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## Main Findings of the Commission's Article 35 Verification Sellafield site

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**Area:** Sellafield site, Cumbria, UK  
**Date:** 8 to 12 March 2004

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**Reference of report:** UK-04/1

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### Introduction

Article 35 of the Euratom Treaty requires that each Member State shall establish facilities necessary to carry out continuous monitoring of the levels of radioactivity in air, water and soil and to ensure compliance with the basic safety standards.

Article 35 also gives the European Commission (EC) the right of access to such facilities in order that it may independently verify their operation and efficiency.

For the EC, the Directorate-General for Energy and Transport (DG TREN) and more in particular its Radiation Protection Unit (TREN H.4) is responsible for undertaking these verifications.

For the purpose of such a review, a verification team from DG TREN visited the Sellafield site located on the coast of Cumbria, England, operated by BNFL Ltd.

The visit included meetings with the Department of Food, Agriculture and Rural Affairs (Defra), the Environment Agency (EA) and the Food Standards Agency (FSA).

The EC team also visited the Geoffrey-Schofield Laboratories (GSL) at Whitehaven. The GSL is a subsidiary of BNFL and performs radiochemical analyses on environmental samples.

The verification activities took place on 8-12 March 2004.

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The verification activities encompassed the following topics:

- Discharges of radioactivity into the environment.
- Levels of environmental radioactivity at the site perimeter and in the marine, terrestrial and aquatic environment around the site, for all relevant exposure pathways.

With due consideration of the scope of the verification mission and taking into account the relatively short time available for the execution of the programme, it was agreed that emphasis would be put on:

- The operator's monitoring and control facilities for gaseous and aqueous discharges of radioactivity into the environment, in particular with respect to the following plants: THORP (Thermal oxide reprocessing plant), SMP (Sellafield MOX plant), SIXEP (Sellafield ion exchange plant), EARP (Enhanced actinide removal plant) and SETP (Segregated effluent treatment plant).
- The implementation of the statutory environmental radioactivity monitoring programme as performed by the operator.
- The operator's effluent and environmental laboratories, including aspects of quality assurance and control as well as document control.
- The independent environmental monitoring programmes as performed by the UK competent authorities (Environment Agency and Food Standards Agency).

The present report gives an overview of the Main Findings of the verification team and corresponding recommendations.

These recommendations are addressed to the UK competent authorities.

## **1. Main Findings with respect to the operator's radioactive effluent monitoring programme and related regulatory control**

The verification activities performed at the facilities for monitoring and sampling of gaseous and aqueous discharges of radioactivity into the environment from THORP, SMP, SIXEP, EARP and SETP:

- 1.1 Confirmed the existence and functionality of monitoring and sampling facilities as defined in the regulatory obligations.
- 1.2 Confirmed that discharges of gaseous and aqueous radioactivity are monitored and sampled in accordance with the Certificate(s) of Authorisation delivered by the regulatory authority and respective Implementation Document(s) from the site operator.
- 1.3 Established that the monitoring and sampling facilities are adequate and that the programmes of sampling of gaseous and aqueous discharges are satisfactory.
- 1.4 Established that quality assurance and control is implemented through a compilation of written procedures and working instructions.

However,

- 1.5 It was noted that up to 30% of the gaseous discharges may originate from so called 'approved places' (approximately 80 minor outlets and the open ponds). The accountancy estimates of these discharges are provided for by a combination of data from on-site high volume air samplers and the application of environmental modelling.

*The verification team points out that the "Approved places methodology" involves large uncertainties and should therefore be applied with appropriate safety margins. While this practice is carried out with the approval of the Environment Agency, the verification team recommends that the Environment Agency review the efficacy of this practice.*

- 1.6 It was noted that the operators performing the sampling of aqueous effluent streams prior to discharge are generally not identifiable. The identity of the operator is in general not registered on the sample taking records. The chain of custody is thus not fully traceable.

*It is recommended, with a view to improve quality assurance, that the traceability of responsibility within the chain of custody for aqueous effluent samples be reviewed to include the identity of the operator in charge of taking such samples.*

- 1.7 It was noted that no special security arrangements (such as comprehensive tagging of the sampling point) were in place at the T-059 sample cabinet (EARP bulk discharges) to prevent an operator sampling from the wrong tank. It was however explained that an operator would be experienced enough not to allow this to happen.

*It is recommended, with a view to improve quality assurance, that in those locations where poor identification of accountancy sampling points (aqueous discharges) may possibly lead to human error, remedial action be undertaken such as providing adequate tagging and/or fitting of 'lock and key' security arrangements of the plant items concerned.*

- 1.8 It was noted that the accountancy sampler for the C-14 removal facility is planned to undergo a re-calibration exercise to verify that it is taking representative samples. It was also noted that the sampling provisions for the aqueous discharges from EARP had not been subject to a calibration verification since they came into operation.

*It is recommended, in the general context of quality assurance and control, that the Environment Agency should consider reviewing the calibration status of the aqueous discharge accountancy sampling provisions present on site.*

## **2. Main Findings with respect to the operators' analytical laboratory for discharge samples and related regulatory control**

The verification activities performed at the analytical laboratory for gaseous and aqueous discharges samples:

- 2.1 Established that the laboratory is well equipped and satisfactorily staffed with adequately trained personnel.
- 2.2 Established that quality assurance and control is implemented through a compilation of written procedures and working instructions.

However,

- 2.3 It was noted that there is a protocol for the exchange of samples between plants and the laboratory: all plants sending samples to the laboratory are treated as clients. Under the quality assurance system in force, instead of contracts defining the relationship with the clients, a compulsory sampling schedule has been put in place that involves the responsibility of both parties. However, for the subsequent analysis and reporting of results, the traceability of activities to individual operators or analysts is not always evident.

*It is recommended that the traceability of the chain of custody from the sampling point to the reporting of data be reviewed.*

- 2.4 It was noted that the laboratory has a policy of systematically reporting positive results for its gamma analysis, regardless of the magnitude of the error.

*It is recommended that this practice be reviewed to bring it on-line with international guidance on uncertainty estimation.*

- 2.5 It was noted that sample management practices within the gamma measurement laboratory may give rise to elevated count rates in the vicinity of the detectors. Samples, after having been measured, are placed on a table next to the measurement device and may loiter there for up to two weeks. A Health Physics survey revealed that the count rate adjacent to the detector can be as high as 200 cps whereas the other parts of the room were mostly below 5 cps.

*It is recommended that sample management practices be reviewed with the aim to reduce the possibility of fluctuations in detector background counts and the risk of contamination in the laboratory.*

- 2.6 It was noted that while the laboratory holds UKAS accreditation for most of its analytical procedures since 1991, it does not participate in inter-laboratory proficiency tests.

It is further noted that the comparison of independent Environment Agency effluent monitoring results with operator results was halted during the year 2003 for reasons of

staff shortages. The opportunity to provide the operator with valuable feedback for the assessment of his laboratory performance is thus lost.

*It is recommended, with a view to maintain high levels of quality assurance and control, that the laboratory regularly participates in inter-laboratory proficiency tests.*

*It is further recommended that the Environment Agency should resume transmitting the results of their independent discharge sampling programme to the operator, so as to provide the operator with a valuable means of performing analytical quality assurance checks.*

### **3. Main Findings with respect to the operators' environmental monitoring programme**

The verification activities performed at the facilities for monitoring the environment around the Sellafield site by BNFL:

- 3.1 Confirmed the existence and functionality of monitoring and sampling facilities as defined in the regulatory obligations.
- 3.2 Confirmed that the levels of radioactivity in the environment is monitored and sampled in accordance with the Certificate(s) of Authorisation delivered by the regulatory authority and respective Implementation Document(s) from the site operator.
- 3.3 Established that the monitoring and sampling facilities are adequate and that the programmes of sampling are satisfactory.
- 3.4 Established that quality assurance and control is implemented through a compilation of written procedures and working instructions.

However,

- 3.5 The verification team witnessed the taking of a grab river water sample at Calder river upstream of the Sellafield site. On the sample bottle the location is marked beforehand, whereas it was said that the date 'will be added later'. Sampling time seemed not to be registered at all. River water flow at the time of sampling was not registered either. No documentation of the sampling is done on paper at the time of sampling.

*The verification team recommends the marking of sampling date and time at the time of sampling on site. Sample description, name of sampler, remarks (e.g. flooding) and indication of the river flow rate should be noted on site.*

- 3.6 The Sellafield site, in particular its THORP plant, is one of two substantial sources of Kr-85 discharge to atmosphere within the European Union. While discharges of Kr-85 are monitored in the release duct of the THORP main stack via total beta measurement, neither the operator nor the regulator provide for the measurement of Kr-85 in the environment of the site, off-site, or in the rest of the UK.

*It is recommended that the Environment Agency review whether sampling of Kr-85 in the environment should be made an integral part of environmental monitoring policy.*

#### **4. Main Findings with respect to the operators' analytical laboratory for environmental samples**

The verification activities performed at the operator's analytical laboratory for environmental samples (Geoffrey Schofield Laboratories):

- 4.1 Established that the laboratory is well equipped and satisfactorily staffed with adequately trained personnel.
- 4.2 Established that quality assurance and control is implemented through a compilation of written procedures and working instructions.

However,

- 4.3 The verification team noted that the Lower Limit of Detection (LLD) for a gamma activity analysis frequently is determined by an algorithm associated to the EAGLE database, based on the measurement result.

*The verification team suggests exploring the possibility to use internationally applied algorithms for the calculation of LLDs, decision thresholds etc. and for this purpose would like to refer to the International Standard ISO 11929-7:2005.*

- 4.4 Geoffrey Schofield Laboratories has no access to the EAGLE database.

*The verification team recommends giving the analysis laboratory access to the EAGLE database.*

#### **5. Main Findings with respect to the Environment Agency environmental monitoring programme**

- 5.1 The verification team considers that the Environment Agency environmental monitoring programme is globally satisfactory.

*The verification activities performed do not give rise to a specific recommendation.*

#### **6. Main Findings with respect to the Food Standards Agency environmental monitoring programme**

- 6.1 The verification team considers that the Food Standards Agency environmental monitoring programme is globally satisfactory.

*The verification activities performed do not give rise to a specific recommendation.*

**7. Conclusions**

- 7.1 The verification visit was successful and the objectives of the review were met. Within the remit of verification activities under Article 35 of the Euratom Treaty the report confirms that, with regard to the monitoring of gaseous and liquid discharges and of levels of radioactivity in the environment, the situation is broadly satisfactory.
- 7.2 However, some shortcomings were noted and lead to recommendations by the Commission to the UK competent authorities with the aim to achieve improvements.
- 7.3 The Commission would appreciate being kept informed about the actions the UK competent authority may undertake in the framework of the recommendations made.
- 7.4 Finally, the verification team acknowledges the excellent co-operation it received from all persons involved.

*[signed]*

V. Tanner