

## DEFENCE NUCLEAR SAFETY BOARD

### 2005 ASSURANCE REPORT TO THE DEFENCE ENVIRONMENT AND SAFETY BOARD (DESB) AND THE DEFENCE NUCLEAR SAFETY COMMITTEE (DNSC)

#### OVERVIEW

1. This assurance report from the Defence Nuclear Safety Board (DNSB) covers the period April – December 2005 to match revised Departmental reporting requirements (it will in future be annual). The DNSB oversees nuclear and radiological safety and environmental protection in the naval nuclear propulsion and nuclear weapons programmes. This report presents a summary compilation of assurance gathered by the independent MOD regulators, the Chairman Naval Nuclear Regulatory Panel (CNNRP) and the Nuclear Weapon Regulator (NWR); its conclusions have been noted by the implementers in both programmes.

#### ASSURANCE ASSESSMENT

2. CNNRP and NWR have assessed that those responsible for the Naval Nuclear Propulsion Programme (NNPP) and the Nuclear Weapon Programme (NWP) have maintained a high standard of safety for the submarine crews, the workforces, the public and the protection of the environment. The demonstrability of this performance to accepted modern standards is good in some parts of the programme, but needs improvement in others. There have been some notable safety improvements and achievements in the programmes, but resource constraints (people and money) and programme management limitations have continued to frustrate safety improvements in some areas.

3. On the basis of the assurance provided by CNNRP and NWR, and dialogue with the dutyholders, the Chairman of the DNSB is satisfied that an acceptable standard of nuclear and radiological safety and environmental protection has been maintained in the operation and delivery of the nuclear propulsion and weapons programmes. Safety behaviour is generally appropriate in the nuclear programmes, underpinned by effective systems for safety and environmental protection, but there are a number of issues which present risks to compliance or demonstrability of compliance with SofS's Safety and Environment Policy Statement and which nuclear programme implementers should regard as potentially significant risks to their programmes.






#### ISSUES & RISKS

4. 9 significant issues are presented in the table below. Progress has been made in addressing all the key risks presented in the 2004 DNSB report. Some of these no longer appear in this table and are being managed as normal business while others still appear but with a lower risk rating taking account of the action already taken. Some issues have become more significant over the last 9 months and are now included. In the table, *Regulatory Risk* is interpreted as the risk to:

- compliance with SofS Safety & Environment Policy Statement in respect of relevant legislation, government policy and MoD requirements (as expressed in JSPs);
- demonstrability of such compliance;
- workforce and public safety.

*Current risk* is the current likelihood of the Regulatory Risk prior to Strategies and Controls being implemented. A high (red) current risk suggests that significant regulatory action might be necessary within a year; medium and low risks have a commensurately longer realisation period. The level of current risk stated is a judgement of the significance within the defence nuclear programmes; no attempt has been made to calibrate these levels against the levels of risks in other safety environments.

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| Issue   | Regulatory Risk  | Proposed Strategies & Controls  | Owners & Managers | Current Risk  |
|---|--|---|-------------------|---|
| <p><b>1. Strategic Management</b><br/>                     DG Nuc's span of responsibilities does not extend to line and performance management of the DPA nuclear IPTs.</p>  | <p>Risk to compliance with SofS Policy in mis-alignment between safety responsibility and resources.</p> | <p>Extend DG(Nuc)'s executive authority to become line and performance manager for the DPA nuclear IPTs.</p>  | <p>DG(Nuc)</p>    |    |
| <p><b>2. Submarine Enterprise &amp; Contracting Strategy</b><br/>                     The challenges of safety assessment against modern standards &amp; addressing the fragmented management structure remain. NNPP contracting strategy results in an inability to prioritise the resource for safety improvements across the whole propulsion programme.</p>                                   | <p>Risk to demonstrably meeting modern standards, due to no contractual incentive.</p>                   | <p>Review contracting strategy to incentivise desired outcomes with safety having as much influence as the financial and commercial disciplines.</p>  | <p>DG(Nuc)</p>    |    |
| <p><b>3. Through-life Management, Decommissioning &amp; Disposal</b><br/>                     No costed and funded through life management position for all submarine platforms. No funded NRP decommissioning &amp; disposal plan, and thus no adequate facilities available to defuel SSNs at the end of service life. Potentially difficult and significant public perception consequences</p> | <p>Risk to demonstrably meeting SofS policy, MoD requirements and wider government policy (Cm 2919)</p>  | <p>Production of a costed and funded through life management plan for all platforms. Production of a Naval Reactor Plant decommissioning &amp; disposal strategy.</p> <p>Co-ordination of stakeholder engagement to drive a coherent approach to decommissioning and disposal across the programme.</p> | <p>DG(Nuc)</p>    |  |
| <p><b>4. Safety Case Improvement</b><br/>                     Safety cases across the propulsion programme are not optimal and fall short of best practice. Inconsistent assumptions prevent their effective use to inform investment decisions.</p>  | <p>Risk to demonstrable compliance with requirements.</p>  | <p>Identification of a programme owner for safety case development to ensure a coherent approach across the programme and to derive maximum benefit.</p>  | <p>DG(Nuc)</p>    |  |
| <p><b>5. Emergency Response</b><br/>                     The current assessment that a radiation emergency at an operational berth (Z and foreign) is reasonably foreseeable requires declaration of significant emergency planning distances in the UK, that may be disproportionate to the real hazard.</p>   | <p>Risk to compliance with SofS policy and the Standard Statement</p>                                    | <p>Implement a strategy to take credit for the robustness of the NRP design and seek to demonstrate that a radiation emergency is not reasonably foreseeable at an operational berth.</p> <p>Establish a credible Reference Accident approach to directly address the requirements of REPIR.</p>        | <p>DG(Nuc)</p>    |  |

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| <b>Issue</b>  | <b>Regulatory Risk</b>   | <b>Proposed Strategies &amp; Controls</b>  | <b>Owners &amp; Managers</b> | <b>Current Risk</b> |
|---|--|--|------------------------------|---------------------|
| <b>6. Clyde Naval Base</b><br>A growing backlog of key regulatory issues, that remain unaddressed, are increasingly threatening Clyde's ability to conduct nuclear activities. Specifically: propulsion authorisation; weapons authorisation; ASTUTE preparedness | Risk to compliance with legislation and JSPs 518 & 538, and to workforce safety                    | Implementation of an improved programme management process, allowing better prioritisation and resource management, and a targeted improvement in specialist resource. | NBC (Clyde)                  |                     |
| <b>7. Nuclear Transport</b><br>There are inconsistent arrangements for the transport of nuclear weapons, special nuclear material and reactor fuel which is exempt from legislation. Cross-fertilisation, efficiency and adoption of best practice is inhibited.  | Risk to demonstrability of compliance of transport safety arrangements with Departmental standards | Improve professional focus on nuclear transport seeking commonality with nuclear weapon arrangements   | DG Nuc                       |                     |
| <b>8. Warhead Modification</b><br>[REDACTED]. Safety approaches need amendment and re-approval.   | Risk to demonstrability of compliance with NW SPSCs (JSP538)                                       | Develop safety campaign & engage [REDACTED]  | NW TL                        |                     |
| <b>9. Event Notification</b><br>There is inadequate information about potential abnormal events with NWP equipment which threatens the ability of operators to notify events effectively.   | Risk to compliance with JSP538 and to ministerial notification requirements.                       | Derive and promulgate guidance for NWP operators.  | StratSys TL                  |                     |

**PROGRESS & SUCCESSES**

5. Those responsible for implementing the nuclear programmes have:
  - a. Reinforced DG(Nuc)'s role as Senior Responsible Owner for the delivery of equipment and support for the nuclear programmes by clarifying his lines of authority over DLO nuclear IPTs and developing his influence in respect of the naval bases.
  - b. Achieved Authorisation of the Naval Reactor Plant in December, thus completing the authorisation of all parts of the NNPP.
  - c. Reduced the hazard associated with nuclear submarine upkeep in Devonport Royal Dockyard, including demolition of the submarine refit complex central management office block (prior to the docking of HMS TRIUMPH), and the completion of primary circuit decontamination in HMS VICTORIOUS.
  - d. Successfully heat treated the RPV Closure Head for HMS VICTORIOUS.
  - e. Made real progress in improving safety case methodologies across the propulsion programme.

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- f. Delivered satisfactory safety justifications on a number of Reactor Plant issues to support operations, including: Control Rod Drive Motor (CRDM) [REDACTED] [REDACTED] RPV UCC on HMS SOVEREIGN; and updated UCC safety justification on HMS SPARTAN to support extended core life operation. Produced acceptable safety justifications enabling the Authorisation to Operate (AtO) for HMS TORBAY and HMS TIRELESS post RAMP.
- g. Developed the concept of mutual assurance between the NRP Authorisee and DML for the conduct of HMS TALENT's LOP(R).
- h. Established and implemented an effective permissioning process to support the safe build and commissioning of the Astute Class, with improvements in the delivery of the NRP safety case.
- i. Achieved regulatory permission [REDACTED] in the Explosives Handling Jetty at HMNB Clyde and maintained continued operational use of the Shiplift, Finger Jetty and Southern Jetties.
- j. Demonstrated a better understanding and acceptance of the NWP regulatory framework.
- k. Applied lessons learned from the introduction [REDACTED].
- l. Amended the AWE contract to end the period of shadow regulation.
- m. Delivered a new safety case for road transport of nuclear weapons.
- n. Given an adequate demonstration of arrangements in a programme of 13 emergency response demonstrations, including the grade A exercise SENATOR 2005 in Edinburgh.

## ISSUES

### Strategic and cross-cutting issues

- 6. The formal empowerment of DG Nuc in March 2005 marked a significant change in management arrangements for the delivery of the nuclear programmes. This was reviewed, from a safety perspective, and Chairman DNSB agreed that it represented a positive development but with more to do. Subsequent activity has been encouraging; transfer of full line and performance management coherency of DPA nuclear IPTs to DG Nuc would address many of the remaining safety management concerns. The formal arrangements by which DG Nuc exercises his responsibility for nuclear safety in the Naval Bases remains unclear. (Issue 1)
- 7. To achieve a sustainable, safe, submarine enterprise proposals are needed to meet the challenge of safety assessment against modern standards with an ageing plant design, sustain an industrial base capable of meeting MoD's medium to long term requirements given the highly variable output required to meet current and likely future plans, and address the fragmented management structure within the MoD. It is of note that reliance on contractor support continues to increase in all areas thereby continuing to place at risk MoD's ability to fulfil its essential intelligent customer capability. The mechanisms and levers are still not in place to allow MoD to drive coherent behaviour across the submarine enterprise and similar activities continue to be managed through diverse routes, although the NPIPT's intent for development of a new Flotilla Reactor Plant Support contract is an encouraging approach. Of particular concern for the future is the impact of the DLO financial commitment pause on the Coherent Equipment Plan which threatens technology insertion and may delay real engineered safety improvements. While Submarine

Acquisition Modernisation work has continued substantive proposals to meet these challenges have not yet been forthcoming (Issue 2).

8. Best international and UK practice is that a nuclear safety case must address the entire plant lifecycle, substantiating and documenting the safety of all activities, thus providing a demonstration that relevant standards have been met and that risks are ALARP. While such demonstration must be founded on robust engineering design, and defence-in-depth, safety cases should focus on safety performance, including identification of safety functions, bounding conditions and limits, operating, maintenance and staffing requirements. They must be integrated with the safety management arrangements, and provide a vehicle for focussing investment in appropriate safety improvements. Deterministic analysis should predominate, and may be supported where appropriate by probabilistic analysis. In the NNPP all hazard emanates from the Naval Reactor Plant, but given its mobility, and the changing safety responsibilities through the lifecycle, there is a complex web of safety cases, which together, across the whole lifecycle, fall short of this best practice in a number of ways. Much encouragement, however, is taken from the safety case improvement programme, which is concentrating on the development of appropriate safety case methodologies and implementation of safety principles across the propulsion programme; and the generic shut down safety analysis work which should fill a void. Meanwhile safety case development continues, but in the absence of a commonly accepted overarching strategy lacks coherence. There is a risk of elements of the generic shut down safety analysis overlapping with safety case work at the sites, but the increasing clarity in responsibilities, resulting from Naval Reactor Plant Authorisation, should facilitate avoidance of this. (Issue 4)

9. DG Nuc's nuclear safety Balance of Investment (BOI) initiative is encouraging. There is concern that without a coherent cost base line across plant and facilities and without a robust methodology to measure safety benefits, meaningful comparison will not be achievable and the benefits will not be delivered. The success of the BOI process is dependent on the quality of the input data and therefore it is vital that the safety case methodologies improvement programme and the shut down safety analysis development work are recognised as key BOI enablers and continue (Issue 2 & 4).

10. Licensees bear the legal responsibility for safety for all activities conducted on their Licensed Site, whilst the costs for improvements are borne either directly or indirectly by MoD. This misalignment between benefit and detriment militates against the ability to prioritise the resource for safety improvements across the whole programme, matching resource to hazard. It is evident that continued boat by boat contracting does not facilitate the required long term planning and industrial investment. To achieve long term value for money across the programme there is a need for all contracts to incentivise desired outcomes ensuring that safety has as much influence on contracting strategy as financial and commercial disciplines. The intended development of the NPIPT/Rolls-Royce Flotilla Reactor Plant Support contract along these lines is welcome. (Issue 2)

11. There is a general lack of through life management planning across the propulsion programme and currently real progress is inhibited by inconsistency and fragmentation as different solutions are found to safety problems within varied projects. This manifests itself in increased programme cost and pressures on design authority resource. The Rolls Royce customer forum is addressing the symptoms, but a clear owner of the overarching strategy must be identified to own a coherent solution (Issue 3).

12. All defence Licensees have published a decommissioning strategy for their respective sites in accordance with government policy (Cm 2919), and the NII's assessment of these strategies is openly published. The laid up submarines, both those already defuelled and those awaiting defuelling are currently well managed and maintained, and pose negligible hazard in the short term. But the lack of a detailed overarching decommissioning and disposal strategy for nuclear submarines (including the De-equip Defuel and Lay-up Period - DDLP), for which CNNRP should publish his assessment, and the resulting lack of compliance with government policy, is of significant concern. Site decommissioning at Rosyth, the future storage of increasing numbers of fuelled submarines at Devonport for up to 10 years, and the Interim Storage of Laid-Up

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Submarines (ISOLUS) Project all have a significant public profile, and public comparison with the DTI/NDA's management of the civil nuclear legacy is inevitable, with considerable potential to adversely affect the public's confidence in the safe management of the propulsion programme. The increased focus on this issue by DG Nuc, at the Defence Nuclear Executive Board, and the Defence Management Board is welcome, but much remains to be done, both to establish provision for re-establishment of a defuelling capability as soon as reasonably practical, and in publishing an overall strategy, against which projects such as ISOLUS can be taken forward. (Issue 3)

13. Managers in the NWP have demonstrated better "instinctive" understanding of safety issues – safety culture is improving – this is evident in the greater clarity that now exists about safety case responsibilities. It remains more difficult to capture these understandings, particularly in relation to responsibilities at organisational interfaces, in documented, auditable arrangements that will stand the test of time and personnel change. There has been no incident of significant safety importance over the period, but work to improve the technical guidance to NWP operators on the diagnosis of possible incidents with strategic weapon system equipment is outstanding. (Issue 9)

**Individual issues**

14. The 2005 REPIR submissions are a significant improvement over the 2002 submissions, but some key shortfalls remain. The shortfalls are associated with the analysis of the reactor plant, and therefore with NII agreement CNNRP has issued a Safety Improvement Notice. Given the current assessment that a radiation emergency at an operational berth (Z berth and foreign berth) is reasonably foreseeable, REPIR requires declaration of detailed emergency planning distances to responding local authorities in the UK for emergency planning purposes. REPIR has increased public awareness of MoD's nuclear propulsion activities, particularly at operational berths, and the significant emergency planning distances determined from the current analysis may be disproportionate to the true hazard, giving rise to unwarranted concern. As recognised in the previous annual report, a longer term strategy is needed, taking greater credit for the robustness of the NRP design, with the intent of demonstrating that a radiation emergency is not reasonably foreseeable at an operational berth and establishing a credible methodology to directly address the requirements of REPIR (Issue 5).

15. Despite recognition by HMNB Clyde of the need for improvements to safety management arrangements, only very limited progress has been made and the Clyde Naval Base has continued to struggle to make headway against a number of core issues, including the delivery of a site-wide programme of improvement, nuclear weapons authorisation, and ASTUTE readiness. This presents a high risk and has significant potential to impact the Base's capability and the provision and justification of any future new capability. The capability to support and operate ASTUTE Class at HMNB Clyde is expected to be consistent with good safety management practice and MoD nuclear safety policy. The constraint of inadequate resourcing, particularly of NSQEP personnel, and of arbitrary RCT reductions over recent years, was highlighted in a recent independent review, sponsored by DG Nuc. This has provided a clear analysis of the root causes of the problems faced at the Clyde and made some key recommendations to address them, focussed particularly on improving programme management. Implementation of these recommendations is essential to making the necessary improvements, and whilst the firm commitment of the Authorisee and the Base Executive Board to doing so is welcomed, extra sustained resourcing will be required if the Base is going to be in a position to make good the shortfalls identified. (Issue 6)

16. Road transport of weapons, in the recently-established "continuous running" mode, was conducted safely, and a new safety case was provided for regulatory review. Emergency arrangements both for the convoy and at the tactical and strategic level were demonstrated in the Grade A exercise SENATOR. Changes have been proposed to the emergency response arrangements for air transport. NWR has called in the changes for review and expressed concern that, for different reasons, none of the three required NAR exercises was held in 2005; inspections are being conducted to establish continuing viability. No progress has been made in the agreed extension of the scope of authorisation for nuclear weapon transport to include SNM. Business

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and operational responsibilities for the transportation of SNM remain unaligned: organisational changes have been mooted but not formally pursued. Furthermore, the arrangements for transport of reactor fuel similarly lack focus, and thus consideration should be given to transferring the funding and responsibility for all nuclear material movements to a single centre of excellence. There is a need for a review of nuclear transport management which seeks out synergies and efficiencies in providing professional consistency for an adequate safety-oriented solution. (Issue 7)

17. Project management of the planned modification of the nuclear warhead (including stakeholder consultation) is effectively addressing safety issues. Briefings and papers have been presented for regulatory review to facilitate a judgement informing the IAB business case

(Issue 8)

18. Aspects of the AWE process for deriving their Annual Statement of Stockpile Health have been inspected, complementing last year's similar process for the NW IPT. This confirmed the previous view that the process was very robust. NWR is again content to support the conclusions that the warhead stockpile is safe, noting some improvement in addressing accumulated recommendations for further surveillance work.

19. Details of an amendment to the AWE M&O contract to conclude the "shadow" regulation period were notified by NW IPT in December; some commercial risk will remain with the IPT in ensuring that AWE's operations are compliant with JSP538. The expectation is that authorisation can be pursued with a target of Autumn 2006. A regulatory strategy has been agreed between NWR and HSE (NII & HID) for the upgrade of facilities at Burghfield; strategies for other major projects are being drafted. Multi-stakeholder (regulators with NW IPT & AWE) working has become the norm for the significant capability sustainment programme.

**REGULATORY ACTIVITY**

20. Merger of CNNRP and NWR (in April 2006) has been agreed by all stakeholders and 2<sup>nd</sup> PUS. The new group (the Defence Nuclear Safety Regulator - DNSR) will be hosted in the joint DPA/DLO Technical Enabling Services alongside explosives and ship safety regulators; its single customer will be Chairman, DNSB on behalf of 2<sup>nd</sup> PUS.

21. In seeking assurance about safety CNNRP and NWR between them:

- permissioned 16 significant nuclear activities;
- reviewed at least 230 documented safety submissions;
- conducted 37 planned inspections (many jointly with NII) and 3 reactive inspections and investigations in response to unplanned events;
- assessed 13 emergency response exercises and a further 4 smaller scale demonstrations on particular aspects of the arrangements;
- issued 1 safety improvement notice.

22. The joint assessment of REPIIR submissions from defence duty-holders marked a further step forward in the "joined-up regulation" between CNNRP/NWR and HSE's NII. The relationship is particularly crucial to key defence programmes managed by DML, BAESM and AWE. There is increasing dialogue between the MoD regulators and the environmental agencies (EA & SEPA) for whom MoD authorisation is seen as the parallel of NII licensing. A letter of understanding is being developed with the Department for Transport which will regularise roles, aligning them with the exemptions in the relevant regulations, and in due course, formalise the defence "competent authority" remit with DNSR.

23. NII are revising their Safety Assessment Principles (SAPs) and recognising the mutual benefit to both parties, the NNRP has engaged to influence the revision and to achieve greater

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clarity in the coherence between NII SAPs and MoD's Nuclear Propulsion Safety Principles and Safety Criteria (NPSPSCs). It is intended, subsequent to and informed and influenced by the NII SAPs revision, to revise NPSPSCs so that they are more clearly coherent with NII SAPs. While the criteria will be presented differently to enhance coherence with NII SAPs targets and limits, it is intended not to fundamentally change the criteria. The revised safety principles will remain at a high level, and will be coherent with the dutyholders development of coherent implementation through the Safety Case Improvement programme.

**PRIORITIES FOR 2006**

24. In 2006 those responsible for implementing the nuclear programmes should:

- a. Ensure that DG Nuc becomes line & performance manager for DPA nuclear IPTs. (Issue 1)
- b. Clarify the arrangements by which DG Nuc exercises his nuclear safety responsibility in the Naval Bases. (Issue 1)
- c. Review the contracting strategy across the propulsion programme to ensure the desired outcomes are incentivised with safety having as much influence as the financial and commercial disciplines. (Issue 2)
- d. Produce a costed and funded through life management strategy for all submarine platforms. Produce a Naval Reactor Plant decommissioning strategy. (Issue 3)
- e. Identify a programme owner for safety case development to ensure a coherent approach to safety case development across the propulsion programme. Continue to develop the NRP Shut Down Safety Case, with appropriate resourcing priority. (Issue 4)
- f. Improve the demonstrable safety performance of the defence nuclear programmes. In part this involves taking better credit for existing sound engineering design. (Issue 4)
- g. Produce and implement a strategy with the aim of demonstrating that radiation emergency is not reasonably foreseeable at an operational berth. (Issue 5)
- h. Ensure that Clyde is adequately resourced to fully implement the recommendations of the recent review. (Issue 6)
- i. Improve professional focus on nuclear transport seeking commonality with nuclear weapon arrangements. (Issue 7)
- j. Develop the safety campaign for warhead modification & further engage [REDACTED] [REDACTED] (Issue 8)
- k. Complete the guidance on incidents for NWP Authorisees. (Issue 9)

25. In 2006, the MOD Nuclear Regulators should:

- a. Complete the merger of CNNRP and NWR to form DNSR, hosted within the DPA/DLO Technical Enabling Service.
- b. Continue to further develop the philosophy for joined up regulation with the Nuclear Installations Inspectorate.
- c. Develop arrangements for joined up regulation with the EA and SEPA.
- d. Establish a letter of understanding with the Department for Transport, clarifying responsibilities for the regulation of the transportation of nuclear materials.



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- e. Establish more objective metrics for the assessment of safety performance across the defence nuclear programmes, in consultation with the dutyholders.
- f. In consultation with DS&C and DG Nuc, clarify the responsibilities for management of defence nuclear safety policy, radiological protection policy, and influencing emerging relevant legislation.
- g. Continue to engage in the NII SAPs revision, in consultation with defence dutyholders.

