



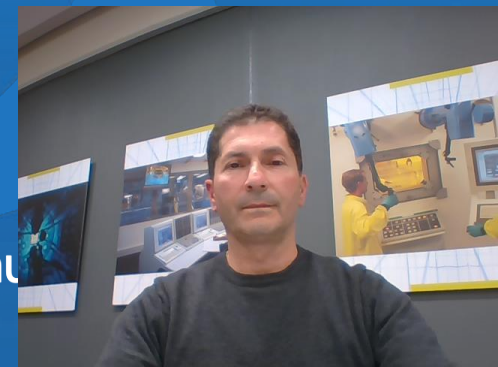
An Asset Management Approach for Reliability

OPAL Reactor

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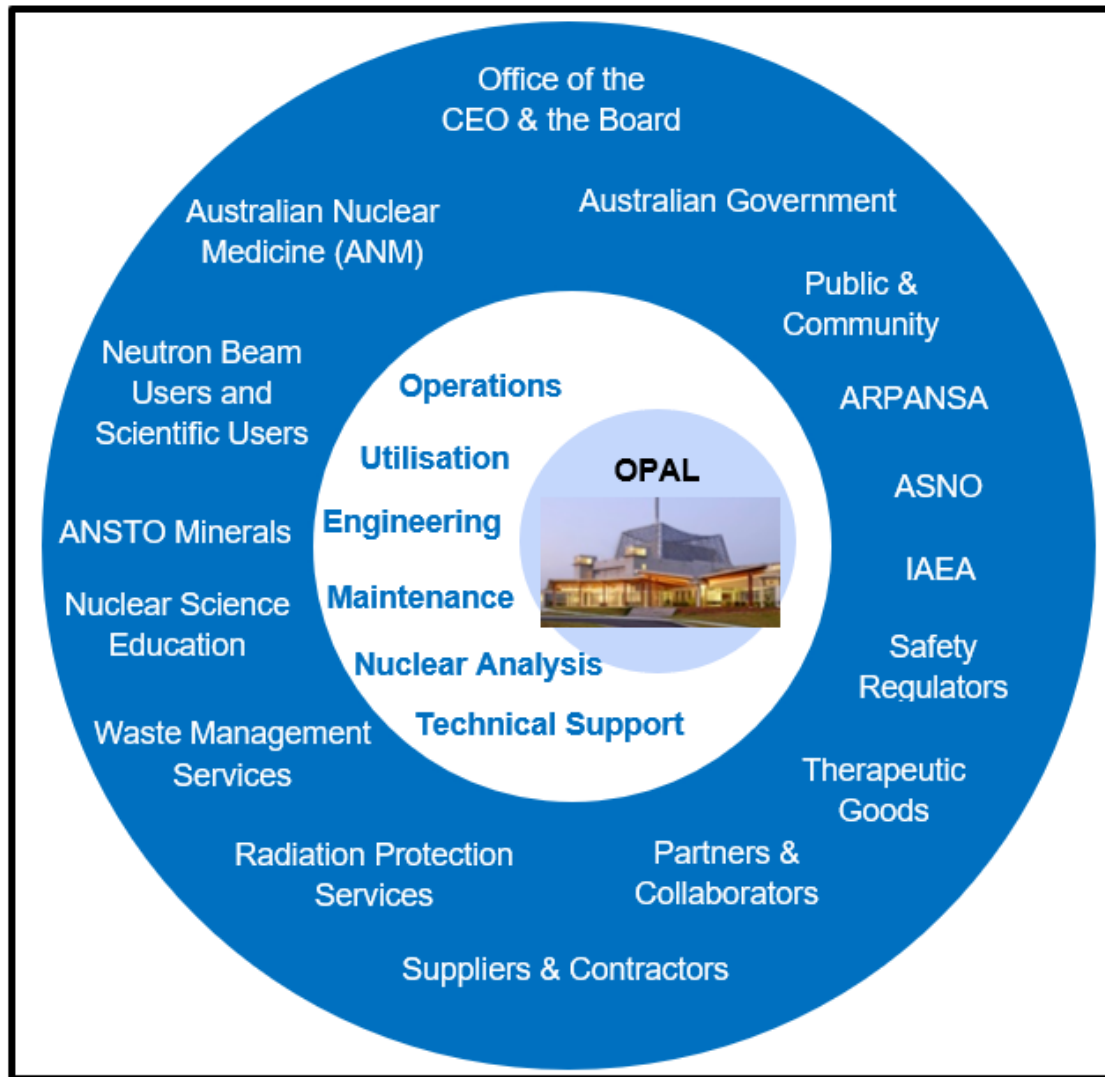


Overview

- Stakeholder Needs – Strategic Planning (NG-T-3.16)
- Ageing Management and Asset Management
- Reliability Engineering
- System Maintenance Strategies
- Maintenance Service Delivery



Stakeholder Needs (NG-T-3.16)



Safe, Secure and Reliable Operation

Ageing and Asset Management

Ageing Management (SSG-10)

Engineering, operation, and maintenance strategy and actions to control within acceptable limits the ageing degradation of SSCs

Asset Management (ISO 55000)

The coordinated activity of an organisation to realise value from an asset

Ageing Management Elements (SSG-10)

Management System	Stages of Lifetime	Programmes	Interfaces with other Areas
1 Responsibilities	1 Design	1 Screening SCCs	1 Maintenance, periodic testing and inspection
2 Resource Management	2 Fabrication and Construction	2 Identification and Understanding	2 Periodic safety review
3 Process Implementation	3 Commissioning	3 Minimization	3 Equipment qualification
4 Measurement, Assessment and Improvement	4 Operation	4 Detection, Monitoring and Trending	4 Reconstitution of the design basis
	5 Utilization and Modifications	5 Mitigation	5 Configuration management
	6 Extended Shutdown	6 Continuous Improvement	6 Continued safe operation
	7 Decommissioning	7 Record Keeping	7 Post-service surveillance and testing

Asset Management Groups (IAM)

GROUP 1

Strategy Planning

- 1 Asset management policy
- 2 Asset management strategy & objectives
- 3 Demand analysis
- 4 Strategic planning
- 5 Asset management planning

GROUP 2

Asset Management Decision-making

- 1 Capital investment decision-making
- 2 Operations & maintenance decision-making
- 3 Lifecycle value realisation
- 4 Resourcing strategy
- 5 Shutdowns & outage strategy

GROUP 3

Life Cycle Delivery

- 1 Technical standards and legislation
- 2 Asset creation & acquisition
- 3 Systems engineering
- 4 Configuration management
- 5 Maintenance delivery
- 6 Reliability engineering
- 7 Asset operations
- 8 Resource management
- 9 Shutdown & outage management
- 10 Fault & incident response
- 11 Asset decommissioning & disposal

GROUP 4

Asset information

- 1 Asset information strategy
- 2 Asset information standards
- 3 Asset information systems
- 4 Data & information management

GROUP 5

Organisation & people

- 1 Procurement & supply chain management
- 2 Asset management leadership
- 3 Organisational structure
- 4 Organisational culture
- 5 Competence management

GROUP 6

Risk & review

- 1 Risk assessment & management
- 2 Contingency planning & resilience analysis
- 3 Sustainable development
- 4 Management of change
- 5 Asset performance & health monitoring
- 6 Asset management system monitoring
- 7 management review, audit & assurance
- 8 Asset costing & valuation
- 9 Stakeholder engagement



Reliability Engineering

- Ownership of SSCs
- Knowledge of SSCs Design
- Knowledge of ageing mechanisms
- Knowledge of Failure modes
- Reliability Centred Maintenance

A	Reactor Systems	D	Instrumentation and Control Systems
01	Reactor Core	40	Nucleonics Instrumentation
02	First Shutdown System (FSS)	41	Reactor Protection Systems and PAM System
03	Second Shutdown System (SSS)	42	Reactor Control And Monitoring System (RCMS)
04	Reflector Vessel	43	Control Rooms
05	Fuel Management	44	OPALNet Systems
06	Reactor Pool (RPO)	45	Radiation Monitoring Systems
07	Service Pool (SPO)		
		E	Electrical System
	B	50	Electrical System
10	Primary Cooling System (PCS)		
11	Reflector Cooling and Purification System (RCPS)	F	Containment and Non-conventional HVAC Systems
12	Emergency Make-Up Water System (EMWS)	51	Reactor Ventilation Systems
13	Reactor and Service Pool Cooling System (RSPCS)		
20	Reactor Water Purification System (RWPS)	G	Services
21	Secondary Cooling System (SCS)	52	Radioactive Waste Management
22	Hot Water Layer System (HWLS)	53	Services
23	Demineralised Water Supply System (DWSS)	54	Conventional Area HVAC Systems
		55	Cranes and Hoists
	C	56	General Equipment
32	Reactor Building	57	Security System
34	Offices and Visitor Centre Buildings		
35	Auxiliary Buildings	H	Neutron Beam Facilities
37	HWUS Building	60	Neutron Beam Facilities
		62	Cold Neutron Source (CNS)

Reliability Engineering

WHAT

- Tasks and their interval
- Fixed Time Tasks
- Failure Finding Tasks
- Condition Monitoring Tasks

WHEN

WHY

Specific failure type addressed by maintenance tasks

WHO

Responsibility for performing maintenance tasks

HOW

How to perform task. Plan, task list, materials and instructions

System Maintenance Strategy

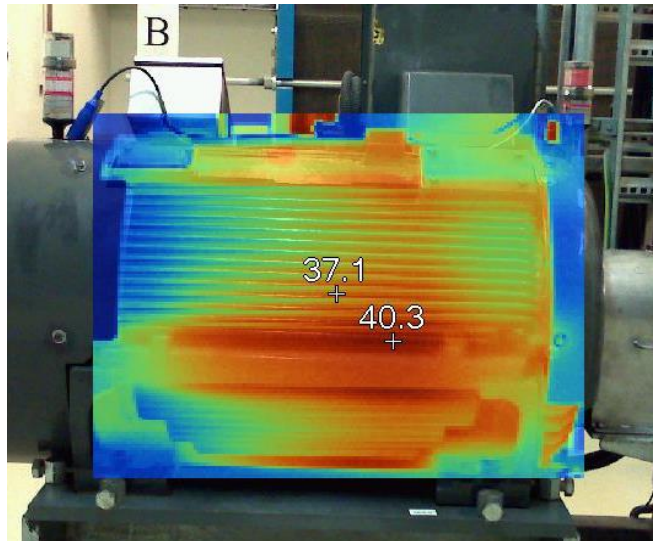
WHAT					WHEN	WHY	WHO	HOW		
No	Task/Activity Description	CM	FT	FF	Relevant Task	Interval ¹	Function Failure/Purpose	Work Centre ⁸	SAP Plan	Integrated Support Docs ⁴
1	SCS pumps bearing vibration and thermography analysis (motor and pump)	X			Replace main pump motor Replace main pump impeller assembly/bearing Replace main coupling	1M	<p>To detect bearing faults/wear, imbalance, coupling or impeller faults, looseness, soft-foot, misalignment in pump or motor that may eventually result in bearing failure/seizure.</p> <p>For pumps 2110-AB-001A/B/C, 2110-AB-003A/B and 2110-AB-004A/B, the task is performed at power on the running pump. Pumps are regularly changed over in accordance with the power cycle briefing and HVAC/CNS pump change-overs.</p> <p>For pumps 2110-AB-002A/B, the task is performed at shutdown on the running pump (refer above LTDCL pump run task).</p>	MECH	OMP-600 OMP-609	OMI 0000-011
2	SCS internal pipework inspection by Ultrasonic Testing thickness testing	X			Repair, replace or recoat pipework	24M	<p>Ultrasonic thickness measurements are taken of Mat Class C piping to trend carbon steel pipe thinning and assist in predicting remaining service life of the SCS.</p> <p>Note: SCS corrosion is also monitored through analysis of SCSWT corrosion coupons, refer to Maintenance Strategy OMM 2100-001.</p>	CONT	OMP-123	OMI 0032-003 OPAL-0032-DAS-005

Maintenance Service Delivery

- Shared Responsibility

- Maintainers
- Operators
- Engineers

- Condition Monitoring and Precision Maintenance



Thank you

Questions

