



HM NUCLEAR INSTALLATIONS INSPECTORATE

BNFL SELLAFIELD AND DRIGG AND UKAEA WINDSCALE LOCAL LIAISON COMMITTEE REPORT

QUARTERLY REPORT FOR 1 OCTOBER TO 31 DECEMBER 2004

FOREWORD

This report is issued as part of the Health and Safety Executive's commitment to make information about inspection and regulatory activities relating to the above sites available to the public. It is for distribution to members of the Sellafield Local Liaison Committee (SLLC) and covers activities associated with the regulation of safety at BNFL Sellafield and Drigg and UKAEA Windscale.

These reports are distributed quarterly and will be available on the Internet. Site Inspectors of HM Nuclear Installations Inspectorate (NII) attend SLLC meetings and will be happy to respond to any questions raised there. Any other person wishing to inquire about matters covered by this report should contact HSE, Nuclear Safety Directorate Information Centre on 0151 951 4103.

This report will be put onto the HSE Website at

<http://www.hse.gov/nsd/nsdhome.htm> under "Local Liaison Committee Reports"

1 INTRODUCTION

NII Inspectors made a total of 56 visits to the Sellafield, Calder Hall, Windscale and Drigg sites during the quarter. This involved a total of 251 days on site (see Table 1 for details). The more significant issues identified during these inspections are summarised below.

2 BNFL SELLAFIELD

2.1 GENERAL SITE MATTERS

2.1.1 Support to National Decommissioning Authority (NDA)

NII undertook a review of the important scope and schedule aspects of the revised Life Cycle Base Lines (LCBLs) for Sellafield, Drigg and Calder Hall during this Quarter. This second LCBL represents a significant improvement over its predecessor.

Although issues were identified that need to be addressed, the NII reviews of the Calder Hall and Drigg LCBLs indicated that they appear broadly acceptable to us.

However, the review did indicate a need for substantial development and improvement to the Sellafield LCBL before NII can have confidence that it will deliver regulatory requirements. In particular, there are a number of site and national level strategic issues, omissions, inconsistencies or areas containing insufficient information that need to be addressed.

2.1.2 Coordinated Inspection – Contamination Control

As a result of NII's coordinated inspection of BNFL's contamination control arrangements on the Sellafield site at the end of September, NII has written to the Licensee confirming the outcome of the inspection, summarising the major findings and the required actions. As previously advised, the team concluded that contamination is being controlled on site but there are weaknesses and inconsistencies that need to be addressed. A response from BNFL has been requested by the end of January 2005.

2.1.3 Emergency Exercise

A Level 1 Demonstration Emergency Exercise was held on the 10 November and was a joint exercise involving both BNFL and UKAEA. The aim of the exercise was to test the interactions between the two licensees following the initiation of an event on the UKAEA site. NII judged that the exercise was an adequate demonstration of the emergency arrangements but a number of issues were brought to the attention of both nuclear site licensees for action, such as roll-call and mustering. NII also participated in this exercise and a number of issues have to be addressed to improve the interaction between the inspectors, who may be present on the site, and the licensees' emergency response teams.

2.1.4 BNFL Restructuring Project

The NII's programme for the restructuring of BNFL continues to be on schedule. As part of this work a series of Licence Instruments (LIs) were issued in December 2004. These LIs gave NII's Approval to BNFL and Magnox Electric (ME) to commence their implementation plans in readiness for the restructuring to take place in earnest on

1 April 2005. As part of NII's work to grant these Approvals, BNFL and ME submitted a large number of Management of Change submissions and NII carried out an inspection at Sellafield relating to these on 13-15 December 2004. A further inspection to check progress against the agreed implementation plans will take place at the end of February/beginning of March 2005. A key facet of this inspection will be an examination of the proposed BNFL control and supervision arrangements to cover Nuclear Science and Technology Services' (NSTS) and BNF Instruments' (BIL) staff, who will no longer be part of the licensee after 1 April 2005.

2.1.5 BNFL Technology Centre (BTC) Commissioning

Following a satisfactory readiness inspection, a Licence Instrument was issued allowing BNFL to commence active commissioning of Phase 1 of the BNFL Technology Centre (BTC) in November 2004. Phase 1 involves the Rig Hall and Level 3 Laboratories (excluding gloveboxes). The operations to be carried out in the Rig Hall are typically process development and equipment testing, and the Level 3 Laboratories will be used for a wide range of physical and chemical experiments using trace quantities of active materials.

2.2 INCIDENTS

2.2.1 Nitric Acid Leak in Thorp

In the third quarter BNFL informed NII of an incident in which a fitter and his supervisor received minor burns from a small nitric acid leak whilst maintaining a valve on a non-radioactive system in the Services area of Thorp. BNFL's review of this incident indicated that those involved were neither following the methods for isolation detailed in BNFL's procedures, nor were they wearing the Personal Protective Equipment (PPE) specified for the job.

NII has considered BNFL's response to this event and has noted the actions BNFL has taken to raise the competency of the individuals carrying out this type of work. In addition, the NII has written to BNFL advising it to further review its arrangements, focusing in particular on the responsibilities of those in oversight supervisory roles. In response BNFL has provided details of a number of actions it will undertake and the NII intends to inspect progress during a future visit.

2.2.2 Fatality at Pile 1 chimney

The HSE investigation has been completed and the Coroner's Inquiry is awaited. The Police continue their investigations.

2.2.3 Product Store 5 - Discovery of Rust on Cans and Accountancy Issue

In November BNFL advised NII that during the transfer of cans from Product Store 5 to Product Store 9 Extension, rust like deposits were found on two product cans. At the same time an anomaly was discovered between a retrieved can and its position in the Product Store 5 racks and its position identified on the list of out of specification product cans held in Store 5. Operations were suspended immediately pending an investigation. NII followed up the issue and BNFL advised that the initial investigation revealed 6 inconsistencies between can storage locations and the list held in Store 5 for out of specification product cans. However, the International Standards Database (ISD,) the definitive record, and the Work Instruction reflected the correct store locations. The problem revolved around an out of date data sheet. NII is satisfied that the Licensee has taken corrective actions. At the time of writing this report the details of the BNFL inspection of the rust deposits on the product cans was still awaited.

2.2.4 THORP Evaporator

Thorp reprocessing operations were halted for a maintenance outage during October and November. Shortly after restart of the plant, in early December, a breakdown of the Medium Active Salt Free Evaporator (SFE) occurred. The evaporator system was shutdown safely, radioactivity was contained within the system and there were no environmental discharges. This plant item provides essential support in Thorp and as a result reprocessing operations were suspended while BNFL investigated the breakdown. NII has been monitoring BNFL's investigations.

2.3 MAGNOX REPROCESSING OPERATIONS

2.3.1 Reprocessing Operations

The Magnox Reprocessing plants operated for the majority of the quarter with a short outage for maintenance activities towards the end of the period. BNFL is marginally ahead of its target for the reprocessing of Magnox fuel during the quarter.

2.3.2 Fuel Handling Plant (FHP) and Pond Conditions

BNFL has continued to make progress in retrieving older fuel from the Fuel Handling Plant. Despite the potential for this retrieval work to cause contamination of the pond water, radioactivity contamination levels have remained in the 3000 to 4000 Bq/ml range.

2.3.3 Wet Inlet Facility

A Consent to operate the Wet Inlet Facility was issued during the quarter.

2.3.4 Magnox Reprocessing Plant COSR

BNFL submitted the Continued Operation Safety Report (COSR) for the Magnox Reprocessing Plant in March 2004. NII was not satisfied with the COSR and had considered regulatory action to ensure improvement. A way forward was agreed and BNFL completed a programme of work by agreed dates during the fourth quarter of 2004. NII has been assessing the revised COSR, and many of the improvements arising from the COSR are planned for implementation during the 2005 outage.

2.3.5 Improvement Notice – Magnox PF&S

NII continues to monitor BNFL's progress towards compliance with the requirements of the Improvement Notice. The bulk of the work relates to the continuing rewrite of work instructions, implementation of positive compliance arrangements and the design of engineered controls. BNFL has commenced the introduction of the new Positive Compliance arrangements within Magnox PF&S. It is generating some feedback from the operations staff. NII plans to undertake an inspection on this topic early in 2005, once the new system has had time to bed in.

Although not a specific requirement of the Improvement Notice, BNFL management has sought to improve the safety culture within Magnox PF&S and NII has observed improvements in this area. However, at least two incidents have occurred during the final quarter of 2004 where individuals have failed to follow Local Rules at sub-change barriers. In one instance this contributed to the individual concerned receiving a low level of personal contamination, subsequently removed at the Site Surgery. Such incidents undermine the progress being made by BNFL. NII will continue to monitor this aspect of BNFL's operations.

2.3.6 Product Finishing Line - Continued Operation Safety Report (COSR)

During the latter part of 2004 BNFL advised NII that delivery of this COSR would be delayed. NII raised concerns regarding the revised submission timescales which gave very little time for NII to consider the adequacy of the safety case prior to the declared decision date (Sept 2005) to allow continued operation of the plant. BNFL has now reconsidered its strategy and a dedicated team has been formed with the objective of producing and delivering a fit for purpose COSR in an acceptable timescale.

2.3.7 Stores Inventory Retrievals Project (SIRP)

BNFL failed to deliver the Pre-commencement Safety Report (PCSR) for this project during November. BNFL has been advised by the NII that sufficient time will be needed to review the document before this Project can commence, and that this should have been considered by BNFL in its programme. There are indications that delays may occur in the delivery of SIRP. NII is seeking confirmation from BNFL of the revised programme for the project, including the expected completion date for emptying of Product Stores 1 to 4 and Store 6, against which the implications of any further delays can be judged.

2.4 THORP OPERATIONS

2.4.1 Thorp Operations

Thorp reprocessing operations were halted for a maintenance outage during October and November. Restart of the plant was delayed in early December following a breakdown of the Medium Active Salt Free Evaporator (SFE).

2.4.2 Thorp Plutonium Evaporator

BNFL has completed its review of the safety case for the control of the Plutonium evaporator in the Chemical Plant area of Thorp. BNFL refined its criticality calculations and was able to show a greater margin of safety than had previously been demonstrated. This demonstration has provided additional safety assurance but NII will continue to maintain awareness of this issue as BNFL modifies the safety case to take account of the outcome of this review.

2.4.3 Thorp Fuel Ponds and Radioactive Waste

BNFL intends to begin removing significant quantities of empty fuel containers, and other pond furniture from the Thorp Fuel Ponds over the next few years as part of a developing fuel storage strategy. NII and EA engaged with BNFL on its long-term strategy for managing this redundant equipment that will be designated as radioactive waste. In this quarter BNFL provided NII with a programme of work on the studies required to underpin its selection of a preferred strategy. NII and EA will monitor BNFL's delivery against this programme and the first in a series of regular progress meetings will be held in January 05.

2.5 HIGH ACTIVE LIQUOR WASTE PLANTS

2.5.1 High Active Liquid Evaporation & Storage (HALES)

BNFL continues to operate in compliance with the NII HAL Specification that limits the overall volume of highly active liquor and the volume of liquor derived from oxide fuel that can be stored in the plant. However, the margin between the operating volumes and the limit volumes has been under some pressure this period; a situation not helped by the need to empty Evaporator B.

Licence Instrument 504 was issued in early December acknowledging a series of modifications and allowing the introduction of a new clearance certificate for HALES.

The report of NII's review of BNFL's HAL strategy and compliancy with the HAL Specification is attached to this report, as advised at the last meeting of the Sellafield Local Liaison Committee. The attached report covers the period to September 2004.

2.5.2 High Active Storage Tanks (HAST)

In October 2004 BNFL reported, under the agreed process, that activity spikes had again been seen in the cooling water from HAST 13. A programme of tests were conducted through November during which it was confirmed that activity had entered both jacket sections 2 and 3 and that the radioactive fingerprint of the activity was that expected for HAL. NII has concluded that the tank wall has allowed minute quantities of HAL to pass into the cooling system; the mechanism is considered to be crevice corrosion. BNFL continue a programme of testing to allow a better understanding of the location and nature of the penetration; NII is monitoring this work and considering the implications for storage and the HAL Specification. BNFL has provided a justification for this work and NII is satisfied that adequate safety margins and protection are in place.

A thorough test on all jacket sections has been completed and no activity detected with the exception of HAST 12 jacket section 3. The very small amount of activity detected was at too low a level to characterise. An enhanced surveillance programme has been put in place for HAST 12 jacket section 3.

2.5.3 HAL Operations

HAL operations have continued routinely for most of the quarter. During the shut down of Evaporator B in December a significant activity spike was detected indicating that one of the evaporator coils had failed allowing HAL to enter the system used for cooling during evaporator shut down. The activity levels were such that BNFL took the conservative decision to empty the evaporator immediately. The recovery strategy and implications of the failure are currently under discussion.

2.5.4 Cooling Integrity

Work continues on the cooling integrity projects. Progress is slower than expected but BNFL has brought forward the project for the installation of intermediate heat exchangers which, it is anticipated, NII will acknowledge in early 2005.

2.5.5 Windscale Vitrification Plant (WVP)

Vitrification rates are in line with the BNFL's plan and that required to meet the HAL Specification. Line 2 has been available through the quarter and there is evidence that good progress has been made to overcome a persistent problem with the electrical inductors. Both Lines 1 and 3 have undergone rebuild and returned to service. Line 3 was lost for a time when it suffered an unexpected failure.

2.6 MOX OPERATIONS

2.6.1 Sellafield MOX Plant (SMP) Operation

MOX commissioning operations in the powder mix, pelleting, inspection and rod manufacture continued to ramp up the rate of production in a carefully controlled manner. NII monitored some MOX operations, and related commissioning activities

and attended scheduled Project Liaison meetings. Safety performance was reviewed and no significant safety issues emerged. Good liaison is maintained between the SMP management and the NII. Inactive commissioning of fuel assembly and the export facility is nearing completion and will be followed by active MOX commissioning. This does not require formal agreement from NII.

2.6.2 SMP - Special Premises Regs 1976 – Fire Safety Inspection

As reported previously, an inspection in SMP had been undertaken with the HSE Fire Surveyor, under the Special Premises Regs 1976, to assess compliance with the Fire Certificate for 'means of escape' and fire compartmentalisation. Several key issues had emerged and a 'steps to take notice' under the Special Premises Regs 1976 had been issued to SMP. The issues arising have now been dealt with and closed.

2.6.3 MOX Demonstration Facility (MDF) Operations

NII has monitored some work to build surplus stored MOX fuel rods into dummy fuel assemblies. This was completed to the appropriate safety and quality standards and the assemblies were placed into secure storage. The plant has reached the end of its planned operational life and work is ongoing on the Post Operational Clear Out (POCO) of the facilities in readiness for decommissioning. This process will continue over several years.

2.7 WASTE TREATMENT & DECOMMISSIONING

2.7.1 Specification 324

Specification 324 was issued on the 4 August 2000: it covered the removal of radioactive waste from a variety of older ILW stores being used by BNFL.

BNFL failed to meet the full scope of the requirements of the Specification 324 Schedules by the due date of 1 August 2004. The majority of the radioactive waste specified to be removed had been recovered by BNFL but there was still some that required retrieval. Progress in satisfying the Specification was slow on several occasions and a number of letters were sent by NII requesting that adequate resources be applied to meeting the Specification. To ensure compliance, it was felt necessary to issue Improvement Notices requiring retrieval of the waste to an agreed Programme.

The facilities concerned are old plants, which were not specifically designed to store waste for prolonged periods and have poor structural integrity. In addition, the waste stored in these facilities has degraded with time. BNFL is now making good progress in retrieving the remaining nuclear waste stored in the original Product Finishing Line and the North Group ILW Store in line with the Improvement Notices.

2.7.2 Waste Treatment Complex (WTC) Commissioning

The active commissioning of WTC (PCM drum compaction and grouting facility, which places the compacted materials into Stainless Steel drums and grouts them for interim safe storage) has been ongoing for some years. NII has received a request for a Consent to Operate and will be carrying out a 'readiness for Consent to Operate Inspection' in January 2005.

2.8 LEGACY PONDS & SILOS

2.8.1 Wet and Dry Waste Storage Silos

BNFL has continued with its programme of improvements on the Wet Silos. These include projects that make the Silos more robust and projects preparing for remediation (i.e. Silo emptying). This quarter included the completion of a significant project using remote methods to clean up a radiation spill from several years ago. This will reduce worker doses and allow future work to be carried out in less challenging conditions

BNFL has also made progress on the Dry Silos Projects, including the commencement of demolition of the original charge tunnel. Removal of the tunnel will improve safety margins at the facility, but is also part of the programme of work leading to remediation of this facility (silo emptying).

NII's regulatory approach is that long-term hazard reduction will require the emptying of both Wet and Dry Silos. NII has ensured that the NDA is aware of the regulatory drivers that should underpin future improvements to BNFL's Life Cycle Baseline (LCBL) so that these requirements are recognised. NII is also looking at BNFL's Near Term Work Plan (NTWP) to determine if BNFL's plans for the next financial years include sufficient work on the main regulatory drivers.

2.8.2 Piles Fuels Storage Pond and Magnox Storage Pond

Some areas of work are progressing well on these two facilities. However a number of tasks related to contingency arrangements e.g. pond water leakage appear to be slipping. The work on the ponds has been subject to funding changes, which has affected programmes of work. Nevertheless a strategy is emerging whereby BNFL should meet the requirements of the Specifications.

An area of concern is the possible unavailability of B13 on the UKAEA site, which is used to sort nuclear matter retrieved from the Ponds. B13 is experiencing problems with the safety case, which is reported within the UKAEA Windscale section of this Report. BNFL is attempting to decouple the tasks performed by B13 from the Piles Fuels Storage Pond Project critical path.

2.9 SITE & PLANT SERVICES, INCLUDING RESEARCH & DEVELOPMENT

During this quarter, NII's interactions with this part of site have concentrated on two areas of work. The first relates to redundant facilities within the analytical laboratories. NII requires BNFL to confirm that these are being maintained in a satisfactory condition, and that they should be decommissioned promptly, as funds allow. The other area relates to improvement projects arising from Periodic Reviews.

2.10 EFFLUENT & ENCAPSULATION

2.10.1 Medium Active Tank Farm (MATF)

Historically, NII has had concerns regarding the suitability of the Medium Active Tank Farm for the storage of medium active concentrate (MAC) liquors, related particularly to the condition of the tanks and the integrity of the roof over certain tank compounds. NII has pressed BNFL to actively pursue a strategy of continued inventory reduction for this facility, and during October the Licensee advised NII that the radioactive

inventory of the liquors contained in the Storage Tanks had been reduced by 50 percent. This involved significant volumes of liquid waste being transferred out of MATF and treated within LAEMG.

The volume of MAC in the tanks in Compound 7, whose roof has led to most concern, is now down to heels.

2.10.2 Floc Retrieval – Floc Storage Facility

NII and the Environment Agency undertook a readiness inspection of the Floc Retrieval Project. The objective of the inspection was to confirm the adequacy of the arrangements for floc retrieval, in particular the start of floc re-suspension. NII informed BNFL that a satisfactory outcome to the inspection was a prerequisite before the Executive would be able to consider issuing the consent to commence Active Commissioning Stages 3 to 5. During the inspection the team identified a number of issues that BNFL is required to address prior to a consent being issued.

In accordance with the Memorandum of Understanding between the Environment Agency and the Health and Safety Executive, NII has also sought the views of the EA on BNFL's formal application seeking Consent to commence Active Commissioning Stages 3 to 5 of the Floc Retrieval Project.

2.10.3 Amendment to COSHH Regulations - Chromium (VI) Content of Cement

An amendment to the COSHH Regulations (dated 17th January 2005) and which implements EU Directive (2003/53/EC), will make it illegal to market, or use in the UK, any Ordinary Portland Cement (OPC) with a chromium (VI) content above 2ppm unless a formal exemption is in place. Cement manufacturers will be required to add a reductant to the OPC, hence reducing the Cr (VI) to Cr (III), to meet this Directive.

The Encapsulation Plants at Sellafield use OPC as a process raw material, as do a number of other nuclear waste conditioning plants in the UK. The conditioned waste products are subject to acceptance criteria based on the original OPC formulation. There has been insufficient time for BNFL to complete the work necessary to determine the impact of the reductant (ferrous sulphate) on the final waste form. Hence, and after discussions with HSE and the NII, BNFL applied to HSE for a Certificate of Exemption, against the need to comply with the amendment in relation to Chromium (VI) in cements.

A Certificate of Exemption was drafted that will apply to the UK nuclear industry as a whole, and to suppliers of cement, where the cement is used solely to encapsulate nuclear waste. The certificate will continue for 12-months, to enable BNFL to investigate the effects of reductant dosed OPC on the encapsulated waste form, and hence whether or not the acceptance criteria for final waste form can be met.

2.10.4 ILW Storage Strategy

BNFL is continuing to develop its strategy for ensuring adequate provision of ILW storage on the Sellafield site for future arisings of encapsulated waste from MEP, WEP and WPEP. This involves the provision of a new EPS 3 store, as BNFL's forecasts indicate existing spare capacity will be used by around 2010. NII has been involved in discussions on this topic with a view to moving the main issues forward. BNFL is seeking consent from NII to temporarily use EPS2 transport aisles for storage as a contingency resulting from delays during the build time for EPS 3. This would lead to extended retrieval times for stored packages. To underpin its strategy, BNFL is in the process of developing a robust condition-monitoring regime for the stores and the waste packages.

NII has also had discussions with BNFL about the need for an Import/Export facility to service the new store. In these discussions BNFL presented a robust case for not requiring an additional I/E facility. However, this has not yet been formally submitted in writing.

3 CALDER HALL

3.1 ROUTINE MATTERS

3.1.1 Fuel Route Transition Project

The NII has continued to assess BNFL's Fuel Route Transition Project to implement improvements to both Calder Hall and Chapelcross. There has been good cooperation on this project, and the NII is satisfied with BNFL's responses to address the issues it has raised.

3.2 NON – ROUTINE MATTERS

3.2.1 Magnox Relicensing

A previous LLC report described NII's concern that Calder Hall could become isolated from the wider reactor community owing to BNFL's proposal to relicense Chapelcross to Magnox Electric plc. The NII has carried out inspections of the steps being taken by Calder Hall to address this issue. Although there is more to be done, the NII is satisfied that the issues are being addressed.

3.2.2 The Nuclear Reactors (Environmental Impact Assessment for Decommissioning (EIAD)) Regulations 1999

As explained previously, to begin decommissioning, Calder Hall needs a Consent from HSE based on evidence submitted in an Environmental Statement under the Nuclear Reactor Environmental Impact Assessment for Decommissioning Regulations 1999 (EIAD). The period of public consultation on the Environmental Statement ended in December 2004 and the HSE is now considering the comments received.

3.2.3 Contaminated Scrap

BNFL reported an incident in which Calder Hall sent some scrap that had a low level of contamination from the site. Calder Hall identified the error and quickly retrieved the scrap. There was no harm caused to workers or members of the public. The NII has examined this event, and is satisfied that Calder Hall has recognised the importance of managing waste disposal safety, and that it is taking steps to prevent a recurrence. One of the steps Calder Hall has identified is a need to improve its waste management facilities.

4 UKAEA WINDSCALE

4.1 B13

There has been considerable activity this quarter on the B13 Safety Case to ensure the delivery of a new Operational Safety Case. Additionally because delivery of this new safety case would not be in time to be implemented before expiry of the old case, a methodology was developed with UKAEA to ensure they remained legally compliant.

As a result UKAEA put in place a Care & Maintenance safety case, which is the legal minimum, required for compliance with the site licence. This is complemented by a formal method to allow some operations to restart early whilst the new Operational Safety Case is implemented and will allow some low hazard operations to restart, probably during January 2005.

The new Operational Safety Case was completed and was considered by UKAEA at its Windscale Nuclear Safety Committee. Formal delivery of the case is expected very early in January. Informal copies were provided in mid-December to allow NII formal assessment to start, although the main work will not be underway until mid-January. Restart of higher hazard operations will not be permitted until NII accepts they are adequately safe.

4.2 Pile 1

The Pile 1 project team continues with scheme feasibility design for decommissioning the Pile 1 reactor. But, development of the new operational safety case that will be required to underpin any scheme has not been as rapid. This new safety case is not now expected to be with NII until Quarter 2, 2005. Acceptance of new safety arguments is crucial if UKAEA is to proceed as intended.

NII does have concern over the longer-term strategy for the decommissioning as noted below.

4.3 Safety Cases

NII is now satisfied that UKAEA has extant safety cases for all its nuclear categorised facilities on the Windscale site. NII has provided advice to help UKAEA to develop a Site Wide Safety Case for Windscale that is approaching completion.

4.4 Emergency Exercises

Windscale provided a scenario for the Sellafield/Windscale Level 1 Emergency Exercise held in November. NII considered the scenario to be well constructed and particularly challenging. The exercise was undertaken with considerable enthusiasm, and NII welcomed the positive contribution of all of those who took part on the day. A key component of the emergency arrangements for Windscale is the ability of the UKAEA Emergency Duty Officer, and BNFL Site Emergency Controller to cooperate at the Site Emergency Control Centre. From NII's observations this aspect worked well. NII was, however, critical of the time taken to complete a roll call in the incident building. This aspect will require a formal re-demonstration to NII.

4.5 Life Cycle Baseline/Near Term Work Plan (LCBL/NTWP)

NII attended as observers at NDA's review of the second Windscale LCBL.

NII has subsequently written to UKAEA with its own comments on this plan. NII acknowledges that this second LCBL (LCBL2) is a significant improvement on the first plan, and recognises that this has been a challenging task for the site. The various

sessions during the NDA team review were informative and positive, and the sessions were conducted in a very open manner.

However, the NII review of LCBL2 has identified a number of concerns that means the Inspectorate is unable at present to give full regulatory support to the proposals in LCBL2. We expect these concerns to be addressed in either the second NTWP or LCBL3, as appropriate. Our primary concerns can be summarised as:

- The absence of a transparent underlying waste and decommissioning strategy that is demonstrably supported by the LCBL.
- The proposed long-term strategy for the piles, particularly that for Pile 1.
- The proposed strategy of minimal remediation and a continuation of Brownfield site management.
- The reliance on others, particularly BNFL Sellafield, without formal agreements on agreed waste routes and service levels.
- The absence of relevant information for B12/B13/B14 regarding BNFL NSTS Post Operational Clean Out, waste management, disposal and withdrawal.

NII has also reminded UKAEA Windscale of its regulatory expectations and requirements for the second Near Term Work Plan.

4.6 Team Inspections

NII conducted two team inspections at Windscale during quarter 4. These looked at Maintenance (LC28), and Safety Cases (LC14). Reports for both inspections are being prepared and the results will be reported to the LLC next quarter.

5 Drigg

5.1 Vaults 8 & 9

BNFL may have problems with the sequencing of construction of Vault 9 and the filling of Vault 8. There is the possibility that a Public Inquiry will be required to determine the provision of planning permission for Vault 9 construction. One way of mitigating the affects of any delay would be to stack isocontainers used for low level waste disposals higher in Vault 8. Higher stacking in Vault 8 also requires planning permission. BNFL may need to examine other options for storage of LLW in the short term.

5.2 Backlog Waste Incident

BNFL reported a small fire in the Backlog Waste Facility at Drigg on 28 Oct 2004. The cause of the incident was a small amount of self-igniting material falling from a damaged drum. The fire went out within in seconds and did not require BNFL intervention. No one was injured and there was no release of activity. BNFL personnel acted in accordance with their procedures and training following the event and in making the plant safe thereafter. Repacking of LLW in the facility has been suspended until the outcome of BNFL's investigation is known.

TABLE 1**QUARTERLY RETURNS FOR
SELLAFIELD, CALDER HALL, DRIGG AND WINDSCALE****DURING THE QUARTER****1 OCTOBER – 31 DECEMBER 2004**

	BNFL SELLAFIELD ¹	BNFL CALDER HALL ²	BNFL DRIGG	UKAEA WINDSCALE
NUMBER OF VISITS	46	2	2	6
INSPECTION DAYS ON SITE	203.5	11	3.5	33
ENFORCEMENT ACTIONS ³	2	0	0	0
Incidents in the quarter likely to be published in HSE's quarterly "Statement of Nuclear Incidents at Nuclear Installations"	0	0	0	0
CONSENTS, APPROVALS	1	0	0	0
LICENCE INSTRUMENTS	4	0	0	3

¹ The figures shown for BNFL Sellafield are those for BNFL's chemical plants. They do not include figures for the plants within the Electricity Generation Group (see note 2 below)

² The figures shown for BNFL Calder Hall are those for the plants on the Sellafield site operated by (or for) the Electricity Generation group, primarily Calder Hall nuclear power plant.

³ An enforcement action may be a Direction issued by HSE under the nuclear site licence, an Improvement Notice, or a Prohibition Notice, or the laying of information in pursuit of a prosecution.

TABLE 2

**APPROVALS, CONSENTS, DIRECTIONS AND WITHDRAWALS
ISSUED DURING THE QUARTER**

1 OCTOBER – 31 DECEMBER 2004

Date	Type	Ref. No.	Description
BNFL DRIGG Nuclear Site Licence no. 29A			
BNFL Sellafield (and Calder Works) – Nuclear Site Licence no. 31G			
09/12/04	Consent	503	Consent to the operation of the Wet Inlet Facility (B311.1)
BNFL Windscale – Nuclear Site Licence no. 46B			

TABLE 3**LICENCE INSTRUMENTS ISSUED DURING THE QUARTER****1 OCTOBER – 31 DECEMBER 2004**

Date	Type	Ref. No.	Description
BNFL DRIGG Nuclear Site Licence no. 29A			
BNFL Sellafield (and Calder Works) – Nuclear Site Licence no. 31G			
08/11/04	Agreement	502	Agreement to commence active commissioning of Phase 1 of the BNFL Technology Centre
	Acknowledgement	504	Acknowledgement of Plant Modification proposal for the introduction of the revised Clearance Certificate for Hales
14/12/04	Acknowledgement	505	Acknowledgement of Receipt of Documentation related to decommissioning of B209 co-precipitate crates
20/12/04	Agreement	506	Agreement to proceed with construction of the Sellafield product and residue store, B556, at BNFL Sellafield
UKAEA WINDSCALE – Nuclear Site Licence no. 46B			
13/10/04	Acknowledgement	500	Acknowledgement of a Category B Modification to the B2 Drum Venting Safety Case
20/12/04	Acknowledgement	501	Acknowledgement of the B13 Care & Maintenance Safety Case
22/12/04	Acknowledgement	502	Acknowledgement and notification of intent to examine of a modification to B13 care and maintenance safety case

HMNII's 2004 biennial review of the storage of liquid high level waste at Sellafield

1 Introduction

1. Highly active liquor (HAL) is produced at Sellafield in the reprocessing of spent fuel from nuclear power stations. It contains fission products and waste actinides, separated from the uranium and plutonium which can be recycled for further power production. The safety of the storage of these heat-generating wastes has been a matter of public interest for many years. The Health and Safety Executive (HSE) published a series of public reports^{i,ii,iii} on the key safety issues and its regulatory approach.
2. In 1990, the Waste Vitrification Plant (WVP) began converting highly active waste from liquid into glass which will retain the hazardous radioactivity in a non-mobile form. The containers of glass provide long-term storage without the need for powered cooling systems, and so are passively safe.
3. In January 2001, the HSE's Nuclear Installations Inspectorate (NII) used its legal powers under the nuclear site licence to place limits on the volume of HAL stored at Sellafield. Specification No. 343 requires the backlog of HAL stocks accumulated since reprocessing began in the 1950s to be reduced to a minimal level, known as the buffer stock, by 2015.
4. The 2001 public report (Ref iii) stated that BNFL was required to provide an annual report to NII on its progress against the specified limits and a programme of committed improvements to plant and procedures. In addition, to take account of technological advances and the changing circumstances of BNFL's business plans, NII would carry out a critical review of the strategy and overall programme every two years in order to identify any further reasonably practicable HAL stock reductions.
5. In line with our stated reporting intentions, the quarterly reports to the Sellafield & Drigg sites Local Liaison Committee (LLC)^{iv} have included information on BNFL's performance against the HAL specification. The outcome of our first biennial review was also reported in this way, in the third quarter of 2002.

2 BNFL's performance against the HAL strategy

6. NII completed the second biennial review in September 2004. This covered the accumulated experience with operating the specification and included a detailed review of the weekly records of HAL volume from January 2001 to March 2004. We have not only confirmed compliance with the specification, but have also considered improvements in process efficiency, trends in the operating margins and the overall effectiveness of the operational strategy.
7. The specification limit on the total volume of HAL was 1470m³ on 1 April 2004. It drops by 70m³ over the next 2 years. There is also a limit for HAL from the reprocessing of oxide fuel in the THORP plant. The oxide HAL is blended with HAL

from Magnox fuel reprocessing before vitrification, in order to optimise the amount which can be incorporated into each container of glass, and thus minimise the total number of containers produced. This limit stood at 630m³ on 1 April 2004, and drops by 85m³ over the next two years. The oxide/blend curve was specified not as an absolute limit, but as a control level in the period up to 1 April 2007. It is permissible to exceed the limit on a maximum of 6 occasions with total duration up to 6 months.

8. The 2001 report gave details of how the curves were derived from modelling predictions of the HAL process based on business assumptions up to 2015. Reasonable assumptions also had to be made about improvements in vitrification capacity and other process parameters, and on the way the plant would be operated. Collectively this set of assumptions was termed the "HAL strategy".

Compliance with the specification and the HAL strategy

9. BNFL achieved compliance with the specification at all times, without recourse to the dispensation to exceed the oxide/blend curve for limited periods.
10. As part of our review, we inspected the arrangements for compliance with the specification, and for planning and control of HAL operations. HAL stocks are recorded and reviewed on a weekly basis. We were satisfied that this was the appropriate frequency for demonstrating continual monitoring, as required by the specification. We also noted that BNFL had established an internal control procedure for anticipating and averting any transgression of the total HAL volume limit.
11. We did, however, identify some scope for improvement in the quality control and format of the reports against the limits. BNFL has already made improvements.
12. Our detailed examination of the records for individual tanks showed that the pattern of operations, including evaporator batches, blending transfer and feed to WVP, conformed to the original strategy and assumptions, albeit at a slower overall rate. Our 2001 report identified a number of aspects of HAL process operations such as in-tank evaporation and target liquor concentrations where improvements were needed to achieve the original plans. We have been able to monitor progress on these by consideration of the operational records of "normalised volume".
13. BNFL has defined normalised volume as the volume a quantity of HAL would occupy when evaporated to the optimal concentration for vitrification. The optimal concentration is specified in terms of the volume of HAL generated per tonne of spent fuel reprocessed. This volume is much greater for oxide fuel than for Magnox fuel because of the greater proportion of fission products per tonne reprocessed. The calculation of normalised volume is therefore based on tracking HAL transfers in terms of the tonnages of uranium from which they were originally separated. Over 2001-3, the physical and normalised volumes progressively converged as excess water was eliminated from the HAL tanks.

Risk, hazard and safety indices

14. Our 2001 report identified a need for a safety index to gauge the hazard from HAL storage in relation to alternative future business options. In the 2004 review, we re-considered the fundamental basis for such an index.
15. The plant safety case for the HAL evaporation and storage (HALES) plant includes the analysis of the radiological consequences to the public from off-site releases of HAL aerosol formed if the tank cooling system fails for so long that boiling starts. The analysis uses calculations of radioactivity content for reference fuels having a minimum cooling time (ie time since removal of the fuel from the reactor) and a maximum irradiation or burn-up (related to reactor power density and time the fuel spends in the reactor).
16. BNFL produces estimates of the radioactive content of the HAL tanks at the end of each financial year (31 March). The estimates are based on the same calculation methods as the safety case, but using the actual cooling times and irradiations of the batches of fuel reprocessed.
17. In our review, we found that this tank inventory data could be used to estimate risk and hazard parameters for the actual tank contents. Our analysis showed that the current heat generation rates in the tanks were around a third of those for the safety case reference fuels at equivalent cooling time. This means that the time available for remedial action if cooling were lost is considerably extended compared to the safety case assumptions—and off-site radiological doses would also be less if boiling did occur.
18. Our review of the radioactivity inventories for 2001-4 showed that after an expected initial increase from 2001 to 2002, the heat generation rate and other parameters were roughly constant over the past three years. NII has asked BNFL to include the HAL storage tank inventories in future annual reports against the specification.
19. At the end of 2003, following numerous discussions with NII, BNFL presented proposals for a safety index based on two parameters related to the safety margins of the plant. One was the volume margin, defined simply as the total volume available for HAL storage less the current volume of HAL. The second was the heat margin, defined as the difference between the heat removal capability of the plant and the current total heat generation of the HAL. BNFL saw this as a useful way of presenting the practical implications of alternative future strategies and contingencies such as removal of a tank from service for any reason.
20. We support this approach, but have concluded that it should be used alongside an understanding of other hazard parameters as discussed above. The safety index involves heat generation figures derived from the HAL tank inventories of radioactivity: this is another reason for closer monitoring of these inventories in future.

3 Review of specification limits

21. The specification limits were based on consideration of BNFL's formal response to the 22 recommendations of NII's 2000 report. This covered a number of areas of the future HAL strategy. In 2004, we reviewed the current situation in each of these areas in respect of their impact on future regulation of HAL stocks. Most of the developments have already been reported to the LLC.

WVP production

22. Breakdowns and premature equipment failures continued to limit WVP production well below its design level. The existing specification exerts continuing strong pressure to achieve sustained high production. BNFL is continuing efforts to improve vitrification performance.

23. Lack of capacity in the vitrified product store should not be a constraint in the foreseeable future. The revised export facility (a major modification of the original facility) is being constructed to return high-level waste containers to BNFL's overseas customers. The first returns are currently planned for 2008.

HAL processing

24. As described above, BNFL's HAL strategy in 2000 required improvements in the evaporation and storage conditions for HAL to support the planned levels of reprocessing and vitrification. Improvements have been achieved. The specification now exerts pressure to maintain or even further improve this process efficiency if the currently planned reprocessing throughput is to be sustained.

25. We reported to the LLC that some medium active concentrate (MAC) liquors have been diverted to the high-level waste plants in order to reduce discharges of technetium-99. This has only a minor impact on the amount of HAL that needs to be vitrified.

26. The appearance of "hot spots" in some of the HAL storage tanks over the past few years has been a safety concern, as well as potentially an additional constraint on the efficiency of operations. NII will continue to monitor the effectiveness of BNFL's hot spot management programme.

Plant safety and integrity

27. The current design of HAL storage tanks contains seven cooling coils with a large excess capacity to counter the potential for failure because of localised corrosion. As expected a number of such coil failures have occurred throughout the life of the plant. BNFL has used the new safety index to predict that, based on projections of the historic rate of failure, the large margin in cooling capacity will not be significantly eroded before 2015, and will actually increase as HAL stocks drop rapidly after 2012.

28. The NII assessment is that there is still significant uncertainty in these predictions. We will therefore continue to monitor closely BNFL's current project to improve cooling water integrity.

29. A significant programme of other engineering improvements and safety case development continues on the HALES plant, addressing both issues from earlier assessments and emergent operational issues such as an excessive number of alarms.

Strategic issues

30. To assist the 2004 NII review, BNFL provided estimates of future HAL stock volumes based on current business plans. These projections included only the currently contracted THORP business, which is expected to be completed around 2010. As a result, the projections showed an earlier reduction in HAL stocks, dropping away from the specification from 2009 onwards and reaching zero in 2014. These predictions assumed considerably higher sustained levels of WVP production than have yet been achieved. We consider that it would be premature to revise the specification to match these predictions.

31. It is also relevant that in April 2005, ownership of the Sellafield site, including the reprocessing and high-level waste plants, will pass to the Nuclear Decommissioning Authority (NDA). The current government policy under which NDA will operate is that new reprocessing contracts for THORP may be sought^v.

Implications for the specification

32. The specification limits were based on what were deemed reasonable assumptions about future business plans in 2000. Experience since then suggests that it would not be appropriate to redraw the lines on the basis of the current HAL stocks predictions (which show a more rapid reduction to below the buffer stock level of 200m³), because future high WVP production levels are not yet assured.

33. Our review showed the effectiveness and robustness of the specification despite significant changes in BNFL's business plans. Any future plans for additional THORP business must fit the specification limits, rather than *vice versa*.

34. The total HAL stocks are likely to remain close to the decreasing specification limit at least until our next biennial review. NII has considered altering the Specification to limits on normalised volume, as a better measure of the hazard. Our 2004 review found that the present limits were effectively constraining the normalised volume, so conversion to this as the specification parameter would not achieve any additional control. Normalised volume is routinely monitored by BNFL as a process control parameter, but demonstration of compliance would be more complex as it is not based directly on measurements in the HALES plant.

35. The current risks from the plant, based on the actual plant inventory, remain considerably below those assessed in the safety case. The concerns over plant integrity were not judged to prejudice the capability of the plant to store HAL safely in the quantities allowed up to 2015, but will be kept under continuous review against the results of plant monitoring and progress with improvements such as intermediate heat exchangers.

36. There do not appear to have been any clear "technological advances" affecting the estimate of requirements for the eventual buffer stock. This will need to be reviewed again if there are new plans for reprocessing business beyond 2015. BNFL's technical efforts focussed more on resolving emergent problems such as

hotspots, possibly affecting process efficiency and operational safety, and cooling water integrity, with implications for the plant lifetime. Significant effort continues on improving vitrification performance.

37. In the light of all the factors discussed above, our review concluded that more rapid HAL stock reductions in the next two years were not reasonably practicable. We found no reason to change the specification limits before the next biennial review in 2006.

38. We will continue to review the specification formally every two years, unless circumstances change: we will keep the LLC informed.

References

i. HM Nuclear Installations Inspectorate, *Safety of the storage of liquid high-level waste at BNFL Sellafield*, Sudbury: HSE Books, 1995.

ii. HM Nuclear Installations Inspectorate, *The storage of liquid high level waste at BNFL Sellafield: an updated review of safety*, Bootle: HSE, February 2000. (<http://www.hse.gov.uk/nsd/bnfl.pdf>)

iii. HM Nuclear Installations Inspectorate, *The storage of liquid high level waste at BNFL, Sellafield: addendum to February 2000 report*, Bootle: HSE, August 2001. (<http://www.hse.gov.uk/nsd/bnfl2.pdf>)

iv. <http://www.hse.gov.uk/nsd/index.htm>

v. Department of Trade and Industry, *Managing the nuclear legacy*, Cmd 5552, July 2002 (<http://www.dti.gov.uk/nuclearcleanup/ach/whitepaper.pdf>).