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Replacement Research Reactor Project

SAR CHAPTER 18
QUALITY ASSURANCE

Prepared By

INVAP

For

Australian Nuclear Science and Technology Organisation

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TABLE OF CONTENTS

End of Table of Contents

18 QUALITY ASSURANCE

18.1 INTRODUCTION

The Objectives of Chapter 18 are:

1. To demonstrate the existence, extent and (with the exception of the Reactor Facility Quality Management System yet you be implemented) effectiveness of the quality assurance arrangements which underpin the activities undertaken leading up to, and during, the period covered by the proposed Facility Licence, Operating Authorisation, including Stage B1, B2 and C Commissioning, the conduct of Contract Performance Demonstration Tests (CPDT), and the parallel operation with HIFAR.
2. To establish the organisational arrangements in effect during commissioning and CPDT.
3. To establish the framework for transition following the completion of all commissioning and testing activities to the normal, ongoing operational arrangements.

Safety categorisation and quality level classification are used with regard to the Reactor Facility items and systems of importance to safety. This is part of a graded approach to the QA program based on the contributions of items, services and processes to Nuclear Safety, as emphasised in IAEA Safety Guide Q13. The extent of design review, inspection and testing is also graded in similar fashion.

This Chapter updates and extends the information provided regarding Quality Assurance in the Preliminary Safety Analysis Report (PSAR). Its scope includes the Quality Assurance related activities of the ANSTO Replacement Research Reactor Project (RRRP), and INVAP for all phases of commissioning and CPDT, and those of the ANSTO Operating Group for Stage B Commissioning onwards and into routine operation. The Quality Systems of the RRRP and INVAP will continue until the completion of the CPDT; the Reactor Facility Quality Management System will be implemented from commencement of Stage B1 Commissioning and will continue for the life of the facility. That is, the Quality Systems of the RRRP and INVAP will overlap with that of the Reactor Facility from the commencement of Stage B1 Commissioning to the completion of the CPDT. INVAP will ensure that any effort required by subcontractors during the commissioning and testing process will be covered by appropriate quality arrangements. At completion of CPDT, this Chapter will be revised and reissued to eliminate information relevant to the RRRP, commissioning and CPDT, leaving only information relevant to the Reactor Facility Quality Management System (QMS) applicable to ongoing operation.

End of Section

18.2 STATUS OF QUALITY ASSURANCE PROGRAMS

18.2.1 ANSTO

ANSTO is the Principal in its Contract with INVAP (Contractor), for the design, construction, commissioning and performance demonstration of the Replacement Research Reactor Facility (the Reactor Facility).

ANSTO is also the intended Operator of the Reactor Facility subject to the granting of the appropriate licences by Australian Radiation Protection and Nuclear Safety Agency (ARPANSA).

ANSTO established a dedicated Project Management Core Team (PMCT) to project manage its responsibilities in relation to the conduct of the Contract, and the achievement of both the Construction and Operating Authorisations for the Reactor Facility.

Immediately following Contract award, the PMCT developed a dedicated Quality Management System, (ANSTO Replacement Research Reactor Project Quality System), for the construction phase of the project. A program of internal and external audits has been established, and is being conducted to maintain quality assurance certification throughout the construction of the Reactor Facility.

The ANSTO RRRP Quality Management System was initially certified to AS/NZS ISO 9001:1994 “Quality systems-Model for quality assurance in design, development, production, installation and servicing”. The System was subsequently updated and re-certified to ISO 9001:2000.

This certification covers the Quality Management System for all phases of the Project Management of the RRRP.

Surveillance audits continue to be conducted on the system on a 6 monthly basis and this audit arrangement will be maintained until completion of the CPDT. The HIFAR Quality Management System, was certified to AS/NZS 9001 in 1996, and recertified in 1999 and 2003. This system has provided the general framework for ANSTO’s knowledge base of managing research reactor operation under an accredited Quality System and, in addition to a number of other sources, was drawn upon in the development of the Reactor Facility QMS, which is described in detail later in this Chapter. The HIFAR QMS is also the system under which some of the personnel have trained and been accredited and operated HIFAR. These personnel will support the commissioning and operation of the Reactor Facility.

18.2.2 INVAP

INVAP is the Contractor (with ANSTO as the Principal) for the design, construction and commissioning of the Reactor Facility and has a Quality Management System certified to ISO 9001:1994 by Bureau Veritas Quality International in November 1999, and subsequently to ISO 9001:2000.

This certification covers the Design, Construction and Commissioning of Nuclear Research Reactors, Low Power Nuclear Reactors and Auxiliary Nuclear Facilities.

18.2.3 Ongoing Auditing of Programs

18.2.3.1 Internal Audits

All three organisations undertake regular internal audits on their quality assurance programs.

In the case of ANSTO, internal audits will continue to be undertaken on a half yearly basis by suitably qualified ANSTO personnel not directly associated with the project.

In the case of INVAP, internal audits are conducted once every three to four months by its quality division.

18.2.3.2 External Audits

ANSTO and INVAP commission regular external audits on their quality assurance programs.

In the case of ANSTO, external audits will continue to be undertaken by a JAS-ANZ approved organisation, following the usual audit cycle of 6 monthly surveillance audits.

In the case of INVAP, periodic external audits will continue to be undertaken by an appropriate organisation.

18.2.3.3 Surveillance Audits

An appropriate organisation has undertaken 6 monthly Surveillance Audits of the ANSTO RRRP Quality System. This process will continue until completion of the CPDT. ANSTO will continue to invite ARPANSA to attend each audit as an observer. Under the provisions of the Contract, ANSTO is able to undertake surveillance of INVAP's execution of the Project Quality Assurance Program (PQAP), on an annual basis or more often if deemed necessary by ANSTO.

All of these INVAP Audit Reports, together with evidence from INVAP that the necessary corrective actions arising from the audits have been implemented, have been provided to ARPANSA. ARPANSA has also been invited to attend each audit as an observer. This process will continue until completion of the CPDT.

End of Section

18.3 QUALITY ASSURANCE ORGANISATION

18.3.1 ANSTO

ANSTO has established its dedicated RRRP Quality System for the period from Contract award (July 2000) and through the successive phases of the project.

The Project Manager for the execution of the Contract with INVAP, and for the overall administration of the cost, schedule and performance of the Reactor Facility project until commissioning and performance demonstration testing have been completed, is responsible for ANSTO's compliance with, and maintenance of, the Quality System. The overall ANSTO project organisation is shown in Figure 18.3/1.

The PMCT Quality Coordinator reports directly to the Project Manager on matters relating to the day to day administration of the quality system, and has the responsibility to promote any amendments required to the quality system to maintain its relevance and certification throughout all stages of the life cycle of the project.

The PMCT Quality Coordinator has the responsibility to:

a) establish and maintain RRRP Quality Procedures throughout the Contract;

b) resolve Quality System issues by initiating, recommending or providing solutions and verifying the implementation of the solutions, on an ongoing basis;

c) regularly evaluate the effectiveness of the RRRP Quality System and maintain, monitor and continually improve the RRRP Quality System. This includes the planning and conduct of internal Quality Audits on an ongoing basis.

18.3.2 INVAP

INVAP has established a Project Quality Assurance Program specifically for the design, construction and commissioning of the Reactor Facility. The Program is managed by the Quality Assurance and Environmental Manager, who is responsible to the Project Director for its implementation. The Quality Assurance and Environmental Manager ensures that QA requirements under the Contract are imposed on all sub-contractors.

The INVAP Quality Assurance and Environmental Manager has:

a) ensured the correct implementation of the Project Quality Assurance Program, Quality Plans, General and Specific Procedures to meet the requirements of the project;

b) allocated project staff to perform inspection duties;

c) ensured that subcontractors fulfil their quality system obligations;

d) participated in meetings called to discuss quality issues;

e) identified and documented quality system problems;

f) updated the Project Quality Assurance Program;

g) reviewed and approved Inspection and Test Plans;

h) prepared and submitted regular quality system reports.

18.3.3 Organisational and QA Arrangements during Commissioning

The functional organisational arrangements which will be in place during commissioning are identified in the Commissioning Plan and the specific arrangements concerning Quality Assurance are identified in the Commissioning QA Plan (CQAP). Both of these documents have been prepared by INVAP with appropriate input from ANSTO. ANSTO

staff participating in any stage of Commissioning will be trained as required by the Commissioning Plan. Commissioning activities are discussed in Chapter 15.

Figure 18.3/1 depicts the organisational structure and team composition during commissioning. Figures 18.3/2 and 3 depict the functional relationships between these organisational elements during Commissioning Stages B1, B2 and C, and CPDT, respectively.

The CQAP provides the overall framework for the arrangements for the management, performance and assessment of the commissioning. The CQAP also provides the means to ensure that work is suitably planned, correctly performed and properly assessed. The Plan describes the system which controls the development and implementation of the commissioning process. The provisions of the plan are based on the following three functional categories: management, performance and assessment:

a) Management provides the means and support to achieve objectives;

b) People performing the work achieve quality; and

c) The effectiveness of management processes and work performance is assessed.

In particular, the CQAP identifies the organisational structure, roles and functional responsibilities, authority, lines of reporting and communication, qualification of Quality Assurance personnel, and work processes and the conduct of testing during commissioning. It addresses modifications and changes and the associated configuration control requirements, component and system maintenance, control of measure and test equipment and the control of documentation and test results. It also addresses training and qualification of personnel, radiation and industrial safety, security and emergency planning and preparedness.

The CQAP is documented in procedures. The procedures address all applicable quality assurance requirements specified in the Plan. The Plan ensures that verification during commissioning of compliance with the quality requirements is carried out by qualified personnel who are not directly responsible for performing commissioning activities. Measures have been established under the CQAP to identify, report, review, deal with, control and document items, activities and services that do not conform to requirements. A history of all non-conformances and the resulting corrective actions will be maintained by the Commissioning QA Officer. The CQAP requirements will be communicated to the staff of the commissioning organisation. Controls will be established to ensure that commissioning activities meet established requirements and perform as specified. The commissioning QA procedures and instructions will be replaced by those corresponding to the operation phase.

End of Section

Figure 18.3/1: RRR Commissioning Organisation and Composition of Commissioning Teams

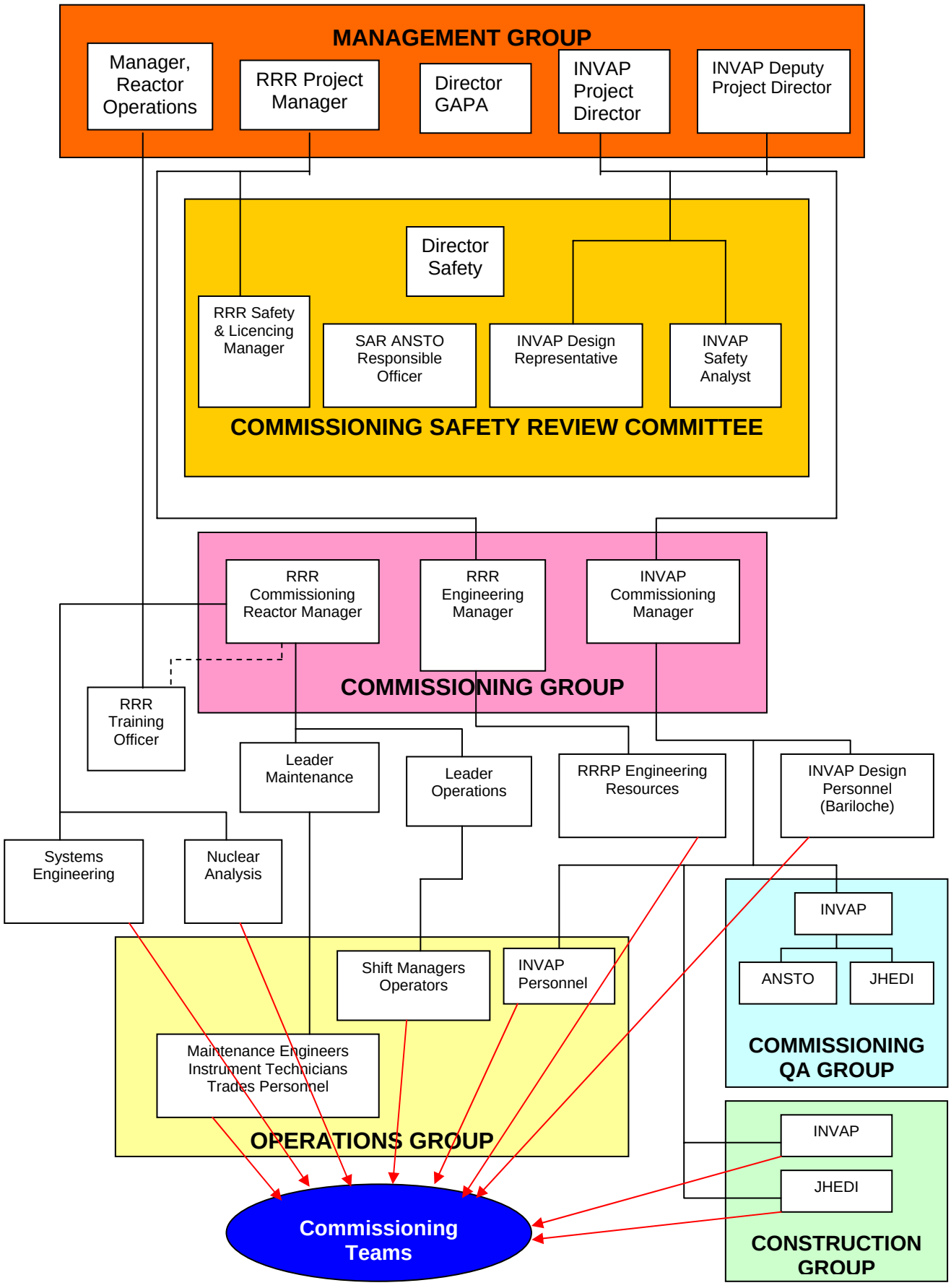


Figure 18.3/2: RRR Project Commissioning Functional Organisation Chart – Stages B1, B2 and C

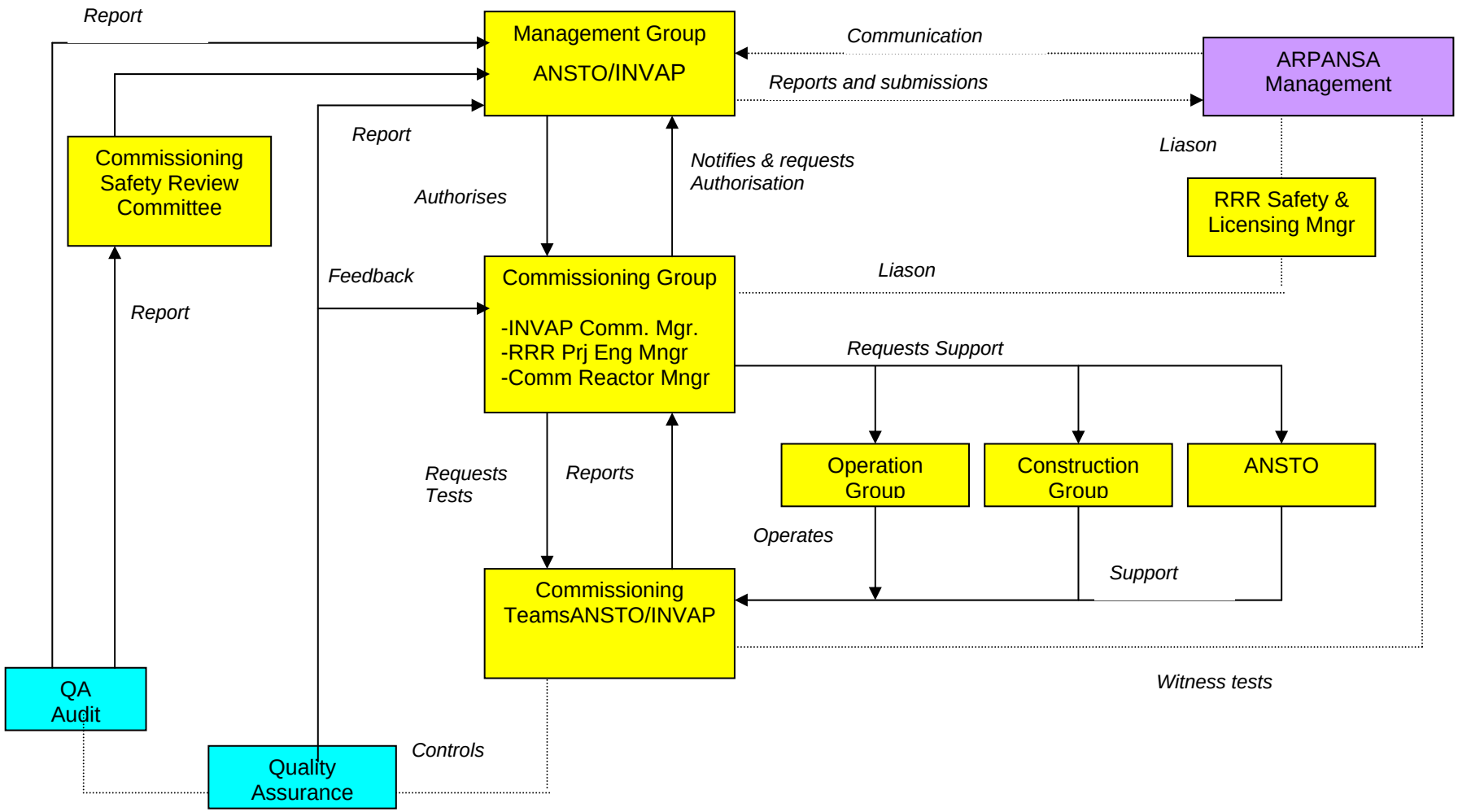
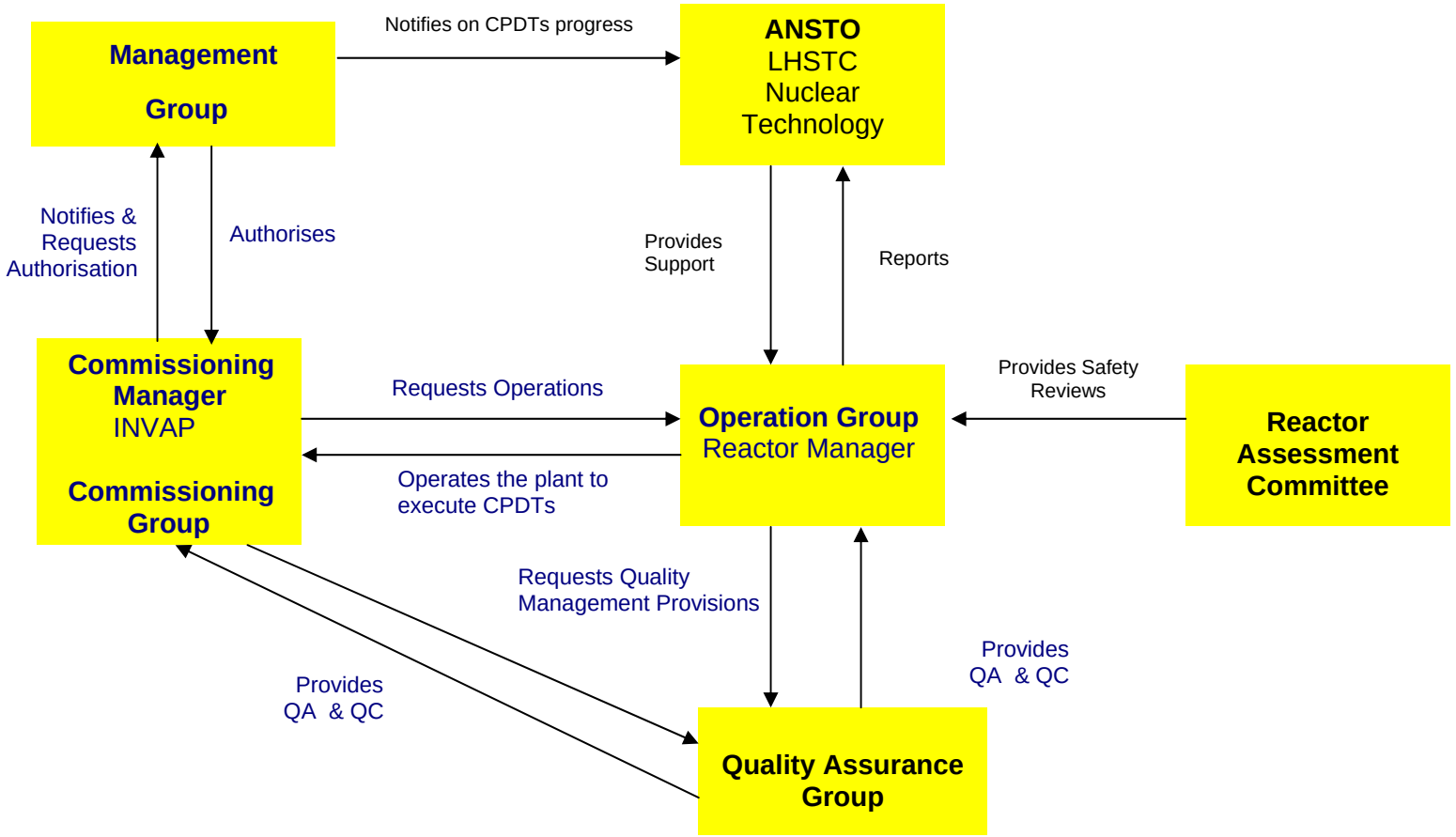


Figure 18.3/3: RRR Project Commissioning Functional Organisation Chart – Contract Performance Demonstration Tests



18.4 REACTOR FACILITY OPERATIONAL PHASES

18.4.1.1 Stage B1, B2 and C Commissioning Stages

Facility operation, including performance of all activities required by the Commissioning Plan, will be covered by the Reactor Facility QMS. Project activities relating to systems testing, recording of results and reporting will be covered by the RRRP and INVAP QMS'.

18.4.1.2 Contract Performance Demonstration Tests

Facility operation, including performance of all activities required by the Commissioning Plan, will be covered by the Reactor Facility QMS. Project activities relating to systems testing, recording of results and reporting will be covered by the RRRP and INVAP QMS'.

18.4.1.3 Parallel Operations with HIFAR

HIFAR will continue to be operated by the existing ANSTO reactor operating organisation for the duration of the RRR Project. This operation is covered by the HIFAR Quality Management System, which is certified to AS/NZS 9001:2000. Some experienced HIFAR personnel who will provide support for operation have been trained in the use of this system. They and other personnel will also be trained in the application of the Reactor Facility QMS. These systems are based on the common quality standard and operational safety principles. In either case, specific training is undertaken as required by the respective Quality Management Systems and will be appropriately implemented during operation of each facility.

18.4.1.4 Routine Operation

Routine operation of the Reactor Facility will essentially commence at the commencement of the CPDT, notwithstanding that measurements will be undertaken to confirm facility performance. This operation will be covered by the Reactor Facility QMS. CPDT activities themselves will be covered by the RRRP Quality System as described above and this system will cease to be applicable to the Reactor Facility from the conclusion of the CPDT. From this time forth, activities at the Reactor Facility will be covered by a single Quality System, namely the Reactor Facility QMS.

18.4.1.5 Reactor Facility Quality Management System

The existing ANSTO reactor operating organisation, suitably retrained, will eventually assume full responsibility for operating and maintaining the Reactor Facility. Organisational changes will therefore be made to accommodate the transition from operating HIFAR alone, to operating HIFAR and the Reactor Facility in parallel, and finally to operating the Reactor Facility alone.

The Reactor Facility Quality Management System (QMS) will be externally certified to assure compliance with AS/NZS 9001 as part of the ANSTO organisation-wide certification to that standard. ANSTO has organisation-wide certification to AS/NZS 14001 and this certification will be maintained to comply with the requirements of the ARPANSA Standard Licence Conditions.

Details of the Reactor Facility QMS are provided below.

18.4.1.6 Preparation of Commissioning and Operations Documentation

INVAP has the responsibility under the Contract to prepare all commissioning and operations related documentation for approval by ANSTO.

There are however a number of important aspects to this process which relate to the involvement of ANSTO.

18.4.1.6.1 Stage B1, B2 and C Commissioning, and Performance Demonstration Documentation

Whilst the responsibility rests with INVAP, ANSTO has undertaken, and will continue to undertake a significant role in the development and review of the documentation to be used during commissioning and CPDT.

The personnel developing and reviewing the documentation will participate directly in the commissioning and performance demonstration activities, which will be undertaken directly by ANSTO with INVAP in attendance.

While some commissioning procedures will be of a stand-alone nature, others will refer to the systems-based manuals and operating procedures which are part of the Reactor Facility Operating Documentation.

18.4.1.6.2 Operations and Maintenance Documentation

INVAP have prepared systems-based design, operation, user and maintenance manuals, as well as operational procedures and an integrated Plant Operation Manual for the Reactor Facility as part of their Integrated Logistics Support obligations under the Contract. These manuals and procedures have formed the basis of operator training to support commissioning and testing activities as well as ongoing facility operation.

The training and commissioning programs have provided the opportunity to validate the documentation provided. That is, these activities will allow ANSTO to ensure the documentation is fit-for-purpose with regards to quality and accuracy. The documentation will be amended where found to be deficient, and re-issued as final Reactor Facility manuals and procedures.

18.4.1.6.3 Quality of Documentation

All documents will:

a) meet the requirements of AS/NZS 9001;

b) be applicable to the as-built plant systems and items;

c) meet the requirements identified in the International Atomic Energy Agency (IAEA) Safety Series guides and Tech Docs for the operation and maintenance of a research reactor;

d) be prepared so that the procedures and instructions take into account guidelines of IAEA Safety Series 50-C/SG-Q, Quality Assurance for Safety in Nuclear Power Plants and Other Nuclear Installations (1996), Safety Guide Q1, or equivalent.

The Reactor Facility Quality Management System will be managed electronically.

End of Section

18.5 REACTOR FACILITY QUALITY MANAGEMENT SYSTEM

The safe operation of the Reactor Facility is ensured by engineered provisions and by the implementation of administrative controls, both of which are based upon the safety analysis presented in Chapter 16 of this document. The policies and procedures important to the safe operation of the reactor constitute the administrative controls, and exist in the form of Operational Limits and Conditions and in the Reactor Facility Quality Management System (QMS) documentation.

The Operational Limits and Conditions (OLC) meet the requirements of ARPANSA Standard Licence Conditions and reflect the provisions made in the design and operation of the reactor plant to ensure safe operation during normal start-up, operation at power, shutting down, shutdown, maintenance, testing, fuel handling and the conduct of irradiations and experiments. The OLC consist of Safety Limits, Limiting Safety System Settings and Limiting Conditions of Operation. The Safety Limits identify those operational parameters which, if exceeded, may cause damage to the reactor core or critical plant.

The Limiting Safety System Settings identify the allowable trip setpoints of instruments monitoring neutronics, Engineered Safety Features and other instrumentation which would prevent a safety limit being exceeded.

The Limiting Conditions of Operation identify minimum plant configuration, operational limits providing a margin to the safety limits and other conditions which are necessary to maintain safe operation.

The limits and conditions identify the bases of the limit or condition, the surveillance requirements and the necessary actions to be taken if there is non-compliance with a limit or condition, as well as any relevant references to the safety analyses of Section 16 of this document.

The operating procedures and instructions important to safety are addressed in the Reactor Facility Quality Management System, as required by the ARPANSA Standard Licence Conditions. This Quality System covers the activities undertaken in the Reactor Facility, and addresses the interfaces with other divisions and units outside the Nuclear Technology Division. The objective of the Quality Management System is to develop and implement arrangements that promote safe and effective reactor operation by providing the documentation which gives assurance that operating and maintenance activities are controlled processes. This objective will be met through implementation of standardised procedures and instructions that have been reviewed and approved by personnel with the appropriate knowledge, experience and authority. The documentation structure of the Reactor Facility QMS consists of a Quality Policy, Quality Manual, safety-related documentation, administrative process procedures and instructions, plant-specific operations manuals, and specific plans and supporting documentation. The QMS Process Procedures identify the administrative controls in place relating to other components of the documentation system (such as the SAR, PSA, OLC, systems manuals and procedures and integrated plant operation procedures), as well as the administrative controls covering the other processes involved in operation, utilisation and maintenance of the Reactor Facility. The procedures and instructions provide a clear statement of the responsibilities, precautions and pre-requisites and records associated with each activity, as well as the detailed procedural aspects. Figure 18.5/1 depicts the structure of the Reactor Facility Documentation System.

The Reactor Facility QMS has been developed to meet the requirements of AS/NZS 9001: 2000, *Quality Systems - Model for Quality Assurance in Design, Development, production, Installation and Servicing.*

The Quality System covers:

a) Management of safety, including reactor, radiological and industrial safety.

b) Management of the fuel element cycle from verification of specification, receipt and inspection, assembly, storage, loading and unloading, shearing, storage, cropping and return for storage or reprocessing, and all associated handling activities.

c) Fuel element accounting, in-core fuel management, reactor physics, reactivity measurements and accounting.

d) Operation of the reactor and ancillary plant.

e) Maintenance and modification of the reactor and ancillary plant.

f) Irradiations and experiments.

g) Training, retraining, accreditation and reaccreditation of all staff associated with operation and maintenance of the reactor.

h) Emergency preparedness and response.

i) General Quality System arrangements relating to management review, document preparation and control, internal audits, non-conformance control and corrective action, and quality records.

j) Continual improvement.

k) Management of customer-related processes.

Further detail on the scope and attributes of specific QMS Process Procedures is given in Section 18.5.3 below.

18.5.1 Documentation System Design

The Reactor Facility QMS represents the plans and arrangements for maintaining effective control of activities undertaken at the Reactor Facility and is implemented by a hierarchial documentation system identifying the administrative controls by which the facility is safely and effectively managed. This is achieved primarily through the QMS Process Procedures, together with the integration of other safety and administrative processes relating specifically to the Reactor Facility and the wider ANSTO organisation. This system is the means by which the Reactor Facility management communicates its expectations to staff, as well as the means by which it ensures facility staff have the capability to meet those expectations, and the means by which it monitors performance and compliance with regulatory requirements. The QMS brings together, in one system, administrative controls to ensure that safety, regulatory, operational, quality, environmental and commercial objectives are met.

The QMS has been developed to meet relevant Australian and international requirements, and has drawn upon Australian and international guidance, and international best practice. The requirements for the QMS include:

ARPANSA Standard Licence Conditions

AS/NZS 9001 Quality Management System

AS/NZS 14001 Environmental Management System

Additionally, the following guidance material was considered when developing the system:

IAEA Safety Series Guides

ARPANSA RG- Safety Assessment Principles

ARPANSA RG-13 Plans and Arrangements

ASME NQA-1 Nuclear Quality Standard

The QMS documentation has been developed to be consistent with the requirements and format of the ANSTO Business Management System (ABMS) certified to AS/NZS 9001: 2000 in July 2004, and the ANSTO Safety Management System, including the Safety Directives. This ensures consistency of the application of administrative requirements across the ANSTO site, and an effective interface between the Reactor Facility and other divisions. Where staff of another division are identified as performing functions in the Reactor Facility, appropriate personnel from that division are included in the review process and sign-off as accepting performance of that function. The QMS does not replicate requirements and processes of the ABMS, but rather provides reference and demonstration of the referenced requirements and processes.

The experience with the HIFAR Quality Management System, certified to AS/NZS 9001 in 1996, and recertified in 1999 and 2003, which constitutes the plans and arrangements for effective control of HIFAR, has been drawn on in the development of the Reactor Facility QMS. This consideration provides the benefit derived from the experience of operating a research reactor within a certified quality system framework in the ANSTO and ARPANSA context over an eight year period. A number of human-factors related issues have been recognised in that system through this period of use, and the Reactor Facility QMS has been developed to address those issues as well as meet the revised quality and environmental standards and licence requirements that have arisen since development and certification of that system.

These changes primarily relate to rationalisation of the level of detail in the operating procedures and an enhancement of clarity. The Reactor Facility QMS documentation provides streamlined procedures, with a greater level of detail being available in referenced and/or sub-ordinate documents. The fundamental difference between the two systems is in the nature of integration of documentation relating specifically to operation of the facility, namely the systems operating procedures and instructions. The HIFAR QMS has the systems operating procedures and instructions as embedded components of the administrative procedures and instructions; the Reactor Facility has a separate administrative procedures manual in addition to the systems-based manuals developed by INVAP. This structuring provides greater clarity in both operating and administrative procedures.
Figure 18.5/1 depicts the hierarchy documentation structure related to the Reactor Facility and the relationship between the Reactor Facility documentation and the ANSTO BMS and Safety Management System.

18.5.2 Documentation System Development and Review Process

The QMS administrative process procedures, listed in Table 18.5/1, were developed through a process including:

a) identification of the licence condition and management system standard requirements above;

b) series of interactions allowing input from personnel across the ANSTO site with a wide range of experience and expertise in the specific areas;

c) inclusion of relevant attributes from the guidance material above; and

d) integrated review and re-baselining.

Further documentation includes subordinate instructions and forms required for implementation of the QMS Process Procedures.

A robust review process was also implemented in the development of the Reactor Facility systems manuals prepared by INVAP. These manuals include: design, operations, user and maintenance manuals and systems procedures as well as integrated plant operation procedures. These manuals, drafted by the INVAP designers, were reviewed extensively within INVAP for consistency across all other components of the documentation system prior to transmission to ANSTO. The manuals were then provided to ANSTO and reviewed extensively by Operations Planning personnel and RRR Project personnel with specific systems expertise. The criteria employed in these reviews included:

a) consistency with the Safety Analysis Report (SAR);

b) consistency between manuals of the same system;

c) consistency between manuals of interfacing systems;

d) consistency with manual drafting templates;

e) clarity of description; and

f) human-factors aspects.

The review of this material provided an excellent opportunity for the proposed operational personnel to develop their understanding of systems design, operation of systems, and of the interaction of systems.

The QMS Manual includes the Quality Policy for the Reactor Facility, documenting the management commitment and priority given to implementation of arrangements to ensure all the above objectives are met, as well as identifying key quality and safety objectives and providing detail of the plans and arrangements embedded in the system. It also integrates the requirements of the Nuclear Analysis Section of Nuclear Technology Division which provides support for Reactor Facility operation.

18.5.3 Documentation System Attributes

An essential attribute of a system to maintain effective control is documented arrangements providing clearly defined roles and responsibilities, authorities, delegation deputising arrangements, lines of reporting and resource management. This information is contained within position Role Profiles and *Operating Organisation*, which also identifies the expected qualifications and experience of personnel, and the objectives of the staff selection process, thereby ensuring staff have appropriate attributes and capabilities to perform their respective roles, including sufficient safety awareness. It also identifies responsibilities for communication with external organisations, including ARPANSA. Staff performance is systematically evaluated using a formal objective setting and review process.

The safe operation of the Reactor Facility is contingent upon an ongoing knowledge of the design basis of the facility, as identified in the relevant safety analysis documents, and an appreciation of the consequences of postulated events which would place the plant outside the safe operating envelope defined in the SAR. Operational Limits and Conditions are established from the Safety Analysis Report. A Probabilistic Safety Assessment is provided.

Operation of the Reactor Facility in compliance with the OLC's, systems operating procedures and therefore within the safe operating envelope identified by the SAR, is prescribed by *Conduct of Operations*. This, in turn, ensures operation with an adequate margin of safety to the relevant safety limit. This procedure identifies the need for plant surveillance, reporting of plant degradation and failure, and oversight of maintenance work including plant tagging, isolation and the oversight of contract effort. It also addresses shift handover and control room log-keeping arrangements, and lines of communication for reporting issues of operational concern.

Documentation and *Records Management* identify the requirements for preparation, review, approval and revision of documents used within the QMS, as well as for maintenance of records of activities undertaken within the facility. They provide for review and agreement of management in other divisions performing tasks in the Reactor Facility.

Core Management identifies the requirements for reactor physics calculation and assessment of approved cores of particular fuel and control rod type, as well as assessment of the performance of any proposed core changes, such as new fuel types or control absorbers. It also includes the assessment of and reporting on core loadings for compliance with the OLC.

Compliance with the OLC is also identified in *Utilisation Management* which identifies the need for controls over irradiation of materials by means of the Target and Canning Specification to ensure there is adequate heat transfer, no excessive build up of pressure or activity, and adequate encapsulation in targets irradiated in the irradiation facilities. Control over facility users is achieved by training and authorisation.

The need for revision of the licensing and design basis documentation, including the SAR, PSA, OLC and systems manuals and procedures, arising from plant modifications or for other reasons is identified in *Configuration Management*. This ensure that all safety and operating documentation available to staff is maintained current and consistent with the installed plant.

Training in each of these safety-related documents and methodologies is identified in *Training and Personal Development Management*. This procedure also identifies implementation of a Systematic Approach to Training (SAT), including the need for induction, role-specific and ongoing training, the need for accreditation of Reactor Operators, and demonstration of required competencies before staff are authorised to perform work at the facility. Ongoing training includes refresher training, to ensure staff retain knowledge of reactor fundamentals and systems design and operation, as well as training staff on aspects related to plant modification, documentation revision and lessons learnt from operational experience. All training is assessed for effectiveness on completion, as is the training program to identify scope for improvement. An essential element of training is on safety awareness and nuclear safety principles, including safety culture and defence-in-depth, and training in the organisational policies contained within the ABMS and the Reactor Facility QMS, and the ANSTO Safety Management System.

Maintenance Management identifies the arrangements for preventive and corrective maintenance, including prioritisation of maintenance work commensurate with the safety significance of the system, structure or component, and isolation and tagging of plant. It also identifies the need for functional testing of plant and equipment prior to returning the maintained item into service, and the oversight of contract effort as well as support services (maintenance, test and inspection) from other ANSTO divisions. It includes the need for systems to ensure instrumentation calibration remains current, that there is an adequate inventory of spare parts and the need for systems to record maintenance and plant history.

Safety Management and *Radiological Safety* collectively identify the means by which the requirements of the ANSTO Safety Management System are implemented within the Reactor Facility. *Radioactive Source Control* identifies the arrangements implemented to ensure adequate controls are in place related to handling, storage and transfer of radioactive materials.

Nuclear Materials Management identifies the processes associated with the handling storage, transport and accounting of nuclear materials in the Reactor Facility. This includes meeting ANSTO's safeguards requirements under the *Nuclear Non-Proliferation (Safeguards) Act 1987* and relevant international treaties, which are managed by Government and Public Affairs division.

Security management identifies the physical protective arrangements for the Reactor Facility and the interface with site security arrangements. The arrangements include, access restrictions reference to the ANSTO Security Plan.

Event Response identifies the organisational and local arrangements for responding to events at the Reactor Facility, including reference to guidance for response to specific incident scenarios. It includes activation of on and off-site response arrangements and communication.

Waste Management identifies the arrangements to ensure personnel safety and environmental objectives are met when dealing with waste arising in the Reactor Facility.

Process Improvement identifies the processes associated with reporting of non-conformances, including abnormal operating occurrences, the process for taking corrective and preventative measures and the identification of improvements to enhance safety and optimise facility availability.

Business Planning and *Business Review* identify the management processes for planning, budgeting, allocation and assessment of implementation of the QMS plans and arrangements to ensure all objectives and performance indicators are met and that adequate human, financial and material resources are applied, to meet all operational, training and safety objectives. They indicate the need for clear lines of communication of issues arising within the Reactor Facility and the wider ANSTO Organisation to be in place, including a means of feedback from staff to management. They also include the setting of performance and development objectives relating to operational, safety, radiation protection and environmental protection matters, the inclusion of these objectives in the Business Plan, and the periodic review of policies, authorisations and staffing requirements.

Organisational Arrangements During Commissioning identifies the organisational groups involved in commissioning, testing and operational activities, and the associated interfaces, and roles and responsibilities, and lines of reporting and communication, throughout the various stages of the commissioning process.

The objective of the QMS described in these plans and arrangements is the implementation of a systematic and integrated approach to ensure effective control of all activities undertaken by personnel at the Reactor Facility. The QMS provides the framework necessary:

a) to implement organisational arrangements focusing on safety and quality objectives;

b) to ensure staff have the necessary skills knowledge and attributes to safely operate the facility, with a strong appreciation of the facility design basis ;

c) to foster recognition by the staff of the need for their actions to support performance of safety functions; and

d) to promote a responsible approach to operation, maintenance of defence-in-depth and a strong safety culture.

Implementation of the system and vigilance on the part of all staff will contribute to safe and effective operation, and will maximise plant availability in support of the ANSTO mission and organisational objectives.

End of Section

Figure 18.5/1 Reactor Facility Documentation System

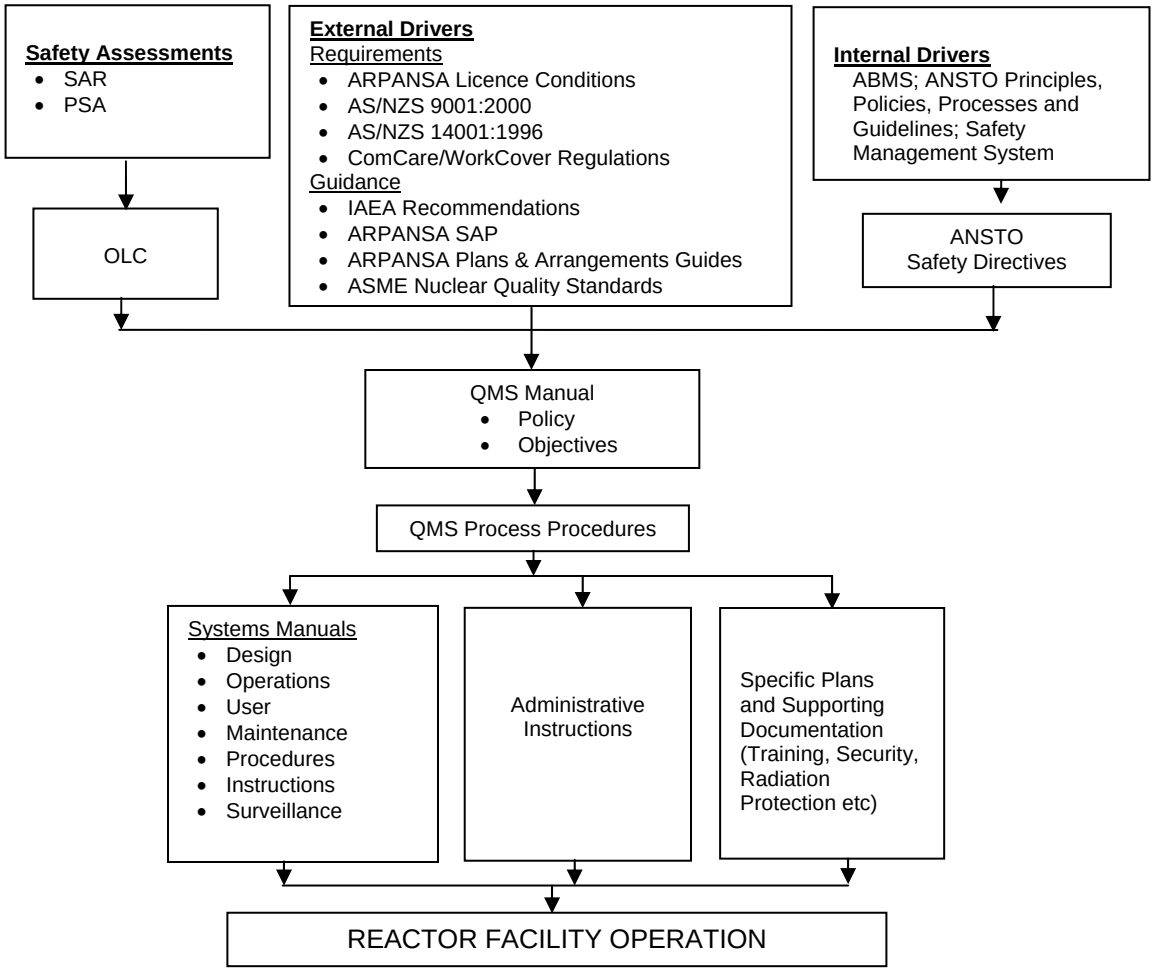


Table 18.5/1 Reactor Facility QMS Process Procedures

	Procedure	Scope
NRP 01.	Business Planning	• dovetail with ANSTO policies • objective & KPI setting (NT Plan) • budgeting, project funding • strategic & operational plans • financial management
NRP 02.	Business Review	• management system review - effectiveness • facility operational business review
NRP 03.	Process Improvements	• continual improvement • client feedback • internal audit • AOR, OOR, FAA • non conformances o operational occurrences, o abnormal occurrences, o non-conforming product o corrective actions o preventive actions • monitoring effectiveness
NRP 04.	Documentation Management	• preparation, review, approval • revision • controlled copies • electronic access • records management - retention, include archiving
NRP 05.	Records Management	• record retention and archiving
NRP 06.	Operating Organisation	• consistent with SAR Chapter 13 • roles and responsibilities • qualification • fitness for duty • delegations
NRP 07.	Training and Personal Development Management	• consistent with SAR Chapter 13 • training program • accreditation levels • refresher training and reaccreditation • accreditation panel • panel review
NRP 08.	Conduct of Operation	• staffing • fitness for duty • periodical updating and review • self assessment • safety culture • operability • licence • OLC compliance • foreign material exclusion

	Procedure	**Scope**
	Conduct of Operation (cont'd)	• procedural use and adherence (all BMS manuals etc) • RAC • Surveillance, testing • periodical regulatory reporting • human factors • approval of experiments • plant safety review & upgrading
NRP 09.	Safety Management	• ANSTO policy • OH&S o WorkCover requirements o Safety Directives • Fire safety o smoke detection, o fire suppression, o combustible material control, o egress, o fire response
NRP 10.	Radiological Safety	• for radiation workers and others • local HP arrangements • local area classification • area radiation monitoring • ALARA compliance • dose reduction
NRP 11.	Configuration Management	• licensing basis • safety reviews and evaluations • design control • modifications • project management • human factors • staged submission • review approval • regulatory interface • document revision • process verification and validation
NRP 12.	Maintenance Management	• work control • post maintenance testing • CMMS • routine surveillance • testing & inspection • preventive & corrective maintenance • Extended shutdown • safe working permits • spares inventory • danger tags • isolations

	Procedure	Scope
NRP 13.	Utilisation Management	• facility & systems operations manuals • logs • irradiation approval • programming • monitoring and measurement of products and process • production scheduling
NRP 14.	Core Management	• reactor analysis • criticality
NRP 15.	Nuclear Material Management	• including fuel, control rods, heavy water • receipt • handling • inspection • transport • storage • accounting, • safeguards reporting • disposal
NRP 16.	Radioactive Source Control	• ANSTO policy • licence • use and inspection • source register • storage • disposal
NRP 17.	Waste Management	• radioactive and other • solid, liquid, gas • limits • sampling • storage • disposal • environmental protection
NRP 18.	Event Response	• ANSTO Response Plan • RRR local control • operator response to anticipated operational occurrences, DBA, BDBA.
NRP 19.	Security Management	• facility security policy • physical protection • access systems • control of visitors
NRP 20.	Organisational Arrangements during Commissioning	• organisational groups • interfaces • roles and responsibilities • lines of reporting and communication

18.6 SUMMARY

The existing ANSTO reactor operating organisation, the Replacement Reactor Project and INVAP have Quality Management Systems certified to AS/NZS 9001 or ISO 9001. For the RRR Project in particular, specific QA Programs have been developed by both ANSTO and INVAP to accommodate the necessary interfaces between the parties to the Contract through the commissioning and testing phases.

A Quality Management System has been developed to cover the routine operation and maintenance of the Reactor Facility from the commencement of hot commissioning, Stage B. This QMS has been developed specifically for the Reactor Facility and will be certified and maintained to AS/NZS 9001: 2000 as part of the ANSTO organisation-wide certification to that standard.

The arrangements described in this Chapter provide adequate assurance that quality objectives will be achieved during the commissioning and operation of the Reactor Facility.

End of Section