IAEA

International Atomic Energy Agency

REPORT OF THE

PEER-REVIEW MISSION

ON THE OPERATING PROCEDURES OF THE OPAL RESEARCH REACTOR FOR ARPANSA

Sydney, Australia

28 November – 2 December 2005

PEER-REVIEW MISSION

DEPARTMENT OF NUCLEAR SAFETY AND SECURITY

DIVISION OF NUCLEAR INSTALLATION SAFETY

INTERNATIONAL ATOMIC ENERGY AGENCY

ORIGINAL: ENGLISH
Distribution: Restricted

Mission date:	28 November – 2 December 2005
Location:	Sydney, Australia
Facility:	OPAL RESEARCH REACTOR
Organized by:	IAEA At the request of ARPANSA
Conducted by:	

T. Hargitai	(IAEA/NSNI- Team Leader)
J. P. Boogaard	(The Netherlands)

CONTENTS

1. INTRODUCTION

1.1 BACKGROUND

In September 2004, the Australian Nuclear Science and Technology Organization (ANSTO) submitted a Licence Application to the Chief Executive Officer of the Australian Radiation Protection and Nuclear Safety Agency (CEO of ARPANSA) seeking authorization for operation of the Replacement Research Reactor (RRR) under construction at the Lucas Heights Science and Technology Centre, Australia. The prime contractor for construction of the reactor is the Argentinean company, INVAP SE. In response to a request from the CEO of ARPANSA, a Peer-Review of the Safety Case for the Operation of the Research Reactor was organized by the International Atomic Energy Agency (IAEA).

The Peer-Review Team consisted of one IAEA staff member, Mr. T. Hargitai, and one external expert, Mr. J. P. Boogaard (The Netherlands). The Peer-Review Mission was conducted at facilities of ANSTO and ARPANSA, from 28 November to 2 December 2005.

The facility, until recently, has been called the Replacement Research Reactor because it is intended to replace the existing HIFAR research reactor operated at the same site. In January 2005, the reactor was renamed as OPAL (Open Pool Australian Light-water reactor). The OPAL research reactor is of a pool type with a rated power of 20 MW. A Cold Neutron Source (CNS) in the reactor pool is considered to be an integral part of the facility, although, a separate safety report has been prepared for this source. The CNS will be commissioned together with the reactor facility.

The present Peer-Review Mission is the third mission organized by the IAEA to review different subjects related to the OPAL reactor. On this mission, the Review Team concentrated on reviewing the Operating Procedures associated with the Licence to operate the reactor. A list of the issues raised by the team, including any ensuing comments or recommendations arising from the review, is given in Appendix I.

1.2 OBJECTIVES OF THE MISSION

The objective of the mission was to advise to CEO of ARPANSA on international best practice in radiation protection and nuclear safety in Safety Case for the Operation of the Australian OPAL research reactor. The stages of operation contemplated by the licence application are hot commissioning and then routine operation.

1.3 REVIEW SCOPE

The scope of the mission was as follows:

- Operating Procedures including Design, Maintenance and Operating Manuals.

1.4 BASIS AND REFERENCE FOR THE REVIEW

This review is based on the Design, Maintenance and Operating Manuals, which were sent to the IAEA and the external experts only a few days before the start of the Peer-Review

Mission. Supporting documents were provided to the review team by ANSTO and INVAP during the mission. A list of these documents is given in Appendix IV.

The main reference for the review is the IAEA Safety Standards related to research reactor safety. These are:

- Safety of Research Reactors, Safety Requirements No. NS-R-4;
- Safety Assessment of Research Reactors and Preparation of the Safety Analysis Report, Safety Series No. 35-G1;
- Safety in the Utilisation and Modification of Research Reactors, Safety Series No. 35-G2;
- Operational Limits and Conditions and Operating Procedures for Research Reactors, DS 261 (under preparation); and
- Safety Guide DS 338; Management Systems (under preparation, revision of SS No. 50-C-Q.

1.5 CONDUCT OF THE REVIEW

In accordance with the action plan and agenda, prepared during that meeting, the review process comprised the following steps:

- Transmittal of some Operating Procedures to the IAEA and the Peer-Review expert before the mission;
- Identification of issues by the Peer-Review Team, and communication of the issues to and clarification with the ANSTO and INVAP counterparts;
- Discussion of the issues with counterparts and between the team members;
- Written response to issues provided to the Peer-Review Team, by the counterparts, giving counterpart views of the issues and measures to address them;
- Discussion of the issues, the main conclusions and recommendations with ARPANSA;
- Preparation and submission of the draft report to ARPANSA on 2 December 2005; and
- Preparation and submission of the final report to ARPANSA on 16 January 2006.

The final Agenda of the mission and milestones in preparation and submission of the mission report to ARPANSA are provided in Appendix II.

1.6 WALK-DOWN OF THE FACILITY

On Monday afternoon (28 November), the team took the opportunity to enter the construction site of the reactor for a short walk-down of the facility under construction. During the walk-down the team visited all the accessible technological areas.

There is only one comment worth mentioning:

- Although it was commented by the previous review team, around the pumps no means, such as trays with connections to hot drains, could be seen for avoiding spread of contamination during pump maintenance.

1.7 STRUCTURE OF THE REPORT

The main body of the report comprises the Introduction followed by the Main Conclusions and Recommendations. The latter is a summary of the main findings as well as the most pertinent recommendations that are elaborated in more details in Appendix I - Issues Identified.

Appendix I constitutes the main technical part of the report in which all issues identified by the Peer-Review Team are discussed. During this review process, issues were identified. Each issue is firstly clarified by the Review Team stating why the team identified the matter as an issue. Then the views of the ANSTO and INVAP counterparts, and measures identified by them, in response to the issue, are given. Finally, conclusions of the Peer-Review Team are given, stating whether the issue is considered to have been resolved or, otherwise, providing comments and recommendations which may assist in addressing the issue.

2. MAIN CONCLUSIONS AND RECOMMENDATIONS

The Review Team is confident that, in finalizing the procedural documents, the operator will have a comprehensive set of Operating Procedures (OPs). OPAL has a dedicated (almost full-scale) simulator available by which the behaviour of all the safety related systems can be tested and the adequacy of the relevant operating procedures can be verified. The Reactor Control and Monitoring System Procedures are tested on the simulator, which is considered to be a Good Practice. It has been shown that the simulator serves as an excellent tool in training the operators in the standard operating procedures. The simulator can also be used to train operators in a number of predefined deviations from normal operation. This is regarded as best international practice.

The Design Manuals contain all important information on the Design Basis, Design Description, Safety, Seismic and Integrated Logistic Systems (ILS) categorization of the given system. The Design Manuals provide good support to the Operation Manuals, allowing easy understanding of the operation of the systems, and can be used as a training tool as well. The inclusion of the System Design Manuals in the set of Operating Procedures is considered to be a good practice.

A major contribution to compliance with the Operating Limits and Conditions (OLCs) is made by the development and utilization of operating procedures that are consistent with, and fully implement, the OLCs. The Plant and System Operation Manuals contain only few indications on the OLCs within which the plant or system should be operated. It is recommended to indicate, at the beginning of each Procedure, the OLCs that can be violated by not following the instructions of the Procedure.

The Plant Procedures and the System and Subsystem Operation Manuals contain the step-by-step instructions for system operations. These instructions are repeated three-four times in different documents, which can cause inconsistencies. It is recommended that consideration be given to deleting repetitions and to providing a check, throughout, for inconsistencies.

The philosophy used for deciding the order of the systems to be checked by the Control Room Operator is not clear. An order based on the safety relevance of the systems, together with the mutual influences of the systems to be checked, could be the basis for the order of the check-out procedures to be followed. It is recommended to evaluate the order of the check-outs to be performed by the Control Room Operator and the Field Operator, taking into account the safety relevance and the mutual influences of the systems.

Before an approach to criticality could start, the Control Room Operator has to check 38 systems and sub-systems without using a tick-list and without any recording into the logbook. It is recommended that Plant Procedures be adapted into tick-lists for the Operators and to require log book entries at least at the beginning and after completion of the checks.

The Reactor Control and Monitoring System, as well as the simulator, are computerised systems. Software bugs and indicated improvements are being implemented in new software releases. With the latest release of the simulator software, a former bug which was solved in an earlier release was re-introduced. It is recommended that a dedicated procedure be developed for the control of software releases in which clear acceptance tests, both by the supplier as well as by ANSTO, are prescribed.

APPENDIX I: ISSUES IDENTIFIED BY THE PEER-REVIEW TEAM

In the course of the review of the Design, Maintenance and Operation Procedures/Manuals the Review Team identified specific issues, which it considered in greater detail. The issues are presented on the following pages.

ISSUE NUMBER: 1

1. REVIEW AREA: Operating Procedures

2. ISSUE TITLE: Structure, Format and Content of the Operating Procedures

3. ISSUE CLARIFICATION:

The Operating Procedures of the OPAL Research Reactor are structured in the following ways:

- Plant Operating Manual;
- Plant Procedures;
- System and Subsystem Operation Manuals;
- User Manuals;
- System and Subsystem Design Manuals; and
- System and Subsystem Maintenance Manuals.

The Plant Operating Manual is a top level document referring to 15 Plant Procedures containing detailed instructions on how the transitions between different reactor states should be performed, including the restart instructions after Trip 1 and Blackout, and how the Plant should be configured after Blackout, Trip 1 and Trip 2.

Additional Plant Procedures provide instructions for Reactor Refuelling, Daily In-Service Inspection, Hourly Supervision of Systems and Main Control Room Evacuation. In the Appendix, Operator Actions are presented for the following events:

- Actions after Trip;
- Actions after Containment Isolation;
- Actions after a LOCA; and
- Actions after a Seismic Event.

The above Operator Actions must be evaluated and performed in accordance with the instructions of the Control Room User Manual (RRRP-4302-EDEIN-001).

The Plant Procedures and the System and Subsystem Operation Manuals contain the step-by-step instructions for system operations. These instructions are repeated three or four times in the different documents. This repetition can cause inconsistencies.

The standard format of the Plant Procedures and the System and Subsystem Operation Manuals is different, e.g., the Abbreviations could be found in different places in the documents.

4. COUNTERPART VIEWS AND MEASURES:

Repetitions were minimised to the maximum extent possible, but it should be noted that the system/subsystem manuals also include training material. ANSTO requested INVAP to include, in the higher-level manuals, some of the information contained in low-level manuals, for completeness.

All the definitions and abbreviations for the OPAL reactor are contained in the stand alone document RRRP-7014-EDEIN-101E *Appropriate Terms to be Used in Manual Writing.* Note that an Australian Standard recommends that every document with embedded abbreviations must contain a list of the abbreviations in the document.

Documents are produced in accordance with the Project Quality System. Any inconsistencies between the manuals will be identified during the manual reviews and commissioning process and will be corrected. Following commissioning, all operating manuals and instructions will be held in the OPAL Business Management System (BMS) document system which is a quality system certified to ISO 9001.

5. RECOMMENDATIONS, COMMENTS, GOOD PRACTICE:

R1. Minimize the repetitions or establish a Quality Control System to assure consistency.

R2. To be complete and to avoid inconsistencies, it is recommended to collect all the definitions and the abbreviations in stand alone documents as well.

Upon providing the above mentioned document the Recommendation (R2) has been closed.

C1. Since the Plant Operation Manual prescribes procedures which should be followed in case of LOCA, seismic event, etc., by referring to the System and Subsystem Operation Manuals (RRRP-4302-EDEIN-001), consider incorporating these manuals as an Annex to the Plant Operation Manual.

C2. Consider standardizing the format of the different types of documents.

GP1. The summary tables presented in the Plant Operation Manual, such as “System Mode Corresponding to Each Reactor State”, are considered to be a good practice.

GP2. The RCMS Procedures are tested on the simulator, which is considered to be a Good Practice.

ISSUE NUMBER: 2

1. REVIEW AREA: **Operating Procedures**

2. ISSUE TITLE: **OLC**

3. ISSUE CLARIFICATION:

IAEA Safety Guide DS261 (Operational Limits and Conditions and Operating Procedures) contains the following statement:

"For a research reactor to be operated in a safe manner, the provisions made in the final design and subsequent modifications shall be reflected in limitations on operating parameters and in the requirements on the reactor facility equipment and personnel. Under the responsibility of the operating organization, these shall be developed during the design safety evaluation as a set of operational limits and conditions (OLCs). A major contribution to compliance with the OLCs is made by the development and utilization of operating procedures (OPs) that are consistent with and fully implement the OLCs."

The Plant and System Operation Manuals contain only a few indications on the OLCs within which the plant or the system should be operated.

4. COUNTERPART VIEWS AND MEASURES:

Agreed. It is the intention to incorporate more OLC references into the Plant Operation Manual procedures when the OLCs are finalised. Both the OLCs and the Operating Procedures are documents that will be continuously improved during the commissioning process.

5. RECOMMENDATION:

R1. It is recommended that the OLCs that can be violated by not following the instructions of a Procedure should be indicated at the beginning of the Procedure.

ISSUE NUMBER: 3

1. **REVIEW AREA**: **Operating Procedures**

2. **ISSUE TITLE**: **System Subsystem Manuals**

3. **ISSUE CLARIFICATION**:

The Manuals give good descriptions in logical order of the related systems. Within these Manuals one can observe the above (ISSUE NUMBER 1) mentioned repetitions. After the detailed description of the actions to be performed they are repeated in Table form at the following page as Operating Instructions. The quality of the Simplified Diagrams, e.g., Figure 1: “PCS Circuit in Forced Circulation Mode” (page 9 of PCS operational manual) is not adequate.

The VERIFY and ENSURE actions in some cases are mixed. In some cases, an instruction for log-book recording is missing from the action list, but presented in the table containing the Operating Instructions. There are cases where verification of a previous action is presented as a Note (First Shutdown System Operating Manual).

It is not clear whether the indicated states, as presented in the system modes diagrams of the subsystem manuals, are always unique and will conform to the definition of the considered mode. As an example of this, refer to Figure 3 of the First Shutdown System Operation Manual. The tripped mode as a result of the performance of procedure “Manual Trip 1 Request Procedure” is not the same mode as used as a starting point for the procedure for the Control Rod Drive (CRD) parking position. As an example of this, the actions 5, 6 and 7 of section 5.3.6.4 are already performed in step 3, 4, and 5 of section 5.3.2.4. It can be noted that, on the other hand, it should be verified that the system configuration resulting from the execution of a procedure is a prerequisite for the reverse procedure or for the procedure with the same initial mode, e.g., the prerequisites of 5.3.1.3 should be the results of 5.3.6.

The indicated states and the transition procedures, as presented in the system modes diagrams of the subsystem manuals, are not always correctly prescribed in the related procedures. The bank insertion procedure from the armed mode and the CRD parking procedure from the tripped mode are only described in one direction.

4. **COUNTERPART VIEWS AND MEASURES:**

The reason that actions are repeated in table form in the subsystem manuals is that, following commissioning, the tables will be extracted from the manuals and used as Operating Instructions held in the ANSTO BMS Operating Documentation system.

Some drawings should be improved, nevertheless the reference to the full drawing is always provided to enable the reader to obtain additional information.

Procedures that can be executed in two directions are avoided where possible. Any procedures of this type will be replaced by two procedures (one in each direction).

Any inconsistencies in modes will be evaluated.

System Subsystem manuals are being verified during pre-commissioning and commissioning and any inconsistencies will be corrected.

5. COMMENTS AND RECOMMENDATIONS:

R1. Consider the deletion of repetitions and provide a through check for inconsistencies.

R2. Improve the quality of the Simplified Diagrams.

R3. It is recommended to check whether the execution of the different procedures results in exact same end modes.

R4. It is recommended to review the procedures in order to check whether the prerequisites of a procedure correspond with the end results of different procedures defining a dedicated mode.

C1. Consideration could be given to whether a procedure which is indicated to be performed in two directions should be described in both directions.

ISSUE NUMBER: 4

1. **REVIEW AREA: Operating Procedures**

2. **ISSUE TITLE: Design Manuals**

3. **ISSUE CLARIFICATION:**

Chapter 5 of the Design Manuals contain all important information on the Design Basis, Design Description, Safety, Seismic and ILS categorization of the given system. The Design Manuals provide a good support to the Operation Manuals to easily understand operation of the systems and could be used as a training tool as well.

4. **COUNTERPART VIEWS AND MEASURES:**

We are pleased that this good practice has been recognized. These manuals have been invaluable in training the future operating staff to have a thorough understanding of the systems.

5. **GOOD PRACTICE:**

GP1. It is considered to be a good practice to include the System Design Manuals in the set of Operating Procedures.

ISSUE NUMBER: 5

1. REVIEW AREA: Operating Procedures

2. ISSUE TITLE: Maintenance Manuals

3. ISSUE CLARIFICATION:

The Maintenance Manuals contain only a list of activities without detailed instructions.

A good example of this is the electrical resistance check of the electromagnets in the First Shutdown System Maintenance Manual. By the manual the measurement should be made by using an Ohm-meter but there is no indication on the acceptable range of measured values.

In the previous Peer-Review mission report (ISSUE NUMBER 34), the team recommended to re-analyse the surveillance requirements paying special attention to the nature of a research reactor cycling through all four operational states at roughly monthly intervals, with more frequent changes taking place in the irradiation and experimental facilities. From the maintenance manual, it is clear that, although the recommendation was considered, the low frequency of the tests and surveillances was kept.

4. COUNTERPART VIEWS AND MEASURES:

Detailed maintenance instructions are contained in the vendor manuals supporting the system maintenance manuals or will be developed by ANSTO. Acceptable ranges will be included in the detailed work instruction for the task. The surveillance intervals are based on the plant design, vendor recommendations, international practice and the PSA.

Maintenance Department will prepare a Safe Work Method Statement (SWMS) for all new maintenance activities.

For the particular issue of the control rods, the OPAL design was proven by many mock up tests and will be confirmed during commissioning. Unlike older research reactors, the design completely separates the control rods from the fuel assemblies and all the irradiation and experimental facilities so that the sort of faults that requires control rod testing every cycle for some reactors can be considered to be eliminated. This will be confirmed by extensive testing during commissioning.

5. RECOMMENDATIONS AND COMMENTS:

R1. It is recommended to check the control rod insertion time in every cycle at least in the first six cycles of the plant power operation.

ISSUE NUMBER: 6

1. REVIEW AREA: Operating Procedures

2. ISSUE TITLE: Witnessing a Transition from Shutdown to Power on the Simulator

3. ISSUE CLARIFICATION:

On 30 November, a shutdown-to-power operation on the simulator was witnessed. This exercise was performed by an operator in training, based on the instructions listed in appendix 1 of the Plant Procedure Shutdown to Power (RRRP-7250-EDEIN-140-A; revision A of 5-11-2005).

The computer screens will have the same layout as the computer screens in the Main Control Room with the remark that in the Control Room 1 one screen will be fixed for alarm handling only. Although the hardware instrumentation of the control desk, such as scram button, selection switches, control rod rise and down buttons are simulated on a "touch screen" the simulator can be considered as a full scope simulator.

The simulator operator acted as the reactor supervisor by which the actual situation could be trained.

During the exercise additional explanation regarding the systems, interlocking and operational handlings to be performed have been provided by ANSTO and INVAP as well. It has been shown that the simulator can be used as an excellent training tool to train the operators in the standard operating procedures and in a number of predefined deviations from normal operation.

During the start-up procedure the operator has to check the prerequisites, 20 systems and several monitors, before he could start to approach to criticality. When there are no deviations, no entry in the logbook has to be made.

Since the alarms at the simulator are not connected to an audio signal, the operator overlooked a few times an upcoming alarm. The reactor control and monitor system will be equipped with an audio signal which will also give an audio alarm in case an alarm is announced. Also, the alarms are presented in the status bar. An upcoming alarm blinks. The priority 1 alarms (red alarms) are presented in red with white letters. The priority 2 (brown) alarms are presented in yellow with white letters, too. With the last combination of colours (white on yellow) the alarm text is hard to read.

For the approach to criticality both the Neutron Flux Channels and the indicators for the Decade Per Minute (doubling time/period) indicators are essential. These values are presented in numbers (height 12) at the left upper part of the right hand screen and as bar graphs on the left hand screen. Since the bar graph for the Decade per Minute signals is to provide a trend screen, the scale was selected in order to have better overview of behaviour of the reactor during this stage of the start-up process. It was explained that, in this release of the simulator software, the last process steps in the approach to criticality are over "SIMULATED" resulting in a sensitive behaviour of the process.

Amongst others a required screen could be selected using a pop-up menu structure. By selecting the pop-up menu all the available system abbreviations are being presented. From all the available options (in the order of 100) one option has to be selected by the operator. Although the information has been ordered based on system identification number, it was observed that the probability of selecting a wrong screen is high, resulting in the need to re-selection the correct screen.

4. COUNTERPART VIEWS AND MEASURES:

The provision of a "ticker" will be investigated.

The bar graph on the simulator is only a virtual image of the hardwired indicator in the MCR. The use of trend screens will be optimised during commissioning and this will improve the information presented to the operator. Customised screens can be set up for any operation to be performed.

Data from commissioning the actual reactor will be used to improve the simulator computer model.

The simulator will have an audible alarm as in the MCR.

The only text that is difficult to read is associated with an indication (summary button) that does not change. All alarm messages are easily readable.

The pop-up menu for screen selection is only one of several ways that the operator can navigate between screens. Experienced operators tend to use one of the other navigation systems. It was ensured during the extensive tests performed on the RCMS that using the active zones, link and navigation buttons and/or the menu buttons located on the left hand side of every screen the operator may change between any two screens with no more than three mouse clicks.

Although the simulator was only delivered this year, we have already found that it is an invaluable tool for training operators. Following initial training on the standard procedures, the simulator instructor is developing fault scenarios for the next stage of operator training.

5. RECOMMENDATIONS, GOOD PRACTICE:

R1. To give the operator additional information during the start-up of the reactor it is recommended to install a "ticker", giving an audio signal of which the interval is proportional to the neutron flux. The proportionality of the ticker with the flux should be adjustable.

R2. To have a better overview of the behaviour of the reactor during start-up it is recommended to adapt the scale of the Decade per Minute bar graphs indicators.

R3. It is recommended to evaluate the response of the reactor during the final steps in the approach to criticality. If the response of the Decades Per Minute on control rod movements is also sensible, as presented during the simulation, a time constant could be introduce in order to avoid unnecessary spurious scrams.

R4. Since training of operators should meet the actual situation as close as possible, it is recommended to install an audio alarm which should announce an alarm at the simulator too.

R5. It is recommended to display the text for the priority 2 (Brown) alarm with black text on the yellow indicator in order to improve the readability.

R6. It is recommended to re-evaluate the presentation of the pop-up menu for the screen selection in order that less information is presented at the time and that presentation of the items presented are more easily distinguished.

GP1. It has been shown that the simulator serves as an excellent training tool to train the operators in the standard operating procedures. The simulator can also be used to train operators in a number of predefined deviations from normal operation. This is regarded as best international practice.

ISSUE NUMBER: 7

1. **REVIEW AREA: Operating Procedures**

2. **ISSUE TITLE: Plant Procedure – Shutdown to Power**

3. **ISSUE CLARIFICATION:**

The plant Shutdown-to-Power Procedure gives a detailed overview of all the relevant systems and subsystems to be checked before the start up of the reactor. It also checks the relevant interlock logics of the First Shutdown System. The verification that all TRIP 2 requests of the Secondary Shutdown System are cleared, is not prescribed. The relevant checks of the Second Shutdown System by the field operator are not presented in this procedure.

It is not clear which philosophy has been used for the order of the systems to be checked by the Control Room Operator. For the Field Operator, the order has been chosen to minimise the required time to perform the procedure. An order based on the safety relevance of the systems together with the mutual influences of the systems to be checked could be the basis for the order of the check-out procedures to be followed.

A plant procedure describing when and how the plant surveillance requirements shall be tested, to assure that the interlock settings and the interlock trips will perform there intended actions upon request, is not yet available.

Before the approach to criticality could start, the control room operator has to check 38 systems and sub-systems without using a tick-list and without any recording into the logbook.

In the present document the approach to criticality is prescribed as a suggested approach to criticality.

4. **COUNTERPART VIEWS AND MEASURES:**

The Second Shutdown System (SSS) is contained in a locked area to which access is normally forbidden. All necessary checks on the status of the SSS can be performed from the MCR and are included in the Shutdown to Power Procedure.

The field operator completes check sheets for all the reactor pre-start checks. The completed check sheets are examined by the Shift Manager and any anomalies resolved before the MCR reactor start-up actions are commenced.

The Operating Instruction for log keeping (OI 11) details which operations must be logged in the MCR Reactor Operators log. The time and details of all important MCR action steps during the reactor start-up will be logged. It will be evaluated to include appropriate hold-points as logbook entries.

Surveillance testing of safety related interlocks is contained in the OLC Surveillance testing documents.

The approach to criticality will be optimised during commissioning and the "suggested approach" will be replaced by detailed action steps which would normally be used. However, considering the comment raised, the approach to criticality strategy will be defined in the specific Briefing for the Cycle (POWER or PHYSICS TEST) to avoid any possible misunderstanding. The procedure will be amended to read "reach criticality following the strategy described in the Cycle Briefing".

5. RECOMMENDATIONS AND COMMENTS:

R1. It is recommended to evaluate the order of the checkouts to be performed by the control room operator and the field operator by which the safety relevance and the mutual influences of the systems should be taken into account.

R2. It is recommended to evaluate whether and which checks have to be performed on the Secondary Shutdown System by the field operator.

Based on the experience gained by HIFAR operation the counterpart considers the checks performed during maintenance are adequate and moreover continuous monitoring can be performed by cameras. Therefore this recommendation is regarded to be closed.

R3. It is recommended to adapt the plant procedure into a tick-list for the operators and to require logbook entries at least at the beginning and after completion of the checks.

R4. It is recommended to prepare a plant procedure describing when and how the plant surveillance requirements shall be tested in order to assure that the interlock settings and the interlock trips will perform their intended actions upon request.

C1. The approach to criticality is not prescribed in a fixed order but as a "suggested approach" to criticality. It is believed that after the commissioning a strict approach to criticality to be followed shall be described.

C2. The verification that all TRIP 2 requests of the Secondary Shutdown System are cleared could be incorporated into the procedure.

ISSUE NUMBER: 8

1. REVIEW AREA: Operating Procedures

2. ISSUE TITLE: Business Management System

3. ISSUE CLARIFICATION:

Based on ANSTO Business Management System a dedicated Business Management System (BMS) for OPAL has been developed. The BMS addresses the requirements of:

- OPAL Reactor License conditions;
- ISO 9001:2000 Requirements;
- ISO 14001:2004 requirements; and
- Occupational Health and safety requirements via the ANSTO Safety Management System.

The BMS has been formally accredited to conform to ISO 9001 and ISO 14001 since September 2005.

In the BMS the organization structure applicable for power operations is being presented. This organization structure diverts slightly from the present structure which is applicable for the construction and commission phase. The tasks and responsibility for safe operations are clearly defined and conform to NS-R-4.

The OPAL Reactor Operations BMS Policy is a stand alone document and presented an Appendix of the BMS manual as well. In the policy statement it is addressed that safe operation will be assured by complying with all relevant legislation and requirements and that nuclear safety is always the overriding priority. The OPAL policy statement has been signed by Manager, OPAL Reactor Operations for the construction and commissioning phase.

The BMS and the related procedures will only be available through the intranet. Hard copies can be printed, applicable for the printing date only. In the control room a number of procedures and instructions will be available in hardcopies, too. The control of these hard copies is not yet described in the procedure for documentation management.

The Reactor Control and Monitoring System as well as the simulator are computerised systems. Software bugs are being fixed and indicated improvements are being implemented in new software releases. With the latest release of the simulator software a former bug which was solved in a former release was introduced again.

4. COUNTERPART VIEWS AND MEASURES:

The formal instruction for control of hard copies is currently being developed.

A procedure for the control of software release will be developed.

RECOMMENDATIONS AND COMMENTS:

R1. It is recommended to incorporate the formal approval and control of the control room hard copies in the procedure for documentation management.

R2. It is recommended to develop a dedicated procedure for the control of software release in which clear acceptance tests, both by the supplier as well as by ANSTO, are prescribed.

C1. The BMS policy statement is signed by the Reactor Manager, responsible for the construction and commissioning. It should be considered to have the policy statement signed by Manager, OPAL Reactor Operations responsible for power operations.

GP1. The BMS is an integrated management system, integrating all the safety relevant requirements for safe operation together with the requirements of the customers and stakeholders.

APPENDIX II: SCHEDULE

The peer-review project progressed on the following schedule:

October 2005	IAEA receives request for peer-review	ARPANSA
28 November 2005	Introduction of Peer-Review Team	ARPANSA/IAEA
28 November 2005	Presentation of Operating Procedures	ANSTO/INVAP/IAEA
28 November 2005	Walk-down the facility	INVAP/IAEA
29-30 November 2005	Review of material, prepare ISSUES	IAEA
01 December 2005	Prepare draft issue pages	IAEA
02 December 2005	Presentation of the issues	IAEA/INVAP/ANSTO
02 December 2005	Draft the Peer-Review Mission Report	IAEA
02 December 2005	Present draft report to ARPANSA	IAEA/ARPANSA
02 December 2005	Exit meeting	IAEA/ARPANSA
09 December 2005	Comments on draft report due to IAEA	ARPANSA
16 January 2006	Final report due to ARPANSA	IAEA

APPENDIX III: LIST OF PARTICIPANTS

IV.1 ARPANSA – Counterparts

Don Macnab	Director, Regulatory Branch
Vince Diamond	Manager, Nuclear Installations
John Ward	Safety Engineer, Nuclear Installations

IV.2 ANSTO - Counterparts

Tony Irwin	Commissioning Reactor Manager
Michael Walsh	Manager OPAL Operations
Greg Storr	General Manager Reactor Operations
Derrick Blackmore	BMS Project Leader

IV.3 INVAP - Counterparts

Pablo M. Abbate	Design and Commissioning Manager
Nestor de Lorenzo	ILS Manager, Nuclear Projects

IV.4 IAEA

Reviewers: J. P. Boogaard
T. Hargitai
Reviewed area: Operating Procedures, Conduct of Operations

APPENDIX IV: IAEA – REVIEW TEAM CV

Name: Jeannot P. Boogaard
Manager QSE

Address: NRG
P.O Box 25
1755 ZG PETTEN
The Netherlands

Office Phone: +31 224 56 4832
Cell Phone: +31 653 33 0255
Email: Boogaard@nrg-nl.com

Professional Qualifications:

Physical Engineer, Delft Technical University, 1983

Relevant Experience:

More than 20 years of experiences in nuclear industry including 12 years as head of the maintenance group and deputy reactor manager HFR a 45 MW Research Reactor, including experiences with an extended upgrading and modifications program, including commissioning. In present position as Manager QSE overall responsibility for policy and implementation of Quality, Safety and Health Physics, Environmental Management and Security Management within NRG. Furthermore responsible for management control and formal administration of all licenses.

As project manager for the license applications of the nuclear activities of NRG (without the HFR) overall responsible for the safety analyses report, safety analyses performed and the Operational Limits and Conditions for the Low Flux Reactor, Hot Cell Laboratories and Molybdenum Productions Facilities as well as for the Decontamination and Waste Storage Facilities.

Since 1988 Dutch representative in several IAEA meetings for drafting and review of IAEA documents related to research reactor safety, operation, maintenance and management systems.

Relevant Expertise:

- Conduct of operations;
- Operation, utilisation, maintenance and refurbishment;
- Instrumentation and control;
- License application, including preparation of safety analyses reports and safety analyses;
- Preparation of Operational Limits and Conditions;
- Management systems; and
- Emergency planning and preparedness.

Name: Tibor Ferenc Hargitai
RR Safety Officer
Address: IAEA
Wagramer Strasse 5, P.O Box 100,
A-1400 Vienna,
Austria

Office Phone: +431 2600 26176
Cell Phone: +3630 4886122
Email: t.f.hargitai@iaea.org

Professional Qualifications:

Electric Engineer, Budapest Technical University, 1972
Nuclear Engineer, Budapest Technical University, 1990

Relevant Experience:

More than 30 years of research reactor relevant experience including 13 years of experience as Reactor Manager. As Reactor Manager, responsible for the re-commissioning of the Budapest Research Reactor after a major reconstruction in 1992. In the reconstruction responsible for the design and construction of the in core instrumentation. Responsible for design, construction, installation of a cold neutron source in 2000.

Since 2002 IAEA staff member working for the Division of Nuclear Installation Safety, Research Reactor Safety Section.

Relevant Expertise:

- Reactor diagnostics;
- Instrumentation and Control;
- Cold Neutron Source;
- Conduct of operations;
- Operation and maintenance;
- License application, including preparation of safety analyses reports and safety analyses;
- Preparation of Operational Limits and Conditions; and
- Emergency planning and preparedness.

APPENDIX V: LIST OF DOCUMENTS

Before the mission the following documents were provided:

Business Management System (BMS)
Plant Procedure - Shutdown to Power
First Shutdown System - Design Manual
Second Shutdown System - Design Manual
Primary Cooling System - Design Manual
Reactor and Service Pools Cooling System - Design Manual
First Shutdown System – Operation Manual
Second Shutdown System - Operation Manual
Primary Cooling System - Operation Manual
Reactor and Service Pools Cooling System - Operation Manual
First Shutdown System - Maintenance Manual
Control Rod Drive Room and Door - Maintenance Manual

During the mission the following documents were provided additionally:

Plant Procedure – Reactor Refuelling
Plant Procedure – Restart to Power after Blackout
Plant Procedure – Restart to Power after Trip 1
Plant Procedure – Restart to Power after Trip 2
Plant Procedure – Plant Configuration after Blackout
Plant Procedure – Plant Configuration after Trip 1
RRRP System and Subsystem Codification