LI.
- 5.8.2 Hazard identification: AWE need to clarify the scope of the hazards assessed.
- 5.8.3 Hazard analysis: The presented hazard analyses relate to fairly generic and static events, without apparent consideration of the occurrence of such events with the most pessimistic operating and environmental conditions.
- 5.8.4 Industrial hazards: AWE will be asked to consider the consequences of industrial hazards such as dust generation and wind blown debris as a result of the construction phase and the potential effect that this may have on existing operational plants.

5.9 Fault Studies

- 5.9.1 Following formal assessment of the Pegasus PCSR-2 submission the fault studies assessor concluded that the overall approach to fault and hazard identification for PCSR2

and the identification of Safety Functional Requirements (SFRs) is generally appropriate. AWE has justified the internal and external hazards to the Main Store as “terminated by design” due to its massive and passive properties. The Fault Studies Inspector considers this approach to be valid and has not identified any safety significant areas that do not have a way forward. Therefore the Fault Studies Inspector supports the issue of a LI for construction of Box A.

5.10 Human Factors

- 5.10.1 Following formal assessment of the Pegasus PCSR-2 submission the human factors assessor concluded that he was satisfied with the claims, arguments and evidence laid down within the Licensee's safety case and considers it acceptable to permission construction of Box A on this basis. However, some further work is required regarding the provision of additional space to ensure that maintenance tasks on installed plant and decommissioning activities later in the life of the plant can be carried out with ease. There are also some concerns relating to the analysis and substantiation of claims made on operators and identified recovery opportunities.

5.11 Internal Hazards

- 5.11.1 Following formal assessment of the Pegasus PCSR-2 submission the internal hazards assessor concluded that he supports the issue of the LI for Pegasus PCSR-2. However, some recommendations need to be addressed to enable future permissioning with regard to internal hazards. In the main AWE need to refine their fire modelling methodology to understand any localised effects in regard to potential fires within Box A.

5.12 Mechanical Engineering

- 5.12.1 Following formal assessment of the Pegasus PCSR-2 submission the mechanical engineering assessor concluded that he had no objections to the activities justified within PCSR2 for the construction of the civil engineering elements of PEGASUS Box A. However, a number of recommendations were made that will need to be addressed by AWE. These were principally in the justification of the selection of specific plant items, their maintainability and the development of fault scenarios regarding their use and do not prejudice the issue of a licence instrument for commencement of this stage of construction.

5.13 Seismic

- 5.13.1 Following formal assessment of the Pegasus PCSR-2 submission the seismic specialist assessor concluded that, as far as the extent of build under PCSR-2 is concerned, he was broadly satisfied with the claims, arguments and evidence laid down within the Licensee's safety case and that the report has provided sufficient justification to allow PCSR-2 construction work to proceed. However, more evidence to underpin the values used for the Modulus of Subgrade Reaction needs to be provided. In the assessor's judgement the technical issues will not be significant in terms of the building structure and therefore do not prejudice the issue of this LI. Nevertheless, since they may be significant for the plant and equipment they will be addressed prior to issue of the LI relating to the installation of this plant and equipment that commences under PCSR-3.

5.14 Waste & Decommissioning

- 5.14.1 Following formal assessment of the Pegasus PCSR-2 submission the waste and decommissioning specialist assessor concluded that she supports the issue of licence instrument for Pegasus PCSR 2. There were recommendations raised regarding updates to supporting documentation, decontamination/disposal of encast items and the ability of AWE to decommission installed plant.

5.15 Radiological Protection

- 5.15.1 The radiological assessor reported that there are no radiological protection issues arising from his review that warrant ONR withholding the issue of an LI following the Licensee's PCSR-2 submission. However, some issues will be of interest going forward, specifically the CAM/portable air-sampling and contamination monitoring and management arrangements and the changeroom facility design and specification, including personal monitoring arrangements.

5.16 Criticality

- 5.16.1 The criticality assessor reported that he considers that the methodologies and approaches proposed by AWE to maintain criticality safety in Pegasus are generally consistent with modern standards and techniques. Therefore in respect of criticality safety he supports the issue of the LI to AWE to begin construction of the Pegasus facility.
- 5.16.2 The criticality assessor notes that insufficient information has been provided to support a CID (criticality incident detection) omission case for the store at this time. ONR therefore wrote to AWE stating that, until a CIDAS omission case is made, ONR would expect a system to be installed at the relevant stage.

5.17 EA and DNSR Input to the Assessment

- 5.17.1 DNSR have confirmed that there are no matters that would prevent the issue of the LI for Pegasus PCSR-2.
- 5.17.2 The EA have confirmed that they are content with PCSR-2 and the demonstration of the application of best available techniques (BAT).

6 MATTERS ARISING FROM ONR'S WORK

- 6.1 AWE made a submission of PCSR-2 documentation to ONR in December 2012. Following initial review by ONR it was identified that some documents were not sufficiently developed and some statements were not sufficiently substantiated. ONR wrote to AWE expressing concern at the quality of the submission and requested a re-submission which resulted in receipt of the updated safety case in March 2013.
- 6.2 The ONR assessment of Pegasus PCSR-2 has resulted in a number of recommendations being raised which should be followed up for the subsequent stages of the build and these have been sentenced either as forward action plan items with AWE or on the ONR issues Database. None of these recommendations are judged to preclude the issue of the PCSR-2 LI.
- 6.3 The seismic specialist assessor stated that the outstanding technical issues associated with the Soil Structure Interaction that will have a direct impact on the design of plant and equipment and are part of PCSR3 should be resolved prior to the release of PCSR2 hold point. Plant and process equipment is to be addressed in PCSR-4 and as such this work needs to be addressed to enable release of the PCSR-4 LI, not the PCSR-2 LI.
- 6.4 ONR issued two letters to AWE with regard to a proposal by AWE to use pre-fabricated rebar cages that incorporated welding in PCSR-2 construction. ONR expressed concern that the classification of the PCSR-2 structure assigned by AWE in its safety case may mean that such techniques could not be supported by ONR. ONR proposed that AWE revisit this aspect of the safety case but advised that this would require submission of any such revision to ONR for further review outside of the PCSR-2 submission. AWE committed to only proceed with loose fixing of rebar (no welding) under the LI issued to enable PCSR-2 construction. AWE may then produce a Design Change Note (DCN) to re-classify the structure and submit this

to ONR for further agreement or adhere to the requirements for the installation of reinforcement bar within a Class 1 structure. Use of welded re-bar cages will be precluded until agreement of this DCN has been obtained from ONR.

- 6.5 One problem encountered across the ONR assessment team was the availability of relevant information to enable an informed assessment to be made. There have been numerous instances where further information should have been included in the original PCSR-2 submission.

7 CONCLUSIONS

- 7.1 This report presents the findings of the ONR project inspector for the weapons programme. The following conclusions are made: -
- 7.2 The assessment team has not identified any matters that would prevent the issue of the LI agreeing to commencement of the Pegasus main store construction (PCSR-2). As such I am broadly satisfied with the claims, arguments and evidence laid down within the Pegasus PCSR-2 safety case submission and am content that the Licence Instrument for commencement of construction of Pegasus Box A can be issued.
- 7.3 The outstanding recommendations can be appropriately managed as the project progresses. Nevertheless, they will need to be closed-out appropriately and in a timely manner. They do not adversely affect the issue of the Pegasus PCSR-2 Licence Instrument.
- 7.4 The scope of the Pegasus PCSR-2 LI (527) is caveated to exclude the use of welded rebar.
- 7.5 Any use of pre-fabricated welded rebar cages must be subject to further assessment and subsequent agreement by ONR.
- 7.6 AWE needs to ensure that future safety case submissions include a comprehensive set of underpinning arguments and associated documentation that are clearly signposted within the headline documents.

8 RECOMMENDATIONS

- 8.1 LI 527 agreeing to the commencement of Pegasus Main Store Construction (PCSR-2) should be issued to AWE.
- 8.2 AWE should be informed that use of welded rebar cages requires additional AWE assessment and agreement from ONR and is therefore outside the scope of the agreement provided by LI 527.
- 8.3 The lessons learned during production and approval of the Pegasus PCSR-2 safety case should be reviewed for learning following issue of the Licence Instrument and this information should be shared between AWE and ONR.

9 REFERENCES

- 1 *ONR How2 Business Management System. Purpose and Scope of Permissioning.* PI/FWD Issue 3. HSE. August 2011.
www.hse.gov.uk/nuclear/operational/assessment/index.htm.
- 2 *Safety Assessment Principles for Nuclear Facilities.* 2006 Edition Revision 1. HSE. January 2008.
www.hse.gov.uk/nuclear/SAP/SAP2006.pdf.
- 3 *Office for Nuclear Regulation (ONR) Permissioning inspection - Technical assessment guides.*
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