

ANSTO Responses to the IAEA Peer Review of the RRRP-PSAR: Comments and Recommendations

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Issue No.1: Application of ASME Codes and Standards to Aluminium and Zircaloy Vessels		
R1.1	When attempting to pick and choose among the various portions of codes to fit a particular application, care should be exercised to select only those portions such that a consistent set of assumptions is used throughout.	The aim of selecting standards for the construction of the various items of plant for the RRR was not to “pick and choose” but to select a logical and consistent set of codes that would provide an appropriate level of confidence in the integrity of the plant components. Where possible, internationally recognised codes were used – for example ASME VIII (AS 1210 being equivalent) was used for vessels and B31.1 and B31.3 (equivalent to AS 4041) for piping. Where no international code existed, for example for the reactor pool liner, a code of similar purpose was used, in this case ASME III ND. In order to increase the confidence in the integrity of this vessel, a number of conservative additions were made to the code – the main one being the application of additional non destructive examination of welds, to more reflect the intent of the Australian code. In all cases, additions to existing codes resulted in additional confidence being gained.
R1.2	The embrittlement of highly irradiated aluminium and Zircaloy materials is not covered by codes and standards. Potential changes in material properties should be carefully considered over the entire design life of those components that may be	The change in material properties under irradiation is acknowledged and has been considered in the design of the key core components, for example, the reflector vessel. Under such conditions end-of-life materials

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	subjected to high neutron fluences.	properties are used as a check to ensure that the component behaves in a manner consistent with the design intention. This issue is also covered in the application of a surveillance program (see response to issue number 10).
Issue No.2: Seismic Hazard		
C2.1	The seismic design basis proposed by ANSTO is considered to be a conservative choice when compared to nuclear installations (both research reactors and nuclear power plants) in intraplate seismotectonic regions of the world. For example, nuclear power plants in Canada, Eastern USA, China, Russian Federation, Korea, Brazil, Argentina and Europe have design basis seismic values less than 0.3g. In fact, the only nuclear facilities (with possibly a few exceptions) with zero period accelerations values in excess of 0.3g are in California and Japan (which are interplate areas).	Comment noted; no response required
C2.2	The PSAR relies on several studies conducted and/or reviewed by ANSTO and other interested parties.	Comment noted; no response required
C2.3	There is a lack of site investigations for the RRR such as those recommended by the IAEA Safety Guide 50-SG-S1 (Rev.1). Only local investigations for faults and fractures have been done out to a radius of ~3kms. Because of this and the fact that the site is in a predominately intraplate tectonic environment, there is significant uncertainty related to seismotectonic parameters which are used in seismic hazard analyses (ie source identification,	ANSTO will comply in full with the ARPANSA requirements as requested in their letter of 17 September 2001 (reference S2001/372) in relation to the need for additional seismic investigations. To achieve this level of compliance, ANSTO has sought expressions of interest from paleoseismologists

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	<p>maximum magnitudes, b values, attenuation relationships and their standard deviations, etc). General lack of historical earthquake data because of the comparatively short period of recorded history in Australia adds to this uncertainty.</p>	<p>from the UK, the USA, New Zealand, Norway and Taiwan to undertake a defined site vicinity study, ie up to 5 km from the site in accordance with IAEA Safety Guide 50-SG-S1, Rev 1. This involved the preparation of a detailed Request for Proposal (RFP). Prior to the release of the RFP, it was submitted to ARPANSA for review, with a request that it be forwarded to the IAEA for their comment. Minor comments were received and incorporated.</p> <p>The nature of the work comprising the study requires part to be undertaken in conjunction with the excavation of the site following the issuing of the Facility Licence, Construction Authorisation. As a result, it is proposed that the work be undertaken and reported in accordance with the following schedule:</p> <ul style="list-style-type: none"> • An interim report to be delivered to ANSTO by mid-January 2002 • A final report to be available by the end of March 2002
C2.4	<p>There is considerable controversy in Australia regarding the results obtained by IGNS. It seems that a majority of the local specialists consider the results to be overly conservative. The comparatively high zero period acceleration value of 0.41g was largely driven by uncertainties resulting in the perceived over-conservatism. However, to date, a quantification of the</p>	<p>Comment noted. The results of the second study referred to are presented in the IGNS report "Extension to Lucas Heights Probabilistic Seismic Hazard Assessment", July 2001. The impact of this report on the seismic evaluation of the RRR is discussed in detail in the Consolidated Seismic Evaluation Report</p>

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	conservatism within a systematic framework is lacking. The results of a second study of IGNS (recommended by the November 2000 specialists' meeting in Canberra) are expected to be delivered soon.	presently being prepared and scheduled for submission to ARPANSA by the end of November 2001.
C2.5	The high frequency (ie short period) part of the design basis response spectrum is particularly important for the site geological conditions (ie rock) and the components of the RRR.	Comment noted. The seismic design-basis response spectrum has been modified such that it bounds both the original design-basis response spectrum and the revised IGNS response spectrum, as identified in the IGNS report "Extension to Lucas Heights Probabilistic Seismic Hazard Assessment", July 2001. As such, the high frequency (ie short period) part is the same as the IGNS response spectrum anchored at 0.37g but very conservative methods are being used in the assessment of these high frequency components. Again, the impact of this report on the seismic evaluation of the RRR is discussed in detail in the Consolidated Seismic Evaluation Report presently being prepared and scheduled for submission to ARPANSA by the end of November 2001
R2.1	In order to demonstrate the conservative choice of seismic design basis parameters, an additional study should be undertaken by ANSTO for the seismic hazard assessment of the RRR site in line with the recommendations of IAEA Safety Guide 50-SG-S1 (Rev.1). The results of this study should be integrated into the PSAR. Alternatively, ANSTO may choose to demonstrate that the design basis adopted for the RRR is sufficiently conservative	Both the recommendations referred to are being followed by ANSTO as indicated in the responses to Comments C2.3 and C2.5. The associated reports will be available as indicated in these responses.

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	with respect to the most recent studies, in particular, those taking account of the uncertainties in an adequate manner. In particular, the high frequency content of the calculated response spectra should be enveloped by the design response spectra both for horizontal and vertical directions.	
Issue No.3: External Hazards (other than seismic)		
C3.1	ANSTO has agreed to undertake a review of the impact on the facility of blast from traffic accidents.	This review will be performed during the Detail Engineering Phase and will be reported in the draft FSAR to be submitted in support of the Application for a Facility Licence, Operating Authorisation. On the basis of work done previously for the HIFAR PSA, it is anticipated that this review will not result in any design changes being required.
R3.1	The conservatism incorporated in the decision of not including a variety of potential human-induced events in the design basis, leading to an impact or blast type load on the reactor building structure is not very clear, especially because any adverse change in the present situation has not been considered. The grillage provides partial protection from only one type of aircraft crash but fails to serve as a protective envelope for blast or impact loads in general. It is recommended to review this decision on the basis of updated data and calculations as well as projections for the potential development in the area that may change the present situation unfavourably.	As stated in the response to Comment C3.1, a review will be performed during the Detail Engineering Phase and will be reported in the draft FSAR to be submitted in support of the Application for a Facility Licence, Operating Authorisation. This review will also consider other blast and impact loads in addition to those arising from traffic accidents, as well as projections for the potential development in the local area. Note that ANSTO has administrative control over the 1.6 km exclusion zone and that as such, will ensure that no development takes place within this zone that may change the present situation unfavourably.

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Issue No.4: Seismic Design of Reactor Building		
R4.1	The design basis response spectra and time histories should be used in accordance with IAEA Safety Standards and other applicable documents as well as internationally accepted practice suitable for nuclear facilities. In particular, loading combinations (with operational loads), combinations of directional components and the behaviour limits of materials should be selected with adequate conservatism. To the extent possible, the use of more than one standard for items interacting with each other should be avoided.	The Consolidated Seismic Evaluation Report scheduled for submission to ARPANSA by the end of November 2001 will include clarification as to the use of appropriate codes and standards as well as the loading combination and the combinations of directional components. These loading combinations have been chosen conservatively.
R4.2	The PSAR should clarify the use of standards and codes in design related calculations. The way in which different standards and codes have been used should be made easy to follow.	See response to Recommendation 4.1. The evaluation contained in the Consolidated Seismic Evaluation Report will be incorporated into the revision of the PSAR as appropriate.
Issue No.5: Replacement/Repair of Embedded Components		
C5.1	Flexible, spiral wound nuclear grade stainless steel tubing can be installed inside existing piping if a leak should develop in inaccessible sections of this piping.	Comment noted; no response required
C5.2	In a humid climate, generation of spurious leak detection signals by moisture condensation on exterior surfaces of tanks could be an operational nuisance, but not a safety concern.	Comment noted; no response required
Issue No.6: Seismic Design and Qualification of Systems and Components		
R6.1	An enhanced seismic analysis should be made of the pool	The methodology for the detailed seismic analysis of

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	including all the internal structures, penetrations and possible sources of interactions. The analysis should use conservative assumptions in relation to support conditions and fluid-structure interaction issues. When components are assumed as isolated structures and analysed accordingly, justification should be provided for this assumption.	<p>the reactor pool including the treatment of the internal structures, penetrations and possible sources of interaction, is again discussed in the Consolidated Seismic Evaluation Report.</p> <p>The actual analysis will be performed during the Detail Engineering Phase and will be reported in the relevant Detail Engineering Work Package Design Deliverables. These are subject to an appropriate review, verification and approval process within ANSTO and by ARPANSA with respect to items important to safety (ie Safety Category 1 and 2 structures, systems and components).</p>
R6.2	All Seismic Class 1 items which are active or which have moving parts should be qualified by testing. These items include, but are not necessarily limited to, pumps, valves, relays, motor control centres and electrical cabinets (housing Seismic Class 1 items). Standard items that have qualification documents enveloping the associated floor response spectra need not be retested. Where applicable, earthquake experience data may be used to support seismic qualification. Testing should be performed using appropriate shaking tables and internationally accepted standards.	The requirements for the qualification of Seismic Class 1 items will be identified in the appropriate Work Package Design Deliverables prepared during the Detail Engineering Phase. This qualification includes testing where appropriate as well as analysis (theoretical and finite element modelling), indirect methods, earthquake experience and qualification by supplier. More details are available in the Consolidated Seismic Evaluation Report scheduled for submission to ARPANSA by the end of November 2001.
R6.3	The testing of the control rod drive mechanism (for FSS) is of particular importance because of the special significance of this system for seismic safety (the SSS is unable to shut the reactor	The requirements for the seismic qualification of CRD will be identified in the appropriate Work Package Design Deliverables prepared during the Detail

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	down before the earthquake due to the long duration of the scram process). Adequate provisions should be made to test this system in order to ensure its safe performance in the event of an earthquake. Failing this, the reliability placed on the performance of this system in the safety analysis should be reviewed.	Engineering Phase. This qualification will include detailed theoretical and finite element modelling analysis. In addition, requirements for the testing of the prototype CRD will be identified in the seismic test plan for the CRD.
Issue No.7: Mechanical Stresses in the Reflector Vessel		
C7.1	The applicant recognises the critical nature of the reflector vessel, the implications of repair or replacement and the difficulty in performing in-service inspection. Appropriate attention has been given during the preliminary design of the vessel.	Comment noted; no response required
R7.1	During the final design phase, the potential loads considered should be reviewed to assure that all credible loads are included, that they are properly combined in the analysis when appropriate and that sufficient safety margin exists.	<p>The project procedure for the review, verification and acceptance of the design deliverables prepared during the Detail Engineering Phase includes the requirement to ensure that the extent of the design analysis and documentation is fit for the intended purpose. This will include ensuring that all credible loads are included, that they are properly combined when appropriate, and that sufficient safety margins exist.</p> <p>It should also be noted that as part of the Detail Engineering Phase, a number of loading cases are being considered for the key plant items. These loading cases include, but are not limited to – normal operational loads, seismic, heat loads, loads due to Zircaloy growth, loads applied during maintenance operation etc. Extensive finite element analysis has and</p>

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		will be used to extend the code-based analysis and provide further confidence in the integrity of the components.
Issue No.8: Tritium		
R8.1	It is recommended that this issue is addressed more explicitly in future documents especially with regard to maintenance and decommissioning, eg the radiological consequences of tritium in the reflector system, particularly personnel performing maintenance. The Emergency Planning and Preparedness should include special precautions to be taken when working with tritium-contaminated components.	The control of tritium and the treatment of tritium-contaminated systems and components will be dealt with more explicitly in future documentation prepared during the Detail Engineering Phase in parallel with the development of the detailed design. This will include the detailed operating and maintenance procedures relating to the treatment of tritium-contaminated items of plant together with appropriate emergency plans and procedures. It is also relevant to note that ANSTO has over 40 years of experience operating HIFAR in which the heavy water circuit is open for refuelling at approximately 4 weekly intervals. The RRR heavy water circuit would only be opened for maintenance, and even at those times, the expected tritium release would be far less than that experienced during a HIFAR refuelling operation.
Issue No.9: Validation of Thermo-Hydraulic Codes Used for the Reactor Core		
C9.1	Direct measurement of the fuel cladding temperature with an instrumented fuel element, as a means for checking the validity of the thermal-hydraulic calculations without performing numerous sensitivity calculations for the various input data, has been	Comment noted. The feasibility of such an experimental validation with an instrumented fuel assembly is being examined. Considerations to date are as follows. Despite efforts, ANSTO has not been

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	reliably done before. This experimental validation is especially useful for the evaluation of the transients in which the cooling is by natural circulation (important safety issue) and for which the validity of the various calculation codes is questionable.	<p>able to obtain evidence confirming the reliability of the claimed tests. There appears to be no peer review evaluation of the tests. ANSTO notes that there are practical difficulties with measuring clad temperatures accurately, and difficulties in interpreting the temperature measurements. These would lead to significant experimental errors. The onset of critical phenomena would not be experimentally tested, as the experiments would be performed at normal operation where single-phase flow exists.</p> <p>Direct instrumentation of the cladding to measure temperature was practiced during the sixties as a verification of the thermal-hydraulic calculations. The then rudimentary computer codes, lack of physical correlations, and insufficient computational capacity to perform a sensitivity analysis justified such practice.</p> <p>The devices used for physical measurement of cladding temperatures in fuel plates perturb the physical and geometric properties of the fuel elements. This produces a large inaccuracy in the measured values. It is much more difficult to correlate those results with the core parameters, i.e. accuracy of flow rate in the instrumented flow channel, accuracy of the heat flux, thermal balance, etc.</p> <p>The calculation of the thermal hydraulic condition under</p>

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		<p>natural circulation assumes adequate engineering factors in those variables (basically in the heat flux and core flow) to have confidence in there being sufficient margin to safety related phenomena.</p> <p>The thermal-hydraulic codes used for the steady state natural circulation condition use accurate correlations validated against experimental data and include safety factors that avoid the necessity of further verification.</p> <p>On the other hand, typical computer codes used for transient simulation like RETRAN and RELAP use conservative models for pump coastdown and heat transfer correlations, implying an overestimation in the wall temperatures when plate type geometry is used. Several code have been run to perform a sensitivity analysis for different input parameters and modelling options</p> <p>Thermo-hydraulic codes have been verified against available data from tests. The results confirm the appropriateness and validity of the codes used for the RRR calculations. (Two diverse codes have been used for transients, RELAP and RETRAN).</p>
R9.1	Whether or not such a validation scheme is adopted, there should be some detailed justification concerning the validation of codes used for the safety analyses presented for the core thermal-hydraulics, as well as for the acceptance criteria used in the	The computer codes used for the core thermal-hydraulics safety analysis (CAUDVAP, TERMIC and CONVEC) are described in Chapter 5 of the PSAR. Reference 1 in Section 5.8 describes the validation

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	results where channel boiling is evident.	<p>(comparison of code results with experimental data) and verification (comparison of code results against results from other codes, or from theory) of the codes. In addition, ANSTO is performing independent calculations to check the various correlations applied in the codes, and the applicability of the design bases which give margins to critical phenomena.</p> <p>Although the review area of Issue No. 9 is stated as PSAR Chapter 5, Section 5.8, the issue clarification overlaps topics of Issue No 14 (PSAR Chapter 16). In this regard, the transient codes PARET and RETRAN have been validated as discussed in PSAR Chapter 16, Section 16.3.3.2.1; in particular refs 1 and 2 of Chapter 16.</p> <p>Fuel element design bases, covering normal operational states, anticipated operational occurrences, and postulated accidents, are discussed in PSAR Chapter 5, Section 5.3.2.1.</p>
Issue No.10: Materials Surveillance Program		
C10.1	Consider irradiating extra coupons in case a metallurgical problem is discovered and more frequent sampling becomes necessary.	ASTM E 185 is being used as a guide for the surveillance program. The number of coupons to be used will be determined during the Detail Engineering Phase and will be sufficient to provide confidence that the core components are suitable for continued operation.

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Issue No.11: Independence of Reactor Protection Systems		
C11.1	If the construction of the systems are designed this way (and in accordance with IAEA guides etc mentioned in Section 8.1.4.2, the independence between the two reactor protection systems is also assured in the way it has been described. The issue is therefore closed	Comment noted; no response required
Issue No.12: CNS Safety Analysis Assumptions		
R12.1	Even though the reactor may not be harmed by a detonation within the CNS, such an event would undoubtedly have negative consequences for the future of the neutron beam experiments. Every precaution should be taken to preclude this event from happening. Therefore, it is of the utmost importance to guarantee that there are no “sneak” paths for accumulation and mixing of oxygen with deuterium.	The Design Deliverables developed during the Detail Engineering Phase for the CNS Work Package will be subject to detailed review, verification and acceptance by ANSTO and ARPANSA with respect to items important to safety. Particular attention will be given to ensuring that there are no “sneak” paths for the accumulation and mixing of oxygen with deuterium.
R12.2	The CNS forms part of the facility; however, a separate safety analysis is being prepared for the experimental utilisation of the CNS. It would be prudent to also have an in-depth multi-discipline safety review of the interfaces and operational interactions with the reactor. This review should address, for example, issues of operator training and awareness, human factors engineering, maintainability and radiological protection. This will provide additional assurance that all safety questions have been addressed regarding the interaction of this complex facility with the reactor.	The detailed review referred to in the response to Recommendation R12.1 will be a multi-disciplined review that will also consider the interfaces and operational interactions between the CNS and the Reactor Facility. In addition, the Contractor will hold formal Design Review meetings during the course of the Detail Engineering Phase as part of the development of the detail design of the CNS and its supporting systems. Due to the importance of the CNS to both the safety and the operational availability of the Reactor Facility, it is anticipated that there will also be

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		appropriate ANSTO attendance at these meetings.
Issue No.13: Break of Reflector Drain Line in Reactor Pool		
R13.1	While the probability of this event may be low, since a common postulated event could defeat redundant shutdown systems, the scenario, along with the interactions of other structures, systems and components should be analysed and discussed in the PSAR and PSA.	<p>This sequence requires both the failure of CRs to drop into the core on demand and failure of the SSS discharge piping within the pool such that the Reflector Vessel fails to drain on demand. The only common event postulated that could affect both the FSS and the SSS is the seismic event. Note that this is also the only event that simultaneously trips both systems.</p> <p>The behaviour of the SSS is being analysed as part of the Detail Engineering Phase. Preliminary results show that the Reflector Vessel can withstand an earthquake well in excess of the SL-2 level. The discharge pipe is short and stiff and rigidly attached to the concrete reactor block. As stated in the counterpart views and measures, its failure will also be shown to be unlikely even for an earthquake in excess of the SL-2 level. This clarification will be incorporated into the next revision of the PSAR.</p> <p>The PSA is preliminary only and does not take such passive failures into account on the basis that their likelihood is sufficiently small to be discounted. However, for completeness, consideration will be given to incorporating such passive failures in the final PSA to be submitted as part of the Application for a Facility</p>

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Issue No.14: Treatment of the Onset of Nucleate Boiling (ONB) Condition		
R14.1	It is recommended that the statement in section 16.8.7.36.3 that “the presence of nucleate boiling does not imply any damage to the clad...” in particular, and similar statements concluding the discussions of other safety analysis results throughout Chapter 16, be carefully justified or quantified.	<p>In any transient conditions, fuel damage will occur only if sufficiently high temperatures are reached. As with similar temperature induced damage (eg to a kettle heating water), ONB is clearly a necessary but not sufficient condition for damage.</p> <p>In the RRR core, nucleate boiling would first occur at clad temperatures of approximately 135°C. This is well below the blistering temperature of the fuel plate.</p> <p>It may be noted that critical heat flux (CHF) or redistribution <u>must</u> be regarded as sufficient to cause overheating and hence fuel damage, if initiated during quasi-steady operation. However, during transients, redistribution onset is neither necessary nor sufficient to ensure fuel damage, and CHF is necessary but may not be sufficient to induce fuel damage. ONB occurs at heat fluxes significantly below CHF or redistribution heat fluxes. Potential damage must be assessed by a detailed study of the transient considered.</p> <p>Since CHF is a necessary precursor to fuel damage in transients, but may not cause such damage, margins to it are sufficient to ensure fuel integrity in transients.</p>
R14.2	It is recommended that the temperature for ONB be dynamically	The Critical Heat Flux Ratio as a function of time has

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	presented in all the relevant transients graphics so that the fuel clad temperature can be compared with its current value at any given time during the transient evolution rather than with its initial value.	been plotted in various detailed transient analysis reports prepared in support of the PSAR and submitted to ARPANSA. It is acknowledged that this is a better way to present the results as it displays the margin to a phenomenon that, unlike ONB, could cause fuel damage during postulated accident sequences.
Issue No.15: Engineering Hot Spot Factors		
C15.1	A discussion, in the context of the safety analyses and in sufficient detail to acquaint the reader with the nature of the treatment and the significance of all the geometrical tolerances, uncertainties and conservatisms incorporated in the treatment, would be very useful.	ANSTO accepts the widely used practice (see eg NEA/CSNI/R(99)10, "Best Estimate Methods in Thermal Hydraulic Safety Analysis") of using best-estimate codes (such as RETRAN), with best-estimate dimensions etc, for transients, (on the basis that the coupling of many phenomena render it difficult to ascertain if a particular tolerance, uncertainty, etc is conservative or not). Such practice ensures conservatism with conservative parameter values, conservative boundary conditions, and conservative initial conditions applied. This is the approach undertaken for the analyses in PSAR Chapter 16.
R15.1	It is recommended that a more direct reference to Sections 5.8.5 and 5.8.7.2 and Table 5.8/9 be made, with some elaboration.	ANSTO considers that this would emphasise "best practice" for evaluating nominal conditions (PSAR Chapter 5) instead of "best practice" for evaluating transients (noted in the response to C15.1). However, a fuller discussion of introducing conservatism to accident analyses will be incorporated into the draft

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		FSAR to be submitted as part of the Application for a Facility Licence, Operating Authorisation.
Issue No.16: Bounding of Cold water Injection by a Control Rod Withdrawal		
R16.1	It is recommended that the typographical correction be addressed and that a justification along the lines of the last sentence of the Counterpart Views and Measures above be provided to support the statement that the initiating event is bounded by the Control Rod Withdrawal DBIE.	<p>The typographical correction and the justification contained in the last sentence of the counterpart views and measures will be incorporated into the next revision of the PSAR.</p> <p>In addition, it should be noted that the design now incorporates an interlock that prevents the start-up of a stand-by PCS pump whilst both other PCS pumps are operating. Thus, the potential for cold water injection during power operation is also minimised.</p>
Issue No.17: Channel Blockage due to Fuel Assembly Damage		
R17.1	It is recommended that the operator “mishap” scenario be analysed as a possible event and that a passage similar to the above Counterpart View be included in the discussion of the event.	Channel blockage due to fuel damage during handling operations will be considered as a PIE and will be incorporated into the next revision of the PSAR. The discussion presented in the counterparts views and measures will also be included as will the conclusion that such a PIE will be bounded in terms of fission product release by the melting of three fuel plates (see PSAR Chapter 16, Section 16.19).
Issue No.18: Hazards Associated with High Energy Piping Systems		
C18.1	Given the counterpart views and measures above, the statement	See response to Recommendation R18.1

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	in Section 16.14 is unclear.	
C18.2	It is understood that the identification of “potential hazardous equipment” mentioned by the counterpart will include the high energy flywheels on the primary pumps.	Comment noted; the high energy flywheels on the PCS pumps will be included as potential hazardous equipment and assessed accordingly.
R18.1	It is recommended that the design intention should be made clear rather than dismissing the matter as is done.	PSAR Chapter 16, Section 16.14 will be revised to clarify the position consistent with the counterpart views and measures. The identification and analysis of internal hazards will be performed during the Detail Engineering Phase and will be reported in the draft FSAR to be submitted as part of the Application for Facility Licence, Operating Authorisation.
Issue No.19: Consequence Analysis for Internal Fire or Explosion		
C19.1	Since a Fire-PSA is in part a consequence analysis, the statement that “no consequence analysis is needed” seems to be contradicted by the intention. It would have been useful if the statement of the last paragraph under Counterpart Views and Measures had been made in the PSAR.	The statement in the last paragraph of the counterpart views and measures will be incorporated in to the PSAR for clarity.
R19.1	It is recommended to carry out a Fire-PSA as intended.	A Fire-PSA will be incorporated into the final version of the PSA to be presented as part of the draft FSAR submitted with the Application for a Facility Licence, Operating Authorisation.
Issue No.20: Impact of Loss of Communications on the Safety of the Reactor		
C20.1	The statements of (and omissions from) Section 16.14.3.2 are	See response to Recommendation R20.1

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	unclear. A reference to the description of the communications systems in Chapter 10 and elaboration such as provided by the counterpart above, would provide clarification.	
R20.1	It is recommended that such a reference and clarification be provided.	A reference to the description of the communications systems in Chapter 10 of the PSAR together with the clarification provided by the counterpart views and measures will be incorporated into the next revision of the PSAR.
Issue No.21: QA on Design Calculations		
C21.1	According to information given by the counterpart, the design process for the reactor is fully transparent to ANSTO which has an active role for checking the technical quality of studies performed by the main Contractor and its sub-contractor.	Comment noted; no response required
R21.1	More details should be provided on practical QA provisions including the eventual treatment of non-conformances and the indication of hold points during design, construction and commissioning activities. The management interfaces between the different parties should be clarified.	ANSTO will consider providing additional details regarding the practical QA provisions within the revised PSAR. In particular, the treatment of non-conformances will be clarified. However, note that the RRRP has been recommended for ISO9001:2000 certification as a result of a surveillance audit performed in early November 2001. The principles for the specification of control points (covering surveillance, witness and hold points) during the design, construction and commissioning phases is presented in the relevant management plans. There is

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		<p>only one hold-point in the Detail Engineering Phase. This relates to the CEO of ARPANSA giving approval to construct an item important to safety in accordance with ARPANS Regulation 54. With respect to the various phases of construction, control points are identified in the Specific Test and Inspection Plans (SITPs) associated with each work package. With respect to commissioning, control points will be identified in the detailed commissioning procedures.</p> <p>The management interfaces are detailed in the Contract Specification and the various associated project management plans. Clarification based on this documentation will be incorporated in the revision of the PSAR.</p>
Issue No.22: Probabilistic Safety Assessment (PSA)		
R22.1	PSA studies should continue to be updated in order to take into account the detailed design of the reactor, eventual modifications to this design and any experience feedback from incidents which have occurred in similar installations.	The PSA will be developed during the Detail Engineering Phase and the next version of the PSA will be presented as part of the draft FSAR submitted with the Application for a Facility Licence, Operating Authorisation.
R22.2	The seismic PSA should be checked when the hazard curve is finalised. Results should be compared with those of nuclear installations in similar seismotectonic regions of the world.	The seismic hazard curve used in the PSA provided as part of the PSAR was based on the original IGNS PGA (at return periods of 100, 1000, 10000 and 100000 years) but scaled uniformly so that the PGA at 10000 years was equal to the agreed SL-2 level of 0.3g. The

Australian Nuclear Science and Technology Organisation
 REPLACEMENT RESEARCH REACTOR PROJECT
 ANSTO Responses to the IAEA Peer Review Comments and Recommendations

Comment/Recommendation		ANSTO Response
No.	Description	
		<p>design spectra for the Seismic Class 1 and 2 equipment were determined by US Regulatory Guide 1.165, scaled to the SL-1 and SL-2 levels respectively. The PSA to be submitted as part of the FSAR will consider the implications of the revised IGNS results on the PSA frequencies.</p> <p>A comparison of the revised seismic hazard curve with similar seismotectonic regions of the world will be presented in the Consolidated Seismic Evaluation Report. In addition, comparisons of the revised seismic hazard results with those of nuclear installations in similar seismotectonic regions of the world will be performed during the Detail Engineering Phase and will be reported in the draft FSAR to be submitted as part of the Application for Facility Licence, Operating Authorisation.</p>