



Australian Government

Australian Nuclear Science and Technology Organisation

Licensing of ANSTO's OPAL Reactor during Construction and Commissioning

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Outline of Presentation

- OPAL Construction Licence
- Interface between ANSTO, INVAP and ARPANSA
- Licensing issues during construction
- OPAL Operating Licence
- Licensing issues during commissioning
- Conclusions/Lessons Learnt

OPAL Construction Licence

- OPAL Facility Licence, Construction Authorisation granted in April 2002
- Approved the overall construction of OPAL, including cold commissioning, based on the PSAR
- Licence contained 18 Licence Conditions, a number of which had significant impact on construction.

Licence Condition 4.6

- LC 4.6: Construction of Items Important to Safety
- Specific application of ARPANS Regulation 54 to OPAL construction
- Required the approval of the CEO of ARPANSA to construct individual items important for safety
- Applicable to all SC 1 and 2 structures, systems and components (SSC), which form 90% of plant systems

Licence Condition 4.6 (cont.)

- More than 130 submissions to ARPANSA
- Complex process requiring careful management by all parties to integrate with construction.
- Several issues that would have otherwise arisen during evaluation of the Application for an Operating Licence addressed at an earlier stage.
- A process that focussed on SC 1 and the few “significant” SC 2 systems might have a better value for effort ratio.

Licence Condition 4.7

- LC 4.7: Commissioning of Items Important to Safety
- Originally applicable to all SC 1 and 2 SSCs
- Subsequently revised in the light of experience with LC 4.6 to cover a specified listing of SSCs as identified in LC 4.7.2
- ARPANSA approval based on INVAP cold commissioning plan plus specific pre-commissioning and cold commissioning procedures for identified SSCs

Interface between ANSTO, INVAP and ARPANSA

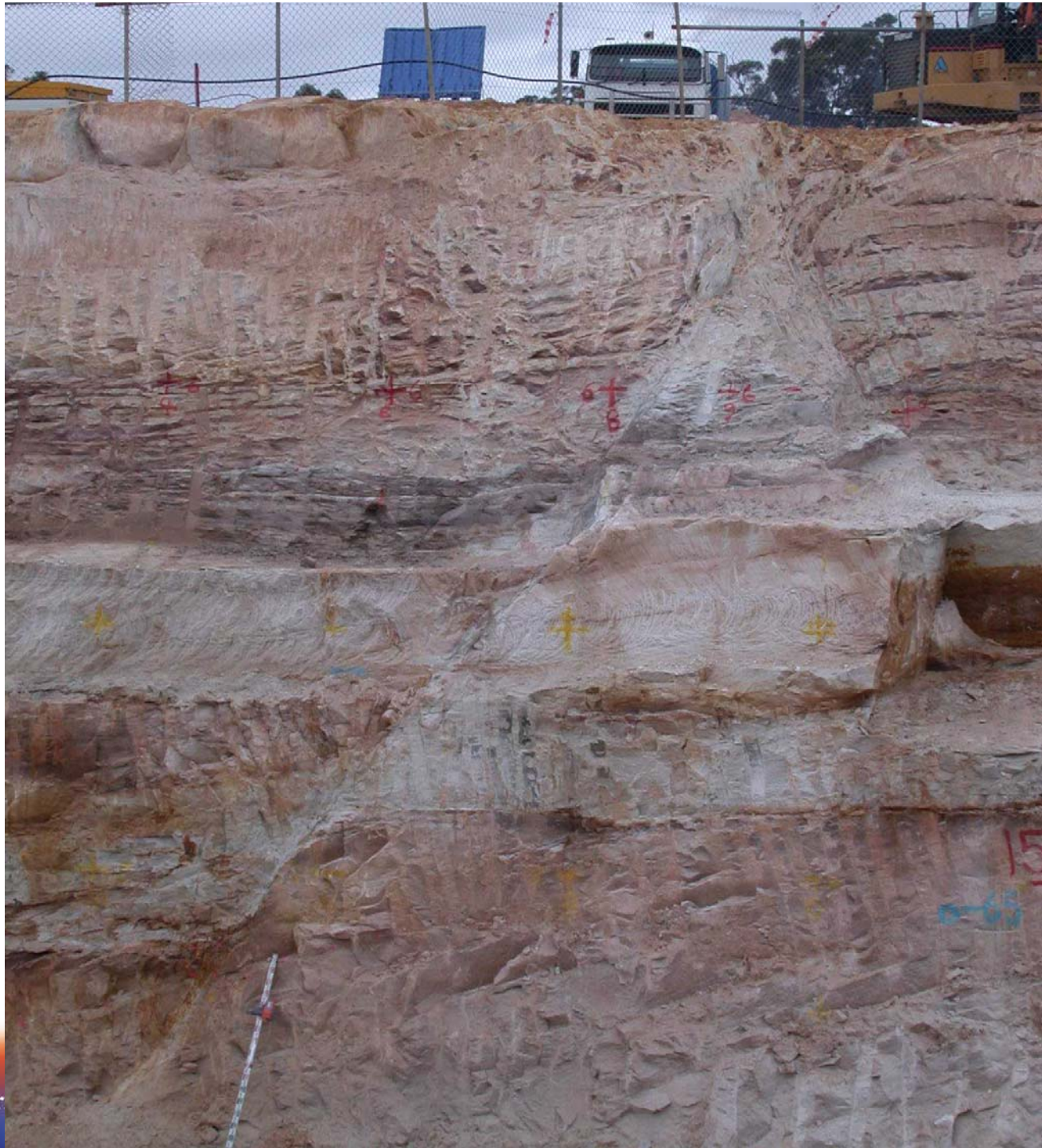
- Between ANSTO and INVAP/JHEDI
 - Weekly ARPANS Regulation 54/LC 4.6
 - Weekly project management meetings
 - Quarterly Project Review Meetings
- Between ANSTO/INVAP and ARPANSA
 - Weekly Assessment Committee Meetings
 - Regular Project Management Meetings
- Project S&L Manager – single point of contact at working level between ARPANSA and ANSTO

Licensing Issues – Construction

- A number of licensing issues arose during construction of the OPAL reactor.
- Most significant were:
 - Discovery of a geological fault during site excavations
 - Concrete cracking in the Reactor Building basement
 - Reactor Pool heavy water penetration cut-outs
 - Repairs to Reactor Pool

Licensing Issues (Cont.)

- Discovery of a geological fault during site excavations in June 2002
- ANSTO suspended construction activities on the site
- A report submitted to ARPANSA
 - assessed by various national and international experts
 - no significant movement of the fault for 9 ± 4 million years
- Delay to the project schedule of 4 months

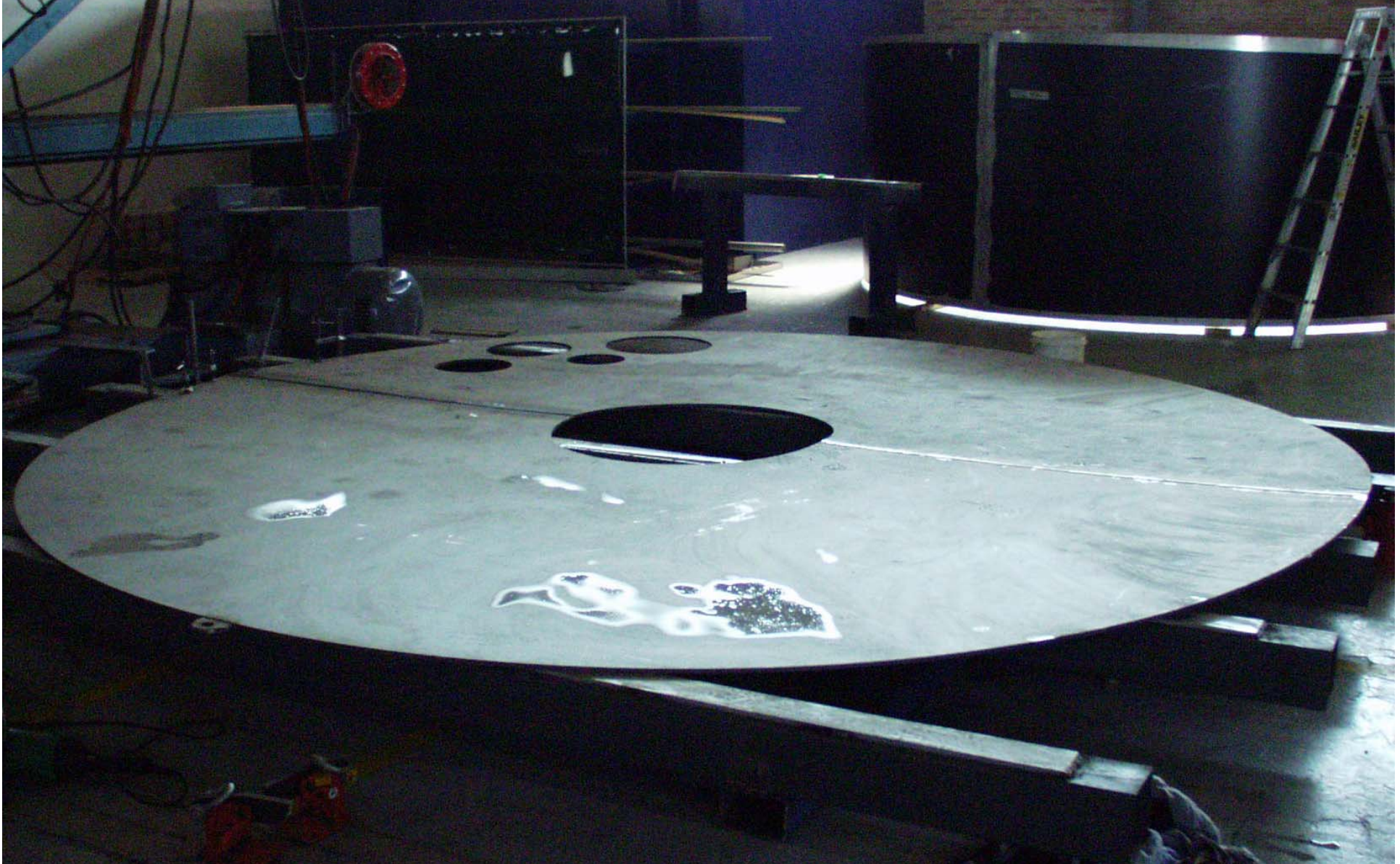


Licensing Issues (Cont.)

- Higher than anticipated cracking in the Reactor Building basement
- Submissions to ARPANSA demonstrated degradation of concrete and corrosion of reinforcing steel from groundwater unlikely in the medium to long term
- ARPANSA engaged a civil engineering consultant to provide independent advice

Licensing Issues (Cont.)

- The Reg54 approval explicitly excluded the cut-outs for the heavy water pipes that penetrated the base of the Reactor Pool
- The Reactor Pool heavy water penetration cut outs were made, constituting a breach of Reg54
- No enforcement action taken:
 - First occasion when a breach of licence condition had occurred
 - CEO of ARPANSA satisfied with commitments made to ensure that that such a breach did not occur again



Licensing Issues (Cont.)

- Manufacturing error resulted in some penetration holes in the Reactor Pool liner being incorrectly positioned in liner shell strakes
- Additional concerns related to:
 - Delays in the errors being detected
 - Delays in communication between the manufacturer and INVAP (the designer)
 - Unauthorised repairs had been carried out by the manufacturer on some of the misplaced penetrations
- ARPANSA imposed an additional licence condition that required ANSTO to provide quarterly reports on quality assurance matters.



OPAL Operating Licence

- Application for a Facility Licence, Operating Authorisation submitted September 2004
- Required before fuel could be loaded into the reactor and hot commissioning started
- Principal documents were the plans and arrangements for managing safety, the SAR (revised from the PSAR) and the OLCs.

OPAL Operating Licence (cont.)

- The Application was subject to review by
 - ARPANSA Regulatory Branch
 - ARPANSA Nuclear Safety Committee
 - IAEA Peer Review Team that concentrated on operational issues
 - Public review and submissions, including a Public Forum in early December 2005
- Operating Licence granted July 2006

Licensing Issues – Commissioning

- A number of licensing issues also arose during commissioning of OPAL.
- Most significant were:
 - ARPANSA hold points during commissioning
 - Core outlet temperature measurements
 - High activity in primary coolant

Licensing Issues (cont.)

- Hot Commissioning split into 3 stages:
 - Stage B1: fuel loading and initial criticality
 - Stage B2 low power test – natural circulation
 - Stage C: power ascension and full power tests – forced circulation
- ARPANSA requested hold points not anticipated during initial scheduling.
- Resultant delays not significant due to parallel production of commissioning reports and efficient review by ARPANSA

Licensing Issues (cont.)

- Core outlet temperature and core temperature difference measurement anomalies during power ascension.
- Caused by temperature measured by sensors not representative of core outlet temperature.
- Resulted in a Reg 51 modification to sensors that was quickly approved by ARPANSA.
- Facilitated by working level meetings at which ARPANSA officers were regularly briefed on status of investigation and proposed solutions.

Licensing Issues (cont.)

- High activity in primary coolant following start-up after 2nd refuelling.
- Sipping of core quadrants and fuel assemblies performed.
- One suspect fuel assembly was removed and replaced with new assembly.
- Reg 51 modification to approved fuel management strategy was approved by ARPANSA, again facilitated by working level meetings at which ARPANSA officers were regularly briefed on status of investigation and proposed solutions.

Lessons Learned

- Nothing helps the licensing process more than well organised and clear submissions and approval process.
- A single working level point of contact facilitated the licensing process and minimised potential misunderstandings.
- Frequent, periodic meetings, even when there were no major issues on the table, proved to be extremely valuable for open communication.

Lessons Learned (cont.)

- Top and middle management involvement in the licensing process is essential.
- Coordination between different regulatory bodies (eg nuclear safety and security) is essential to ensure clarity as to who approves what.