The Environment Council

BNFL NATIONAL STAKEHOLDER DIALOGUE

DISCHARGES WORKING GROUP

A combined report comprising:

Interim report:	28 February 2000
First update:	31 October 2000
Second update:	31 January 2002
Date of this combined report:	November 2002

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Produced by The Environment Council

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Preface

This document is a compilation of three previously published reports. The reports are divided by the yellow pages and are presented in chronological order:

Discharges Working Group Interim Report - An initial report from the Working Group to the Main Group on 25/26 November 1999 subsequently published on 28/02/00.

First Update – a meeting report from the reconvened Discharges Working Group that met on 31/10/00 to review their interim report in the light of the UK Strategy for Radioactive Discharges Consultation Document and BNFLs announcement on 23 May 2000 concerning closure of Magnox reactors.

Second Update – a meeting report from the reconvened Discharges Working Group that met on 31/01/02 to review their work in the light of developments over the past year, and to assess any evidence of the Dialogue's impact on BNFL.

BNFL NATIONAL STAKEHOLDER DIALOGUE

DISCHARGES WORKING GROUP

28 February 2000

INTERIM REPORT

Produced by

THE ENVIRONMENT COUNCIL

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Foreword to Interim Report of the Discharges Working Group in the BNFL National Dialogue

Background to the Interim Reports

Two sub-groups were set up within the BNFL National Dialogue: the Waste Working Group (WWG) and the Discharges Working Group (DWG). The working groups included members from community and environment interests, regulators, government departments, BNFL and its UK customers. The terms of reference for the working groups were derived from the outputs of workshops involving a much wider range of interested parties or "stakeholders" in BNFL's activities - the "Main Group".

Participation (by organisation or individuals) in either the overall dialogue or the working groups must not be taken as an indication of support or disagreement with the dialogue itself , its outputs or BNFL's activities.

The reports from both the WWG and the DWG must be read carefully. The working groups have been very careful to outline where they agree and disagree and they have tried to be as explicit as possible.

These are interim reports, with both WWG and DWG indicating areas needing further work. Their principle purpose is to inform the deliberations of the Main Group of stakeholders in the dialogue and any related decisions or activities they might undertake. It is important to note that these are, therefore, interim reports to the Main Group of stakeholders in the dialogue.

Nothing can or should be inferred from the reports about the views of Main Group stakeholders on their contents, except where these views have been made explicit and appended to the reports.

Aim of the BNFL National Dialogue

The BNFL National Dialogue involves a wide range of organisations and individuals interested in or concerned about nuclear issues. Its aim is to inform BNFL's decision-making process about the improvement of their environmental performance in the context of their overall development. The dialogue is open to national organisations and regional groups as well as well as expert and specialist concerns. If you believe you are affected by the issues, think you can contribute or wish to participate then please contact The Environment Council on 020 7632 0117.

History of the BNFL National Dialogue to date

After a preparatory period, a large meeting of stakeholders in the activities of BNFL was held on 9th September 1998. This group identified and prioritised a list of issues and concerns that could be addressed in further meetings. "Reprocessing" and "Trust" headed the list of issues.

In December 1998 a smaller Task Group drawn from a range of organisations (listed below[1]) met to consider how the dialogue might move forwards. Early on it was decided that Trust could not be addressed as a separate issue; rather participants would have to see if it began to build through attempting to work together.

The Task Group recommended that the dialogue first address Waste and Discharges. It was thought these areas offered the best potential for finding some areas of agreement, however limited. These might in turn have an influence on related external developments like the implementation of OSPAR and the government's response to the House of Lords recommendations on the management of nuclear waste. Also it was thought that, as such a nuclear dialogue was unprecedented in the UK, Waste and Discharges offered the best opportunity for learning about the strengths and pitfalls of working together before attempting to address even more contentious issues like Reprocessing.

The Main Group of stakeholders met again in March 1999 to revise the proposed talks programme put forward by the Task Group. The Waste and Discharges working groups were formed and issued with draft terms of reference by the Main Group. Both WWG and DWG revised their terms of reference slightly in the light of the practicalities of the task in the timescale granted (March to November 1999). The amended terms of reference were forwarded to Main Group members in August 1999 and are given in each report.

The role of the convenor

The convenor of the dialogue is The Environment Council, an independent UK charity. The Environment Council is responsible for designing and facilitating each stage in the dialogue. The Council also provides or organises the relevant support, like issuing invitations and booking venues.

The Environment Council is not responsible for any issue discussed in the dialogue. The Environment Council holds no formal position on any of the substantive issues that are or might be considered. It is for the participants to decide what issues are raised, how they might be addressed and how any observations, conclusions and recommendations might be recorded and communicated.

The Environment Council, 28 February 2000

[1]The Task Group met on 14 December 1998. Note that participation in the Task Group in itself did not imply support for or disagreement with BNFL's activities or the National Dialogue. The Task Group consisted of a total of 14 people, as follows:

Mr Mark Fryer	Allerdale Borough Council
Mr Colin Duncan	BNFL
Ms Grace McGlynn	BNFL
Mr Tony Free	British Energy
Mr Robin Simpson	Copeland Borough Council
Cllr Anne Glendinning	Cumbria County Council
Mr Martin Forwood	Cumbrians Opposed to Radioactive Environment (CORE) Mr
Robert Gunn	DTI
Dr Alan Duncan	Environment Agency
Dr Patrick Green	Friends of the Earth
Mr John Kane	GMB
Mr Pete Roche	Greenpeace
Mr Steve Napier	IPMS
Mr David Mason	Nuclear Installations Inspectorate (NII)

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1. Introduction and Background

1.1 This report aims to summarise the progress achieved by the Discharges Working Group (DWG) which was convened as a sub-group of the BNFL national stakeholder dialogue process (the 'Main Group'). This process has the overall objective of making recommendations to the company in respect of ways it can improve its environmental performance. The Main Group made a number of suggestions as to the aims and issues of the DWG's work. These were considered, and we set ourselves an overall objective in the light of the time and resources available:

> *"To recommend a framework for BNFL's management of radioactive discharges (liquid and aerial) with particular emphasis on a contribution towards achieving the OSPAR strategy"*

We were unable to explore all the possible approaches for contributing to the implementation of a UK OSPAR strategy because evaluation of different spent fuel management options as an alternative to reprocessing was outside our remit. Nonetheless we believe that our work, reported here, will make a substantial contribution to the further work and discussion which is already planned in the ongoing stakeholder dialogue process.

1.2 The full Terms of Reference of the group, developed through successive meetings, are available and referenced in Appendix 6.

1.3 The dialogue process involves circa 80 stakeholders from whose ranks were drawn two working groups of approximately 15 people to examine the issues of waste and discharges. Further working groups, building on the findings and recommendations of the waste and discharges groups, will be the subject of discussion at the November meeting of all stakeholders involved in the process.

1.4 In a series of four meetings from May to October, the DWG examined the issues surrounding liquid and aerial discharges from the Sellafield site, their prioritisation and the potential for abatement. Sellafield is the most significant site, both in terms of discharges and their potential impacts. However, discharges from other sites were also considered, mainly to ensure that other significant discharges were not ignored.

1.5 We recognised that some members of the group consider the only way of reducing all discharges effectively was to stop reprocessing. But as the issue of reprocessing was to be a matter for a future working group we accepted that our remit was limited simply to the discharge issue. Our report has therefore been produced on that basis and must not be interpreted as compromising or changing any of the group member's views on reprocessing.

1.6 This report summarises our work. Several documents were made available to or generated by the Group, and the most important of these are included as Appendices. It would be impractical to include all the documents, but they are available from The Environment Council on request.

2. The Work Process

2.1 We initially had a brief visit to the Sellafield site to familiarise ourselves with the processes and issues leading to radioactive discharges, and the practices for their abatement. This was followed by discussions around a working methodology. We identified a cyclical approach to address the work, whereby individual elements could be revisited. This process consisted of three elements:

1. Collect discharge data (nature, origin, past/present/future amounts);
2. Assess the effects and impacts of these discharges on the environment and on man;
3. Prioritisation of what should be done about the discharges, and agreement on how to implement these activities.

In parallel, a fourth element of interpreting OSPAR was explored.

BNFL were asked to supply data to support this process, and did so.

2.2 While we were carrying out this process, the Waste Working Group (WWG) was also deciding the approach it should take. The WWG decided to examine a number of scenarios, whereby Magnox and Thorp operations were continued for differing timescales, and the implications in terms of waste volumes and type examined. The WWG recommended that we examine the discharge implications of these, to provide subsequent working groups with a consistent set of findings. We did this.

3. The Work of the Discharges Working Group (DWG)

3.1 Introduction

3.1.1 As part of the overall dialogue between BNFL and its stakeholders, our work aimed to better inform BNFL's overall environmental strategy in relation to discharges. We saw that a major influence on strategy in this area over the next two decades will be the Sintra statement of the OSPAR Commission, and consideration of BNFL's response to the Sintra statement naturally dominated our work. However, there were substantial differences in interpretation of the meaning of this statement within the group, which are explored in Para 3.10.
Notwithstanding the differences, in order to make progress we proceeded in the following way:

- Development of a common understanding of radioactive discharges based on information from BNFL, including their origin, history and effects;
- Seeking a pragmatic way forward, recording disagreements and range of opinions where consensus was not readily achievable;
- Consideration of the interpretation of OSPAR;
- Prioritisation of the most important discharges and radionuclides for attention;
- Consideration of reduction scenarios and their effects on discharges;
- Discussing the match between the reduction scenarios and the various interpretations of OSPAR.

3.2 Discharge data

3.2.1 Data for the radioactive liquid and aerial discharges from the Sellafield site were provided by BNFL. This is reproduced as Appendix 1. The data considered for each major radionuclide were:

a) Becquerels discharged from 1995 –1998
b) Critical Group dose (microsieverts) for 1998 (modelled from discharge data and as derived from environmental monitoring data)
c) Concentration as measured in locally produced foodstuffs (Bq/l and Bq/kg)

Data were also provided for:
a) Origin of discharges from Sellafield site
b) Abatement potential for a selection of radionuclides

3.2.2 Our remit extends to discharges from all of BNFL's activities in the UK. Information on discharges and doses from other BNFL sites was therefore requested and provided by BNFL (Appendix 2). We concluded that issues connected with Sellafield discharges were both dominant (in terms of quantities and effects) and also very complex; we therefore determined our time would be best spent in considering Sellafield related issues in detail, in the expectation that our methodologies would have some generic application to the other sites.

3.2.3 The discharges can be allocated to the various processes on the Sellafield site according to the contribution each discharge makes to the critical group dose. The allocations are broad judgements based on current typical discharges and measured environmental impact.

Table 1 Aerial Discharges

Plant Category	**Critical Group Dose %**
Calder Reactors	60-80
Magnox reprocessing	10-15
Oxide Reprocessing	10-20
Legacy	<1
Site Total	**~60 microsieverts ($\mu Sv\ a^{-1}$)**

Table 2 Liquid Discharges (ignoring unavoidable dose from historic discharges)*

Plant Category	**Critical Group Dose due to current discharges %**
Calder Reactors	~0
Magnox reprocessing	80-90
Oxide Reprocessing	5-10
Legacy	5-15
Site total	**~26 microsieverts ($\mu Sv\ a^{-1}$)**

**Critical Group dose based on measured environmental samples, which includes dose from historic discharges, is ~100 microsieverts per year. The historic component of dose is around 75 microsieverts per year, predicted to decline slowly to around 50 microsieverts per year by 2030.*

3.2.4 Points to note from the discharge data are:

1. The dominant contribution to aerial critical group dose arises from the Calder Reactors, principally from Ar-41, but with lesser contributions from C-14 and S-35. But in terms of activity (Bq) the discharges are dominated by Kr-85 (~97%) with 60-70% of that coming from THORP. However the critical group dose from Kr-85 is low (1.4 microsieverts per year).
2. Critical group doses resulting from current liquid discharges are dominated by Tc-99 from Magnox reprocessing (about 20 microsieverts per year), but with most activity coming from tritium, 70% of which comes from THORP (0.01 microsieverts per year). However all current liquid discharges contribute only about 25% of the total current dose to the critical group; the remaining 75% arises from accumulation of radioactivity from historic discharges, which were at very much higher levels than at present .

3.2.5 The data was accepted as a good basis for proceeding, although a number of caveats were raised by some members of the Group:

1) Collective dose is also a useful measure of impact for long-lived radionuclides *(Collective doses were ultimately considered in prioritisation, see below);*
2) The evaluation of critical group dose is subject to a number of uncertainties, including the emergence of previously unanticipated exposure pathways (e.g. radioactive pigeons) and aspects of dosimetry (see below);
3) Some low energy Beta emitters (e.g. H-3) may be especially effective in damaging DNA so doses from them may be understated;
4) Environmental doses from I-129 discharges to atmosphere may be overstated because of assessment methodology.

3.2.6 Not withstanding the caveats, we felt that the data was sufficient to move onto the next stage of prioritising radionuclides for reduction.

3.3 Prioritisation

3.3.1 Whilst OSPAR calls for significant reductions in discharges as an end in itself, we felt there was merit in attempting to identify the most important radionuclides in order to prioritise reductions.

3.3.2 We could not agree on an interpretation of OSPAR. The OSPAR statement was interpreted by some members of our group as requiring <u>both</u> individual substances and particular human activities (for example, reprocessing) to be prioritised for phase-out. It was also argued by some members that going through the process that we went through in the Group showed that if effective action is to be taken within the timeframe of OSPAR, prioritising activities (e.g. reprocessing) is the only thing that will really work.

3.3.3 A workshop exercise was held to develop criteria for prioritising radionuclides. In our discussions we concluded that a number of factors needed to be considered. In addition to the actual amount of radioactivity discharged we needed to consider its potential effect on human health; various measures of radiation dose were considered for this purpose. We were also conscious that the mere presence of radionuclides in food or other environmental materials could cause problems, even if the implications in terms of dose were very minor - for example, Tc-99 in lobsters caught in Scandinavia. We therefore felt that concentrations in environmental media were a relevant factor. Finally, we recognised that if radionuclides were very persistent in the environment detriment could potentially occur for future generations; radioactive halflife was therefore a relevant factor. So the criteria we identified were:

- Size of discharge (in Becquerels per year);
- Critical Group Dose (in microsieverts per year);
- Collective dose (in mansieverts from a year's discharge);
- Environmental concentrations (Bq/l, Bq/kg);
- Half Life (years).

3.3.4 In addition there were a range of less easily quantified criteria which may also be important. These include economic and social impact (e.g. on West Cumbrian community, Norwegian and Irish fishing industries), public perception, political profile, costs, employment and site safety. Rather than affecting relative priorities these factors, including technical feasibility, may be thought to influence the acceptability (or otherwise) of actions proposed in relation to the priorities. In particular we noted that socio-economic pressures and safety matters on the site, together with cost issues, may not support other drivers to reduce discharges. In view of the concern we agreed to support the WWG recommendation that a socio-economic study be initiated.

3.3.5 The workshop exercise also derived factors to weight the relative importance of the various quantitative criteria.

3.3.6 The methods used were subjective and not rigorously scientific; nor do they provide a comprehensive appraisal of environmental impact. There was some discussion about the various weighting factors used, especially with regard to the relative importance of critical group dose and collective dose. However as we only needed a priority index (in terms of numbers of asterisks) rather than a scientific unit, the matrix system proved to be relatively robust to changes in the weighting used. Several members of the Group tried using the matrix with different weightings, but in fact the radionuclides which came out as priorities stayed more or less the same whatever weightings were used. One member of the Group suggested a methodology for creating a "hazard index" which we might have pursued further had there been more time, but we concluded our criteria and methods for ranking were quite adequate for the assessment we wanted to perform.

3.3.7 The following tables are the result of the group's first run through the matrix system. Three stars means under that criteria this radionuclide would be a high priority; two means medium priority and one means lower priority. No stars means it wouldn't be a priority. The index is then added up using the agreed weighting factor: critical group dose 5, environmental concentration 3, discharge quantity (Bq) 3, collective dose 1, half life 1. So Tc-99 scores 32 made up from 6 for Becquerels (3x2) 9 for Environmental Concentration (3x3); 15 for Critical Group Dose, nothing for collective dose and 2 for Half-life.

3.3.8 We acknowledged that the drivers for discharge reductions are less about the radiological hazard relating to dose and more about issues relating to political acceptability, which takes into account public perception, sustainable development and the precautionary principle.

Table 3 Liquid discharges

	Criterion					
	Discharge (Bq)	**Concentrations (Biota, Bq kg^{-1})**	**Critical Group Dose (μSv a^{-1})**	**Collective Dose (manSv)**	**Half Life (y)**	**Score**
Relative weight	3	3	5	1	1	
Qualitative criterion ranking by radionuclide (*) and weighted final score:						
Tc-99	**	***	***		**	32
C-14		*	*	***		11
H3	***					9
Sr-90	*		*			8
Pu/Am			*		*	6
Co-60			*			5
Ru-106			*			5
I-129					***	3
Zr/Nb 95						nil
Cs-137						nil

Using this matrix system the top five radionuclides in liquid discharges are Tc-99 (32); C-14 (11); H-3 (9); Sr-90 (8); and Pu/Am (6)
Using a different weighting system, which increases the weighting for collective dose, brings I-129 and Cs-137 up the priority order in place of Sr-90 and Pu/Am; but Tc-99, C-14 and H-3 remain as the top three.

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Table 4 Aerial discharges

	Criterion					
	Discharge (Bq)	**Concentrations[1] (Bq kg^{-1}) Biota/Air**	**Critical Group Dose (μSv a^{-1})**	**Collective Dose (manSv)**	**Half Life (y)**	**Score**
Relative weight	3	3	5	1	1	
Qualitative criterion ranking by radionuclide (*) and weighted final score:						
Ar-41	**	Nil/**	***			24
C-14		***/nil	**	***	*	18.5
Kr-85	***	Nil/***		***		16.5
I-129			**		***	13
H-3	*	**/*				7.5
S-35		*/nil	*			6.5
Pu/Am					**	2
Sr-90		*/nil				1.5
Co-60						0

The top 5 radionuclides in aerial discharges are: Ar-41 (24); C-14 (18.5); Kr-85 (16.5) I-129 (13); H-3 (7.5).
Using the other weighting system noted in para 3.3.6 makes no difference to the top 5.

3.4 Options for discharge reduction

3.4.1 There are three broad options for reducing discharges:

- Abatement. This is essentially the provision of an add-on system to transfer radioactivity in gaseous or liquid form into a solid form for extended storage and, where possible for subsequent disposal, or gaseous into liquid form for immediate disposal;
- Modify the process in order to reduce discharge arisings at source, or enable their diversion into long term storage (e.g. as high active solid waste);
- Stop the process/shut the plant.

3.4.2 For any of these options to be practical they should lead to waste in a safe passive form and should not create insoluble safety or environmental problems, either at Sellafield or elsewhere in the fuel cycle.

[1] In this case radionuclides were ranked twice for environmental concentrations, firstly for concentrations in biota and secondly for concentrations in air. This was done to accommodate the radioactive 'noble' gases Ar and Kr, which are not taken up by biota but which (because of the quantities discharged) are present in significant concentrations in air. The score for this category was taken as the mean of the scores for biota and air.

3.4.3 Consideration of timescales is important. BNFL's experience has been that new plant, or substantial modifications to existing plant, would take at least 5 – 8 years to implement, given technical development, planning permission, safety case etc. BNFL suggested that for some discharges, processes may be phased out before new abatement plant can be introduced.

3.4.4 A full table of abatement possibilities currently being considered by BNFL is given in Appendix 3. In summary, for the priority radionuclides, these are:

Table 5

Liquid	**Abatement & plant modification**
Tc-99	Earlier work on removal by chemical precipitation halted as final waste form not compatible with requirements for disposal. Two other removal processes (chemical reduction and electrodeposition) are being actively researched together with assessment of modifying Magnox plant to route Tc-99 bearing streams to highly active storage.
C-14	Precipitation at Magnox is considered possible, but not cost-effective; being reviewed as part of business strategy.
H-3	No abatement considered viable in near future. Watching brief on technology.
Sr-90	Initial work on removal by enhancement of EARP process has shown promise. Pilot scale study underway.
Pu/Am	The EARP plant was commissioned to reduce these discharges and BNFL keep the effectiveness of this process under review
I-129	Liquid discharges of I-129 arise mainly from scrubbing of offgases to prevent discharge to atmosphere.
Cs-137	As for Sr-90, enhancements to the EARP process show promise for reducing emissions.

3.4.5 We noted that an otherwise potentially feasible abatement methods for Tc-99 had been rejected by BNFL because it did not fulfil Nirex repository requirements.

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Table 6

Gaseous	**Abatement & plant modification**
Ar-41	Not considered feasible because Ar is an 'inert' gas and very large volumes of air are involved.
C-14	An additional scrubber is under construction to deal with a presently untreated discharge from the Magnox high active waste plants. This will re-route aerial discharges to the liquid effluent stream. Incremental performance improvements on other existing scrubbers on the Magnox and THORP plants may be possible.
Kr-85	Research on possible processes is ongoing but currently known candidate technologies are not considered viable at the necessary scale on technical, engineering and safety grounds.
I-129	The new scrubber referred to in relation to C-14 may abate I-129 discharges from Magnox to some extent. The feasibility of a new type of filter for more general application is being assessed and some process adjustments to improve abatement in THORP are being considered. Absorption onto a solid matrix may be feasible but wasteform not presently compatible with disposal requirements
H-3	Some incremental improvements which will increase abatement of tritium released in the form of tritiated water ('HTO') are being pursued. However there are currently no viable technologies which could abate discharges in the form of tritium gas ('HT' or 'T_2').

We did not form a view on the viability of the abatement technologies summarised above; the comments in the above table reflect the current views of BNFL.

3.4.6 The other option for reducing discharges is of course to shut plant down. We accepted that it may not be appropriate to expend huge amounts of resource to eliminate or reduce emissions of all of the priority radionuclides, some of which are likely to prove very difficult (e.g. Ar-41), if the closure of plant will eliminate the discharges on an acceptable timescale. We therefore looked at BNFL's indicative information on the possible options for plant closure timescales, together with their effect on discharge reduction.

Table 7

Plant	**Impact**
Calder Hall is likely to close around 2006-10.	Aerial Discharges of Ar-41 and S-35 reduced to zero.
Magnox Reprocessing; indicative timescales for closure scenarios typically cover 2007/8 to about 2013/14	*Liquid discharges:* Cs-137 discharges cut by 30% two years later I-129 discharges cut by 30-50% Tc-99 discharges cut by 99% five years later C-14 discharges cut by 70% one year later Sr-90 discharges cut by 70% five years later Tritium emissions cut by 30% Pu/Am discharges cut very marginally *Aerial discharges:* I-129 emissions cut by 50% five years later Kr-85 emissions cut by 10% C-14 emissions cut by 70% Tritium emissions cut by 90%

3.4.7 These closures of Calder Hall and Magnox reprocessing would cut critical group doses due to aerial discharges by 70-90%, and the critical group doses attributable to ongoing liquid effluent discharges by a similar factor. However because doses from historic accumulations of radionuclides in marine sediment make a dominant contribution (about 75%) to the dose currently received by the marine critical group, the immediate effect on doses to the marine critical group would be an initial reduction of around 20% followed by a slow decline as the effects of historic accumulation diminish.

3.4.8 BNFL explained some possible variations in these scenarios to the Group. For example, BNFL is pursuing the possible extension of the operating lives of the Magnox reactors. If such extension is achievable it may become economically viable to construct new plant which allowed Magnox fuel to be reprocessed through THORP, and the existing Magnox reprocessing plant (B205) to be closed whilst Magnox reactor operation and fuel reprocessing continued. This would result in most of the discharge reduction benefits attributed above to the simple Magnox reprocessing ‘closure’ assumption. For similar reasons, a new type of fuel for use in Magnox reactors (‘Magrox’) and which could be fed directly to THORP is being trialled. However programme dates and overall viability for any of these possible developments are currently conjectural, but these are longer term possibilities requiring considerable development work etc.

3.4.9 Notwithstanding these possibilities, the closure of Calder Hall and the closure or replacement of the current Magnox reprocessing plant are critical ‘landmarks’ which would be associated with substantial reductions both in discharges and in critical group doses.

3.4.10 In order to assess further the need for further discharge reductions for those radionuclides whose discharge would be reduced to near zero by 2012-18 in any event as a result of BNFL's closure programme, we felt it would be helpful to consider a number of future business and plant operation scenarios for BNFL.

3.5 Scenarios

3.5.1 We agreed to take as its starting point some of the scenarios for BNFL potential future business that were developed by the Waste Working Group. The scenario assumptions are:

D1 - 'Stop Now'
D2 - 'Contracted Business'
D3 - 'Partial Blue Sky'
D4 - 'Full Blue Sky'

They are set out fully in Appendix 4.

3.5.2 Taken together, these scenarios bound all the significant business options that are likely to impact on the discharges from the Sellafield site. In addition, it may be possible to fit abatement technology to further reduce the discharges of selected radionuclides.

3.5.3 In order to consider the discharge profiles which would emerge, the two bounding scenarios, 'Stop Now' and 'Full Blue Sky' were modelled by BNFL using the priority radionuclides identified in the previous exercise.

3.5.4 The discharge and dose profiles shown in Appendix 5 are indicative rather than precise, depending on assumptions about process throughput, plant performance and in some cases the introduction at target dates of abatement technology with assumed performance. Since they are based on BNFL's assumptions about future process throughput, they differ somewhat from the figures in Tables 1 and 2, which are based on the outcome of recent actual operations. The group accepted them on this understanding as a basis for discussion about discharge management strategy.

3.6 Discharge and dose profiles for liquid discharges

3.6.1 Considering first liquid discharges (figures 5.1 to 5.6, Appendix 5) we accepted that *the discharge profile calculated for* scenario D1 ('Stop Now') was not achievable in practice because of the inventory of Magnox fuel currently in reactor cores or storage ponds (about 7,000 tonnes) which currently relies on Magnox reprocessing for medium to long-term management. Most of the group accepted BNFL's advice that the achievable profile taking account of the need to deal with this Magnox fuel inventory would only be slightly 'lower' than D2. This profile was referred to as D2 minus during subsequent discussion. Other members of the group, whilst accepting the possible need to reprocess some Magnox spent fuel which is already wet and corroded, would advocate maximising the amount of Magnox spent fuel, currently in stores or ponds, going into dry storage. This scenario could be referred to as D1 plus. We recognised that the technical and safety issues around Magnox dry storage were complex and were unable to explore them in the time available. This is an important area of work which we feel should be addressed by a subsequent working group. Nevertheless, the difference between 'D1 plus' and 'D2 minus', bearing in mind our qualitative treatment of optimisation (para. 3.6.3) was not an impediment to our discussions.

3.6.2 We also concluded that scenario D4, which involves considerable extension both of Magnox reactor and Magnox reprocessing lifetimes and an extension well beyond existing business forecasts for reprocessing in THORP, would not be acceptable on discharge grounds without substantial abatement, sufficient to bring the discharge and dose profiles closer to those of scenarios D2 and D3 (figure 5.1, Appendix 5); to some parties this scenario would not be acceptable even with such substantial abatement.

3.6.3 We accepted, qualitatively, that the most appropriate discharge/dose profile would lie in a 'region of optimisation' between the minimum achievable "D1 plus/D2 minus" and something close to "D3 plus" - recognising that the current opinions of the achievability or acceptablity of the extremes of this range varied within the group. The final form of the profile would be determined by pressures and priorities for discharge reduction, as discussed by the Group, in the downward direction and counteracting pressures including socio-economic issues. We did not have the time or resources to discuss or evaluate these counteracting pressures (see paragraph 3.3.4) and recommend further study in this area. The concept of 'region of optimisation' is illustrated in (Figure 1) below.

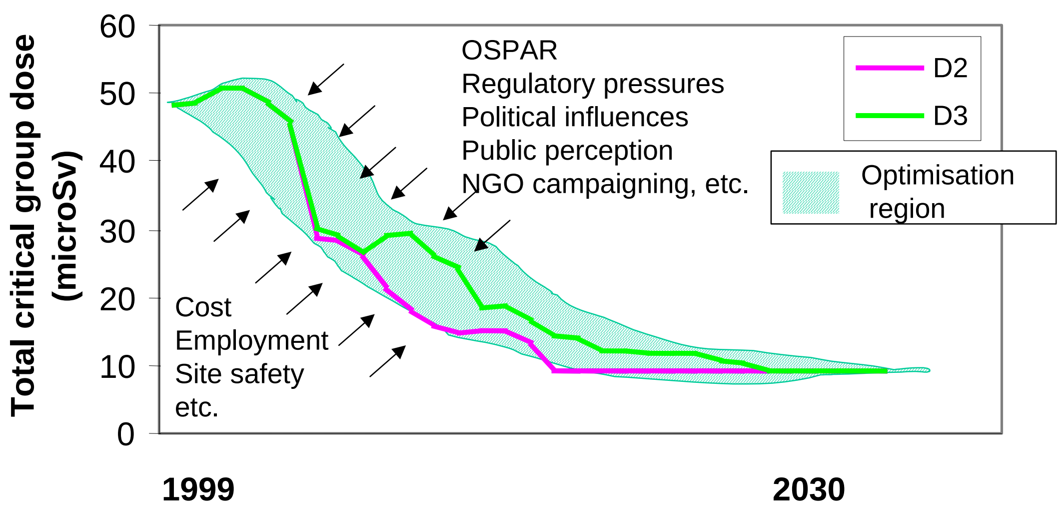

Figure 1: The concept of a 'region of optimisation', illustrated in terms of critical group dose from liquid discharges, in which the dose profile ultimately achieved as a result of discharge reduction lies in a region bounded by the profiles 'D2 minus' and 'D3 plus' and reflects a balance between pressures for discharge reduction and competing factors such as cost, employment, and site safety. Tc-99 reduction is assumed to be implemented as a 'constraint on optimisation'. *Note that the bounds of the optimisation region are illustrative only.*

3.6.4 With regard to specific nuclides, we noted and emphasised the importance of Tc-99. Introduction of abatement technology for Tc-99 should clearly be a major priority for BNFL who should make utmost endeavours to achieve discharge reduction by 2005; it is significant that the dose profiles for 'continuing business' scenarios D2 and D3 with Tc-99 abatement are comparable to, or better than, scenario D2 minus without Tc-99 abatement (figures 5.1 and 5.2). Abatement will not be cost effective or practical in the D2 minus scenario - although interim storage may be feasible (see para 3.10.4).

3.6.5 C-14 does make a significant contribution to critical group dose (figure 5.3, Appendix 5) and because of its long radioactive half-life it is the major contributor to collective dose. C-14 abatement therefore clearly merits some priority.

3.6.6 Some of the discharge scenarios include abatement options for liquid discharges of Tc-99 and C-14, but it should be noted that there is no guarantee that BNFL will be able to develop these abatement technologies in the timescales indicated.

3.6.7 We considered that notwithstanding the importance of Tc-99 and C-14, work needs to be started on reducing discharges of Sr-90, Ru-106 and Pu/Am in the longer term, since these dominate the ''tail" of the predicted dose profile at around 2020 (figure 5.3, Appendix 5).

3.7 Discharge and dose profiles for aerial discharges

3.7.1 We recognised that for aerial discharges the principal driver for reductions relates to current government policy rather than OSPAR.

3.7.2 In discussing the profiles for aerial discharges (figures 5.7 to 5.9, Appendix 5) we noted the importance of Ar-41 to critical group dose (figure 5.7, Appendix 5) which, coupled with the contribution to overall activity discharged resulted in its being rated as one of the priority radionuclides. We noted, however, that other factors notably its very short radioactive half-life, consequent lack of persistence in the environment, and lack of concentration into biota result in Ar-41 not being considered a 'special case' in the same manner as is Tc-99 in liquid discharges. We accepted that Ar-41 discharges would be eliminated altogether when the Calder reactors are shut down and felt this mechanism to be acceptable given that the current timetable for reactor shutdown is implemented - although some of us ideally would wish for a shorter timescale. Similar considerations apply to S-35.

3.7.3 We also noted that I-129, another of the priority radionuclides, makes a significant contribution to critical group dose from current discharges and dominates the 'tail' of the dose profile at around 2020 (figure 5.8, Appendix 5). Although BNFL feel that these doses may be overestimated by the dose assessment model currently in use, we felt that BNFL should resolve the uncertainty on predicted doses and, if the current predicted levels were to be confirmed, start substantive work on abatement strategies within the next one to two years.

3.8 Overall effects of discharge reductions

3.8.1 Based on BNFL's calculations, reducing discharges according to the 'region of optimisation' concept discussed above will result in dose to the critical group for liquid discharges reducing from about 50 microsieverts per year currently to about 10-15 microsieverts per year at around 2020 (figure 5.2, Appendix 5). For the dose to the critical group from aerial discharges the reduction is from about 100 microsieverts per year to less than 20 (figure 5.7, Appendix 5).

3.8.2 The above figures for liquid discharges exclude the effects of historic discharges which have accumulated in the environment. If these are included the critical group dose declines from the current predictions of about 120 microsieverts to around 55 microsieverts per year (figure 5.6, Appendix 5).

3.9 Group views on discharge profiles

3.9.1 We welcomed the indicative discharge profiles which had been developed by BNFL. We considered that they represented a very good first step and an important indication of BNFL's good intentions to reduce radioactive discharges. However there were a number of important caveats:

- Timing of reductions is important. Some of us felt that reductions should be introduced as soon as technically possible - but there was a difference in view as to what was 'technically possible', particularly as to how much weight cost and economics should carry in such considerations.
- The strategy as presented relied heavily on plant closures. Experience from the oil industry in the North Sea has shown that plant lifetimes are regularly extended beyond existing predictions because improving technology allows continued operation and there is a business imperative to continue as long as possible. Commercial pressures to extend Magnox lifetimes or extend reprocessing at Thorp could therefore delay the achievement of discharge reductions. The sole reliance on plant closures as a method of securing discharge reductions is only acceptable if the indicative programmes in table 7 are maintained, or speeded up. Some felt this concern could be dealt with by Regulators writing the discharge authorisations accordingly.
- The size of the discharges remaining by 2020 was a matter for concern to some members who felt that further abatement technologies should be investigated, particularly for Sr-90, Ru-106 and Cs-137.

3.9.2 Thus, whilst welcoming the reducing discharge profile as the first public indication by BNFL of forward discharge reduction plans, there was a general feeling in the group that BNFL needed to show very clear commitment to timescales where plant closures were involved; and also to show that they were striving to the utmost to secure discharge reductions *over and above their pre existing plans* in response to OSPAR.

3.10 OSPAR

3.10.1 Underlying all this is, as stated in the Objective of the Working Group, responding to the UK Government's commitments under the OSPAR Convention.
Section 4 of the Strategy gives two time frames:

(a) "By the year 2000 the Commission will, for the whole maritime area, work towards achieving further substantial reductions or elimination of discharges, emissions and losses of radioactive substance."

3.10.2 Views on this ranged from:

i) The UK has to produce its plan by 2000

to:

ii) The UK has to implement a programme of substantial reductions by 2000.

"By the year 2020 the Commission will ensure that discharges, emissions and losses of radioactive substances are reduced to levels where the additional concentrations in the marine environment above historic levels, resulting from such discharges, emissions and losses are close to zero."

3.10.3 Views on this ranged from:

i) We need to start now, because radionuclides released today, with long half-lives will mean concentrations are still above zero in 2020 and therefore logically reprocessing must now end

to:

ii) Although there is no scientific definition of 'close to zero' there is probably a low level of discharge which would result in low enough environmental concentrations to be described at close to zero (see BNFL charts with scenario 1 in Appendix 5).

3.10.4 It should also be noted that Tc-99 receives special mention in the Sintra Statement. Some felt that BNFL should "address the concerns" of the OSPAR countries about Tc-99 more immediately than the planned closure of B205 **or** the introduction of abatement technology could begin to have an influence. One way could be to continue storing MAC in adequate facilities until "abatement technology" has been developed; some felt that BNFL need to be seen to be pursuing this option *in parallel with* their pursuit of abatement.

3.10.5 Notwithstanding the range of opinions held within the group as to the meaning of the Sintra statement in relation to timing of reductions and the quantification of 'close to zero', one approach which we found helpful was to consider the OSPAR under three discrete, but linked, objectives:

- The substantial reduction of discharges;
- The reduction of health effects to as low as reasonably achievable;
- The reduction of concentrations in the marine environment to levels close to zero.

3.10.6 Insofar as this can be accepted as an interpretation, it was felt that the discharge reduction strategy, outlined by BNFL, went some way to addressing the first two objectives. Some felt that meeting the third objective would depend on the development of the science and methodologies for assessing the environmental impact of man-made radionuclides, in particular the intent declared at Sintra to develop Environmental Quality Standards; others felt that such standards would be unnecessary if reprocessing ceased.

3.10.7 Whilst we could not achieve overall consensus about the detailed interpretation of OSPAR we did agree that BNFL must be seen to 'break sweat' to make sure that the discharge profiles move as far as possible to the left, and the tail of the profiles is as low as possible. This will entail continuing and intensifying BNFL's achievements in reducing its discharges.

3.11 Future decommissioning activities

3.11.1 We have not given detailed consideration to discharges from future decommissioning activities: whilst these could result in increases in some discharge components, these may be able to be accommodated within the broad shape and framework discussed in this report: further detailed consideration of this matter is required in due course.

4. Findings and Recommendations (and Suggestions for Future Work)

We submit the following findings and recommendations subject to the caveat that they do not indicate any change of views by those members of the group who believe that early cessation of reprocessing is the best way of reducing discharges.

4.1. We were unable to agree the meaning of the details of the OSPAR strategy implementation but did agree that it implied substantial reduction of discharges. We recognise that BNFL's indicative reduction profiles potentially provide a good first step in achieving the OSPAR recommendations. We recommend that BNFL show a very clear commitment to timescales where plant closures are involved and also show that they are striving to the utmost to secure discharge reductions over and above their pre-OSPAR plans.

4.2. We recognise that other factors, principally socio-economics, cost and safety, may produce a pressure against discharge reductions. We did not have time to discuss and evaluate these factors and we recommend that suitable studies should be commissioned (para 3.3.4 and 3.6.3).

4.3. Notwithstanding our inability to quantify the above factors, we recommend on a qualitative basis, that BNFL should reduce its discharges within a region of optimisation between continuing business scenarios D1 plus/D2 minus and D3 plus (para 3.3.4 and 3.6.3)

4.4. Tc-99 liquid discharges are specifically referred to in the Sintra statement and as such are a 'special case'**.** We therefore recommend BNFL make utmost endeavours and be seen to be doing so to achieve Tc-99 reductions by 2005. We also recommend that liquid discharges of C-14, Sr-90, Ru-106 and Pu/Am are addressed as 'second tier' priorities (para 3.6.5, 3.6.7 and others)

4.5. We recommend that, the current indicative timetable for shutdown of the Calder reactors should be implemented (para 3.7.2 and Table 7). We see this as the only effective means of reducing Ar-41 gaseous discharges.

4.6. We recommend that uncertainty on predicted critical group dose arising from gaseous discharges of I-129 be resolved. (para 3.7.3)

4.7. We recommend that in parallel with resolution of uncertainties in critical group dose for I-129, BNFL formulate by 2002 appropriate abatement strategies for the reduction of I-129 aerial discharges. (para 3.7.3)

4.8. We recommend that a subsequent working group should examine in detail all the issues associated with prolonged dry storage of spent Magnox fuel, in order to properly determine whether earlier cessation of Magnox reprocessing is feasible and appropriate; if so, to consider what further reductions in discharges might be achieved.

4.9. We recommend BNFL conducts further studies on the impact of future decommissioning operations on the discharge profile (3.11.1)

4.10. We recommend that BNFL should use a methodology similar to that described in this report to develop a strategy for discharge reduction at each of its sites in the UK.

4.11. We recommend that the government and regulators are urged to set criteria for the acceptability of waste forms which should inspire confidence that they will lead to best practicable environmental options being adopted. Consideration should be given to reviewing those criteria and their application to remove unnecessary barriers to the achievement of reduction objectives (para 3.4.5)

4.12. We recommend that the main group should make the results of our work to date available to the UK government, as a contribution to the government's development of the UK OSPAR strategy.

5. Appendices (attachments)

Appendix 1: Discharges from the Sellafield site: quantities, impacts and origins

Appendix 2: Discharges from BNFL UK sites other than Sellafield: quantities and impacts

Appendix 3: Overview of Abatement potential for selected radionuclides

Appendix 4: Future business and process scenarios for BNFL

Appendix 5: Indicative discharge and dose profiles for future BNFL business and process scenarios

Appendix 6: Terms of Reference of the Discharges Working Group

Appendix 7: Membership of the Discharges Working Group

Appendix 8: Papers Considered or Generated by the Discharges Working Group

Appendix 9: Glossary

Appendix 10: Stakeholder Comments

Appendix 1

Discharges from the Sellafield site: quantities, impacts and origins

Data as presented by BNFL to the Discharges Working Group, June 1999

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Table 1.1: Discharges and Impacts – Aerial

Nuclide	Discharge				Critical group dose (uSv) 1998		Concentration in biota 1998					
	1995	1996	1997	1998	Derived from monitoring data (contains historic discharge component)	Modelled (1998 discharge Component only)	Milk		Beef	Pheasant	Potatoes	Blackberries
							0-3 km zone	Ravenglass estuary	Seascale	Gosforth	Seascale, Gosforth	Calder valley
	TBq/y						Bq/l		Bq/kg wet weight			
H-3	590	530	170	250	0.1	0.8	11	<5			19	27
C-14	4.6	4.2	2.2	2.9	2	4.1	2.7	0.5	42	31	11	5
Ar-41	2700	2600	2500	2500	41$	41						
Kr-85	97000	100000	95000	99000	1.4$	1.4						
	GBq/y											
S-35	140	140	89	150	0.06	2.3	<1.3	<1.1			1.1	6
Co-60	0.055	0.05	0.06	0.053	<0.1	0.0077						
Sr-90	0.095	0.13	0.1	0.06	4.8	0.0013	0.18	0.29	0.28	0.31	0.46	5
Ru-106	0.81	0.88	7.1	1.1	<2.4	0.0025	<0.33	<0.33	<0.8	<0.7	<0.8	<3
Sb-125	1	0.76	0.22	0.18	<0.1	0.00029						
I-129	20	25	25	27	1.5	7	0.04	0.04		<0.002	<0.009	0.034
I-131	1.1	2.3	2.6	3.2	0.27	0.034	<0.05	<0.07				
Cs-137	0.6	0.85	0.62	0.44	2.7	0.024	0.24	0.36	0.25	1.6	0.43	3
Pu-a	0.054	0.064	0.1	0.03	1.8	0.057	<0.0003	0.006	0.007	0.019	0.013	0.026
Pu-241	0.76	0.59	0.79	0.27	0.3	0.0055						
Am-241	0.039*	0.039*	0.065*	0.05*	1.3	0.088	0.0005	0.0009	0.004	0.009	0.005	0.014
Total					**59**	**57**						

*Am-241 discharge contains Cm-242 component
$Immersion dose from Ar-41 and Kr-85 is derived by modelling only

Table 1.2: Discharges and Impacts – Liquid

Nuclide	**Discharge (TBq/y)**				**Critical group dose (uSv) 1998**		**Concentration in biota (St Bees - Selker) 1998**					
	1995	1996	1997	1998	Derived from monitoring data	Modelled	Plaice	Cod	Winkles	Mussels	Crabs	Lobster
					(contains historic discharge component)	(1998 discharge component only)	Bq/kg wet weight					
H-3	2700	3000	2600	2300	*	0.0082						
C-14	12	11	4.4	3.7	3.6	2.4	120	79	140	200	170	190
Co-60	1.3	0.43	1.5	2.4	0.89	1.8	0.24	<0.26	25	15	3	4.6
Sr-90	28	16	37	18	2	3.5	0.31	0.33	5.5	3.6	1.2	0.38
Zr-95	0.34	0.52	0.18	0.3	0.04	0.0043	<0.35	<0.005	<1.5	<1.7	<0.5	<0.8
Nb-95	0.4	0.63	0.18	0.35	0.003	0.0027	<0.11	<0.001	1.5	4.2	<0.3	
Tc-99	190	150	84	53	28	12	12	5.8	1300	1400	28	6000
Ru-106	7.3	9.0	9.8	5.6	3.8	2.6	<1.4	<1.6	63	53		2.8
I-129	0.25	0.41	0.52	0.55	*	0.12						
Cs-134	0.51	0.27	0.3	0.32	0.09	0.07	<0.18	<0.05				
Cs-137	12	10	7.9	7.5	4.7	1.3	5.7	8.4	12	4	2.9	3.4
Ce-144	1.1	0.78	0.49	0.76	0.19	0.22			<2.5	<2.3	<0.8	<0.9
Np-237	0.18	0.04	0.03	0.04	0.098	*			0.04	0.1	0.008	0.03
Pu-a	0.31	0.21	0.15	0.14	19	1.1	0.02	0.02	13	11	0.54	0.54
Pu-241	7.7	4.4	3.3	3.5	3.6	0.38			130	110	6.8	5.4
Am-241	0.11	0.07	0.05	0.05	36	0.42	0.03	0.02	22	17	1.3	8.7
Total					**100**	**26**						

* dose contributions are negligible

Notes on aerial discharges and impacts (Table 1.1)

- 1998 discharges and environmental impact as presented were subject to final confirmation. BNFL have advised that these data agree with the final published figures.
- Adult critical group dose only.
- Historic discharges are based on best current estimate – updating previous information where appropriate.
- Ru106 critical group impact is Limit of Detection on monitoring samples.
- A component of the total measured dose results from discharges in previous years – primarily Sr90, Cs137 and actinides (plutonium and americium). For these nuclides the doses assessed from environmental monitoring are somewhat higher than assessed doses due to the current year's discharges.
- The I129 assessment model currently overpredicts the actual measured environmental impact, as does the C14 assessment.
- Where there is no data given for biota radionuclide concentrations, the overall significance of that pathway is negligible.

Notes on liquid discharges and impacts (Table 1.2)

- 1998 discharges and environmental impact as presented were subject to final confirmation. BNFL have advised that minor amendments have been made in finalising data, with the critical group dose becoming 130 microsieverts.
- The critical group used in this assessment is West Cumbria fish/shellfish eaters.
- Critical group doses are dominated by historic discharges of actinides (plutonium and americium), with some contribution from historic Cs137.
- Tc99 assessment models are currently under review: there is significant evidence that doses reflect discharges over the preceding two year period.
- Where there are no data given for biota radionuclide concentration, the overall significance of that pathway is negligible.

Origin of Discharges on the Sellafield Site

Categorisation of Discharges

1 Discharges have been allocated into the following source categories:

Calder Reactors
Magnox Reprocessing
Oxide Reprocessing (Thorp)
Legacy activities

2 For the Magnox and Oxide reprocessing categories, discharges have been allocated from the reprocessing plants and all their supporting upstream and downstream plants, where necessary apportioning discharges between the two categories. Delayed discharges (ie after storage for radioactive decay) have been included at broadly equilibrium values.

3 Legacy activities include Post Operational Clean Out (POCO), decommissioning and the treatment of historic wastes. Where current reprocessing activities route activity into decay storage systems which also contain historic liquors (eg Magnox-related Medium Active Concentrate) then the legacy component is defined as discharges in excess of those resulting from current operations.

4 Plant throughputs for Magnox and Oxide reprocessing have been subject to variation over recent years. Additionally there are a range of plants which are anticipated to come into operation over the next few years which will make some change to the pattern of discharges: eg Vitrification Plant Line 3, Solvent Treatment Plant, Street 3 Scrubber (diverting some C14 and I129 discharges from air to sea, hence giving net reductions to critical group). Discharges from the Sellafield Mox Plant are so low that they would not affect the data presented here.

5 Discharges from waste retained for decay storage are not usually discharged on a time smoothed basis due to plant operational constraints. Hence these components can vary from year to year.

6 The discharge allocation picture is therefore somewhat complex. Routine measurements, and indeed in some cases even special measurements, do not allow the allocation of many discharge components uniquely to one of the defined plant source categories. Some judgements have therefore been made to present data as percentage range statements which are believed to be generally representative of discharges over recent times and for the foreseeable future.

Dose Data

7 Data are presented in terms of critical group dose. Percentage contribution to critical group dose is based on the doses assessed from a one-year discharge, ie excluding any contribution from historic discharges. The additional historic component of the total dose to the critical group is particularly important in the case of the marine critical group. However, wherever possible doses are based on measured environmental parameters and reflect actual discharges, not discharges at the authorised limits.

Aerial Discharges

8 The choice of critical group (ie adults or infants) has a significant influence on the relative contributions to critical group dose and because these two groups are finely balanced the dominant group can be changed by relatively small changes in discharge pattern. The range of contributions shown in Table 1.3 cover both critical groups.

Table 1.3 Aerial Discharges

Plant Category	Critical Group Dose %
Calder Reactors	60-80
Magnox Reprocessing	10-15
Oxide Reprocessing	10-20
Legacy	<1
Site total	~60 μSv

9 The dominant contribution to aerial critical group dose arises from the Calder Reactors, principally from Ar41 but with contributions from C14 and S35. In terms of activity (Bq) the discharges are dominated by Kr85 (~97%) which directly relates to reprocessing throughputs: oxide reprocessing will generally dominate – typically 60-70%. The critical group dose contribution from Kr85 is low (1.4 μSv pa).

10 The operation of the Solvent Treatment Plant, currently undergoing inactive commissioning, will result in a small increase in critical group dose from legacy operations.

Liquid Discharges

Table 1.4 Liquid Discharges

Plant Category	Critical Group Dose due to current discharges (%)	Critical Group Dose based on measured environmental samples (%)
Calder Reactors	~0	0
Magnox Reprocessing	80-90	20-23
Oxide Reprocessing	5-10	1-2.5
Legacy	5-15	1-4
Historic discharges	-	75
Site total	~26 μSv	~100 μSv

11 Critical group doses resulting from current discharges are dominated by Tc99 contained within the Magnox reprocessing stream. Tc has also made a dominant contribution to doses from legacy discharges over the last few years although this proportion has decreased in recent time.

12 Activity (Bq) discharges are dominated by tritium (H3) arising from reprocessing operations, typically in a 70/30 split Oxide/Magnox. The critical group dose due to tritium is negligible (<0.01 μSv pa).

13 Note that the critical group dose from current discharges, currently assessed at approximately 26 μSv (1998) is only a small fraction of the total critical group dose of approximately 100 μSv pa which is dominated by historic discharges. Approximately 60% of this total dose arises from historic actinide discharges (plutonium and americium). This is illustrated in Table 1.4.

BNFL
June 1999

Appendix 2

Discharges from BNFL UK sites other than Sellafield: quantities and impacts

Data as presented by BNFL to the Discharges Working Group, September 1999

THE ENVIRONMENT COUNCIL

SUMMARY OF RADIOACTIVE DISCHARGES AND IMPACTS FROM BNFL/MAGNOX SITES OTHER THAN SELLAFIELD

CONTENTS

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THE ENVIRONMENT COUNCIL

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TABLE 1. RADIOACTIVE DISCHARGES IN 1998 FROM BNFL/MAGNOX NUCLEAR POWER STATIONS

Radionuclide (TBq)	Calder	Chapelcross	Bradwell	Dungeness A	Hinkley Point A	Oldbury	Sizewell A	Wylfa	Berkeley*	Hunterston A*	Trawsfynydd*
AIRBORNE DISCHARGES											
Beta part.	0.000098	-	0.00026	0.00040	0.00011	0.00010	0.000056	0.000063	0.0000019	0.00000010	0.000016
Tritium	4.0	1300**	0.84	0.58	2.5	2.4	0.52	8.2##	0.015	0	0.12
Carbon-14	0.35	-	0.38	3.3	1.4	3.7	0.46	1.5	0.00023	0	0.0015
Sulphur-35	0.15	0.022	0.058	0.062	0.057	0.31	0.019	0.30	-	-	-
Argon-41#	2500	2800	720	1200	2700	180	840	61	-	-	-
LIQUID DISCHARGES											
Tritium	***	0.22	1.8	0.42	0.68	0.17	2.9	9.6##	0.034	0.0067	0.061
Caesium-137	***	0.0049	0.32	0.71	0.47	0.063	0.071	-	0.014	-	0.006
Other activity	***	0.04	0.36	0.39	0.26	0.18	0.15	0.070	0.073	0.24	0.018

- Not reported.
* Undergoing decommissioning.
** Mainly from Chapelcross Processing Plant.
*** Liquid discharges from Calder Hall are not reported separately from Sellafield site discharges
\# Discharges from Oldbury and Wylfa are much lower than from the other Magnox stations because they have concrete pressure vessels cooled by water, unlike the others which have steel pressure vessels and shield cooling air.
\## Discharges of tritium from Wylfa are higher than from the other stations due to the power output

TABLE 2. RADIOACTIVITY IN FOODSTUFFS IN 1998 IN THE VICINITY OF BNFL/MAGNOX NUCLEAR POWER STATIONS

Radionuclide	Calder	Chapelcross	Bradwell	Dungeness A	Hinkley Point A	Oldbury and Berkeley*	Sizewell A	Wylfa	Hunterston A*	Trawsfynydd*
MILK (Bq l^{-1})										
Carbon-14	Inseparable from Sellafield	Indistinguishable from natural background for the sites where it is measured (Chapelcross, Dungeness A and Hinkley Point A)								
Sulphur-35	<1.3	0.75	<0.4	<0.4	<0.6	<0.5	<0.4	<0.7	0.89	-
Strontium-90	Inseparable from Sellafield	0.061	0.014	0.019	0.033	<0.02	0.023	0.060	-	-
Caesium-137		0.029	<0.3	-	-	<0.3	<0.4	<0.3	0.23	-
FISH/CRUSTACEANS/MOLLUSCS (Bq kg^{-1})										
Cobalt-60	Inseparable from Sellafield	-	<0.4/-/<0.4	<0.3/<0.5/<0.9	<0.6/<0.5/-	<0.5/-/-	<0.4/<0.7/<0.2	<0.2/<0.2/<0.3	-/-/-	<0.4/-/-
Zinc-65		-	<0.4/-/1.8	<0.6/<0.9/<0.8	<2/<2/-	<0.3/-/-	<0.7/<2/<0.3	<0.4/<0.3/<0.5	-/-/-	-/-/-
Caesium-137		Inseparable from Sellafield	1.2/-/0.67	<0.5/<1/<0.7	<0.8/<0.9/-	0.94/-/-	<0.5/<0.7/<0.2	3.0/<0.7/1.4	<1/-/3.0	130/-/-
Americium-241			<0.8/-/<0.5	<1/<2/<1	<0.9/<0.8/-	<0.4/-/-	<0.5/<0.6/<0.3	<0.5/<0.5/<0.9	-/-/-/	0.0034/-/-

TABLE 2. RADIOACTIVITY IN FOODSTUFFS IN 1998 IN THE VICINITY OF BNFL/MAGNOX NUCLEAR POWER STATIONS (CONTINUED)

Radionuclide	Calder	Chapelcross	Bradwell	Dungeness A	Hinkley Point A	Oldbury and Berkeley*	Sizewell A	Wylfa	Hunterston A*	Trawsfynydd*
RADIOLOGICAL IMPACTS (μSv)**										
Terrestrial	Inseparable from Sellafield									
Milk (infant dose)***		2	<20	<50	<50	<20	<20	<10	<30	-
Vegetables (adult dose)		3	<2	<3	<5	<2	<2	<2	<2	-
Argon-41		16	27	90	32	5.7	20	<5	0	0
Marine	Inseparable from Sellafield									
Seafood (or lake fish) consumption		3.8	<3	<3	<2	<1	<2	<7	<3	<9
External exposure		21.5	13	<5	24	8.9	<5	7.2	31	29

- Not measured
* Undergoing decommissioning. Berkeley is near Oldbury and shares its environmental monitoring programme
** Excludes direct radiation
*** The doses to infants from milk consumption near Magnox Electric power stations are probably greatly overestimated because most of the analytical data are below detection limits. MAFF report doses generally less than 5 μSv

TABLE 3. BNFL SPRINGFIELDS 1998: RADIOACTIVITY IN DISCHARGES AND LOCAL FOODS; CRITICAL GROUP DOSES.

Radionuclide	Discharges (TBq)		Mean radioactivity concentration (Bq kg^{-1})	
	Airborne	Marine	Cockles	The concentrations in cockles reflect discharges from Sellafield. Concentrations of radionuclides discharged from Springfields, in terrestrial foodstuffs, are negligible.
Caesium-137	-	-	2.3	
Technetium-99	-	0.027	-	
Thorium-228	-	-	0.9	
Thorium-230	-	0.085	0.5	
Thorium-232	-	0.0012	0.2	
Protactinium-234m	-	-	150	
Total beta	-	150	-	
Total alpha	-	0.20	-	
Uranium alpha	0.0023	0.047	-	
Neptunium-237	-	0.0002	2.8	
Plutonium alpha	-	-	0.9	
Americium-241	-	-	1.8	
Critical group dose (µSv)	6*	9-15		

* Excludes direct radiation

TABLE 4. BNFL CAPENHURST 1998: RADIOACTIVITY IN DISCHARGES AND LOCAL FOODS; CRITICAL GROUP DOSES.

Radionuclide	Discharges (TBq)		
	Airborne	Brook	Concentrations of radionuclides discharged from Capenhurst, in terrestrial and marine foodstuffs, are negligible.
Tritium	5	0.15	
Technetium-99		0.0014	
Uranium alpha	0.000006	0.0013	
Non-uranic alpha		0.000014	
Critical group dose (μSv)*	<1	<1	

* From milk consumption and playing in the brook.

Appendix 3

Overview of Abatement potential for selected radionuclides

Data as presented by BNFL to the Discharges Working Group, June 1999

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Radionuclides	Aerial discharges	Liquid discharges
H-3	Change made to operation of central off-gas dehumidifier equipment at Thorp to reduce aerial tritiated water discharge. Further work planned to continue to reduce tritiated water discharges from Thorp vessel vent. Aerial tritium emissions from reprocessing plants normally are comprised of tritiated water and tritiated hydrogen. A study of technologies has been made and it is evident that there is no proven technology to abate tritiated hydrogen which is sufficiently developed.	Very low impact: no abatement considered likely to be viable in near future. Review developments in technology worldwide in order to identify potential processes for the cost effective removal and retention of tritium from aqueous effluents.
C-14	Review of abatement technologies for carbon-14 and iodine-129 carried out over the last 2-3 years. The purpose of this was to assess the current state of development of each of the technologies with respect to their potential use by BNFL. Selected technologies have been assessed in greater depth with respect to carbon-14. These are: • Fluidic scrubbing • Solid adsorbers • Chemical additives to caustic scrubbers A packed column caustic scrubber is under construction to abate the vessel vent system from B212 and B215. Fluidic scrubbing was also considered but it was concluded that, although such a scrubber would have similar capital costs to the packed-column scrubber currently predominant on site, it would not deliver significant advantages where space and height was not a limiting feature. The fact that packed-column scrubber technology is well proven on site was also a factor in its selection. It was also concluded that solid adsorbers could not compete in terms of primary abatement. The fact that packed-column scrubber technology is well proven on site was also a factor in its selection.	Undertaken development work and plant improvements at Thorp to optimise the control of operations within the C-14 plant (which treats dissolver off-gas scrubber liquors) in order to maximise the efficiency of precipitation of barium carbonate whilst minimising residual marine discharges of barium and carbon-14. Consideration has been given to whether to build a plant to treat the liquor from the Magnox dissolver off-gas scrubber. This would precipitate the absorbed carbon-14 and allow it to be treated as a solid waste. Current assessments indicate that this is not cost effective, but this will be reviewed against the outcome of the current business strategy review.

Radionuclides	Aerial discharges	Liquid discharges
C-14 (cont)	Thorp are currently investigating the source of the vessel vent C-14; overall discharges are lower than expected. However the potential for either modifying plant operations to control the main source of vessel vent arisings or for abating such arisings without adversely affecting the abatement of other key radionuclides is being considered.	
S-35	S-35 is present at an equilibrium level in the primary coolant circuit of Calder Hall reactors. The normal equilibrium level is significantly influenced by the amount of moisture present in the coolant, elevated levels leading to desorption of previously deposited S-35. Discharges of S-35 are highest when raised moisture levels are unavoidably present in the coolant, such as when a reactor is returned to service following shutdown or in the event of a boiler tube leak. Actions have been taken as far as possible to minimise the level of moisture following a boiler tube leak and work is ongoing to establish whether the installed iodine recirculation filters can be used to manage the enhanced level of S-35 following a boiler tube leak.	No significant discharges.
Ar-41	Ar-41 arises from the reaction of neutrons with naturally occurring Ar-40 present in the air used to cool the bioshields surrounding Calder Hall reactor pressure vessels. Ar-41 is an inert gas and therefore abatement strategies are limited, particularly taking into account the very large air volumes involved. Abatement is considered not to be feasible.	No liquid discharges.

Radionuclides	Aerial discharges	Liquid discharges
Co-60	No significant discharges.	Co-60 discharges arise principally from fuel handling operations in Thorp and associated oxide fuel ponds. Assessment of operational data has identified the handling of fuel from a limited number of BWR reactors to be the key source of Co-60 discharges. Fuel processing at Thorp will be programmed so as to avoid, as much as is practicable, significant changes in Co-60 discharges and to continue to optimise plant operations and the use of existing equipment designed to reduce Co-60 arisings in the feed pond purge. A feasibility study will be undertaken into the incorporation of suitable high Co-60 selective ion exchange materials into the Thorp feed pond particulate filters. Development work will be used to demonstrate whether use of such materials will have an adverse effect on related and downstream operations. As an alternative to the above, the feasibility of re-routing the Thorp feed pond purge to other treatment processes on site will be studied.
Kr-85	Over the last five years, the Company has maintained a programme to share best practice, review international developments in technology and commit R and T funding to the development of a novel removal process for reducing Kr-85 discharges. This work is ongoing but the current position is that on technical, engineering and safety grounds there is no currently viable krypton recovery process. Longer term research is attempting to identify potentially-viable process although there are significant safety case challenges and considerable cost implications (typically many £100M’s).	No liquid discharges.

Radionuclides	Aerial discharges	Liquid discharges
Sr-90	No significant discharges.	Development work has been carried out on a variation to the normal caesium removing inorganic species used at EARP. Initial work has already shown promise with an increased pH allowing greater Sr-90 removal without loss of Cs-137 removal. Pilot scale studies have begun with simulant waste streams to determine whether there is any interference with processing in EARP or encapsulation within WPEP or subsequent acceptance in a repository. BNFL has participated in an EU programme (just completed) on the development of new inorganic ion exchange materials of use to the nuclear industry. Certain of the new materials outperformed available commercial materials, notably for strontium removal.
Tc-99	No aerial discharges.	Most of the Tc-99 currently discharged arises from the EARP concentrate stream. A range of abatement options has been investigated. A recent Value Engineering (VE) study evaluated the options and concluded that two were the most technically feasible –electrochemical deposition (Porocell) and chemical reduction – and that future R and T would focus on these. Work on a previously favoured option (chemical precipitation) has ceased as the final waste form is not compatible with Nirex repository requirements. Work is continuing at laboratory scale on electrodeposition and on its final waste form (encapsulation or vitrification).

Note: Sr-90 and Tc-99 are Magnox fuel reprocessing and waste treatment issues.

Radionuclides	Aerial discharges	Liquid discharges
Tc-99 (cont)		It has been concluded that the chemical reduction process is not viable within the existing EARP process. Therefore, the current programme of work is focussed on scaling up the chemical reduction process in order to assess the feasibility of a full-scale abatement plant. Feasibility studies are being undertaken to assess whether changes to the Magnox reprocessing plant could result in the diversion of major Tc – bearing streams to vitrification.
Ru-106	Options are being considered for the reduction of future potential ruthenium discharges from WVP cell vent by abatement or process control or modification. This is being supported by R and T work on ruthenium chemistry. So far, options involving process control or modification are favoured.	Discharges will continue to be controlled as far as practicable through reprocessing and effluent plant programme planning, noting that Ru has a relatively short (1 year) half life. Hence decay store is the most appropriate abatement strategy.
I-129	Review of abatement technologies carried out as described under carbon-14. Selected technologies have been assessed in greater depth with respect to iodine-129. These are: • fluidic scrubbing • foam scrubbing • corona discharge • solid adsorbers • chemical additives to caustic scrubbers The B212/B215 scrubber referred to under carbon-14 may also abate iodine-129 to some extent. The feasibility of developing a HEPA filter with fibres impregnated with a solid adsorber is being assessed.	Iodine-129 discharges to sea arise mainly from the liquid scrubbing of 'off-gases' as this is seen as the Best Practical Environmental Option. Adsorption on a solid matrix may be feasible but current Nirex repository requirements would not permit this.

Radionuclides	Aerial discharges	Liquid discharges
I-129 (cont)	Thorp are also considering modifying operations to control the major sources of I-129 discharges or focusing such discharges into a preferred route. The preferred route is one which affords the best abatement.	
Cs-137	No significant discharges.	Work on amending the EARP process to improve caesium-137 removal has already been described under strontium-90.

Appendix 4

Future business and process scenarios for BNFL

Operating Scenarios

The following scenarios correspond with those discussed at the 7/8 September meeting of the Discharges Working Group and the earlier meetings of the Waste Working Group. Indicative discharge and dose projections are given for these scenarios in Appendix 5. Projections are illustrative and should not be interpreted as implying any degree of precision.

D1 "Stop now"

Magnox reprocessing, Calder reactors and reprocessing in Thorp cease on 31 December 1999.It subsequently takes 5 years to process concentrates; discharges from pond purges, decommissioning etc. are on-going. This scenario is not practicable because of the quantities of Magnox fuel already in the system, for which there is no proven long term management route other than reprocessing.

D2 "Contracted business" – corresponds to WWG case 'Reference' for Magnox: 'Contracted' for Thorp.

Magnox reprocessing and Calder continue as current BNFL business plan (ie 37 years average station lifetime; 45 year for Calder/Chapelcross). Thorp reprocesses currently contracted fuel.

D3 "Partial Blue Sky":

Magnox reprocessing and Calder indicative lifetimes around 2010 (± several years) with some years to work off backlog liquors. Thorp continues reprocessing in 3rd decade, ie to 2023/24, on oxide and/or Magnox fuel.

D4 "Full Blue Sky"

Magnox reprocessing continues to 2023/24 (Magnox stations average 50 year lifetime); Thorp continues at full throughput in 3rd decade, ie to 2023/24.

Appendix 5

Indicative discharge and dose profiles for future BNFL business and process scenarios

Data as presented by BNFL to the Discharges Working Group, October 1999

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Discharge and Dose Projections

The following figures give illustrative projections. Critical group doses relate to the contribution from current and future discharges i.e. excluding the dose contribution from historic discharges.

Figure 5.1: Dose to the critical group from liquid discharges, no abatement for Tc-99 or C-14

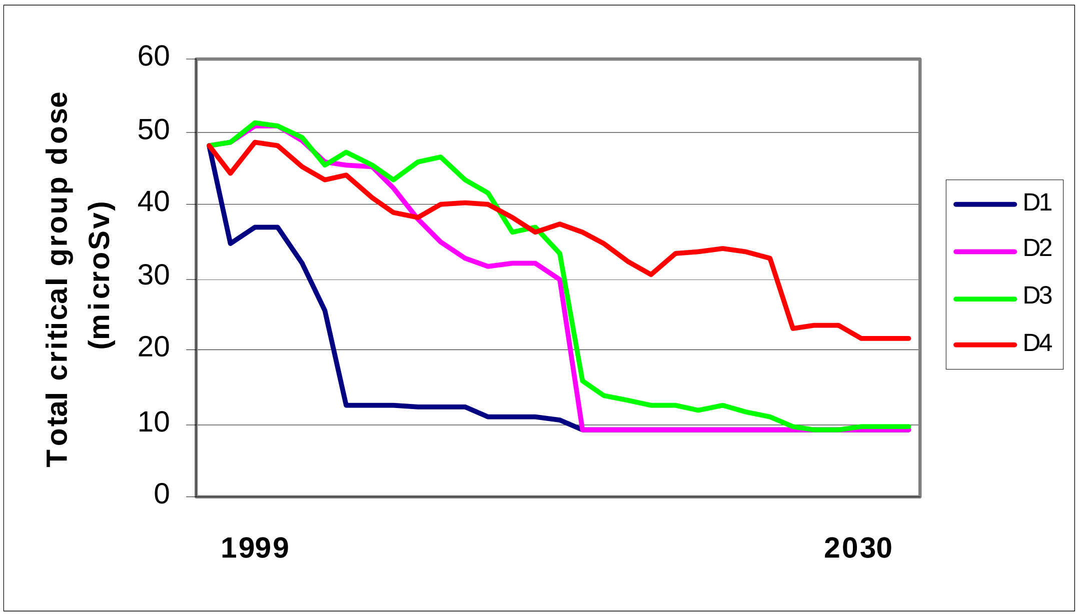


Figure 5.2: Dose to the critical group from liquid discharges, with abatement introduced for Tc-99 and C-14

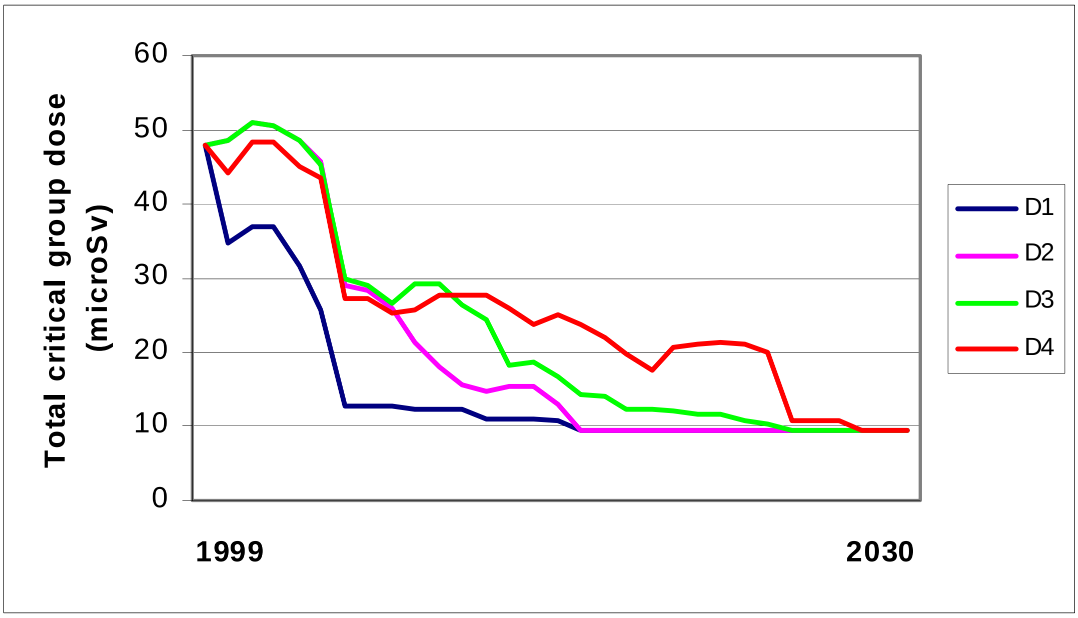


Figure 5.3: Contributions by nuclide to the critical group dose for liquid effluents, exemplified by scenario D3 without Tc-99 or C-14 abatement.

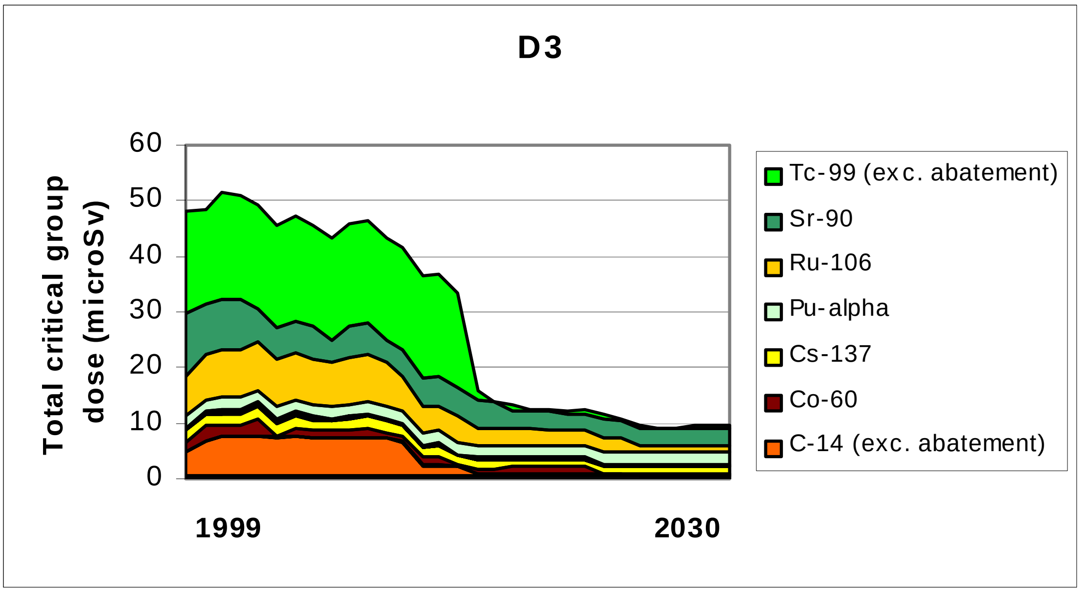


Figure 5.4: Indicative total activity in liquid discharges

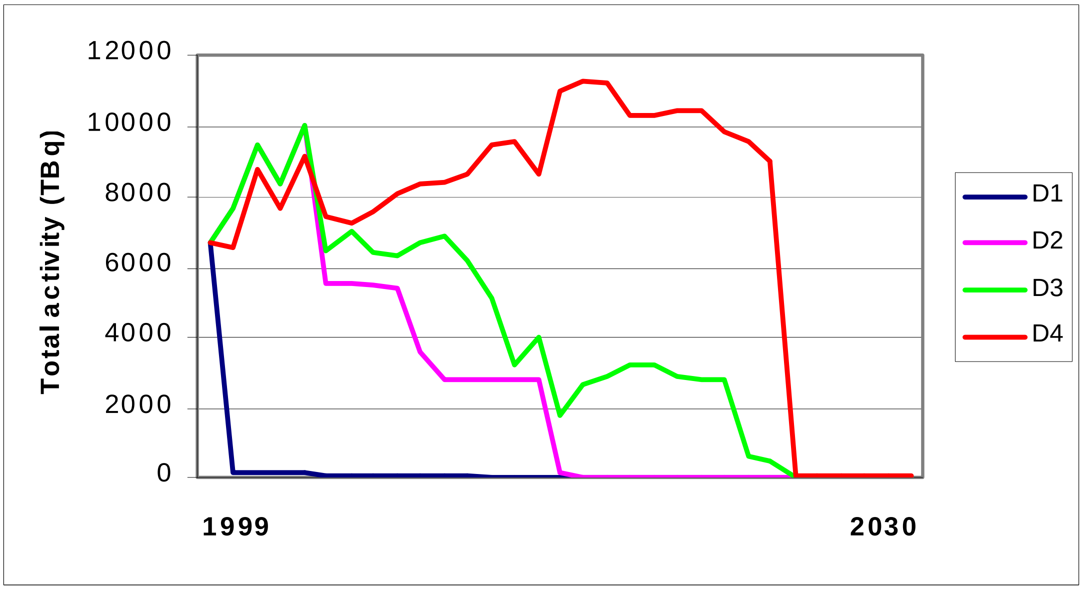


Figure 5.5: Effects on total activity discharged of Tc-99 and C-14 abatement, exemplified by scenario D3

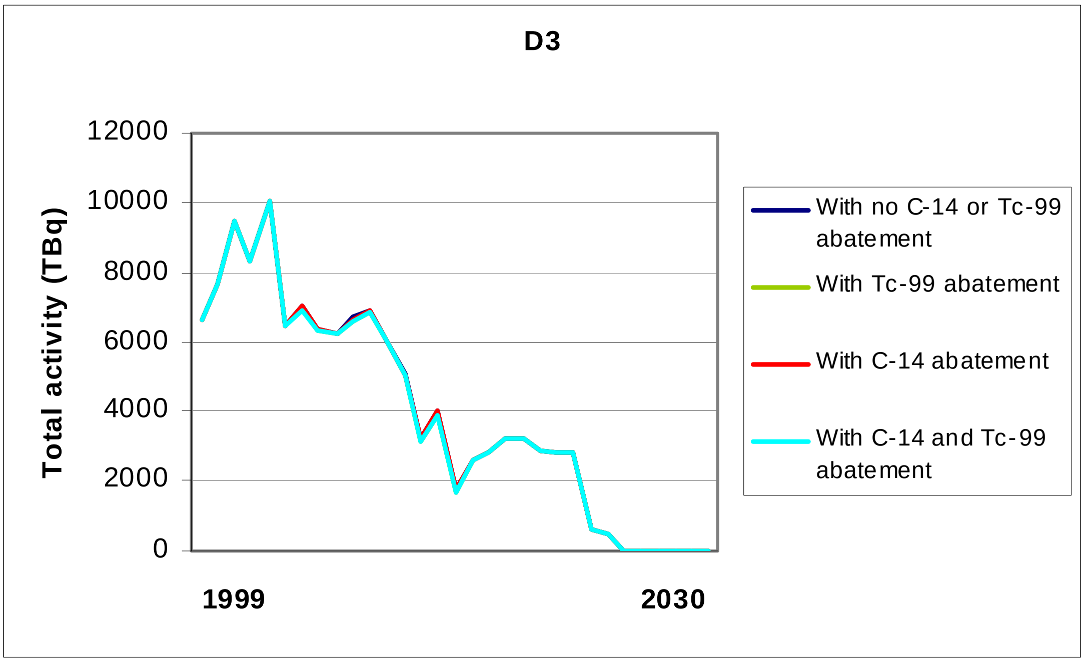


Figure 5.6: Indicative dose to critical group from liquid effluents, assuming Tc-99 abatement, including estimated effect of the accumulation of historic discharges onto sediments

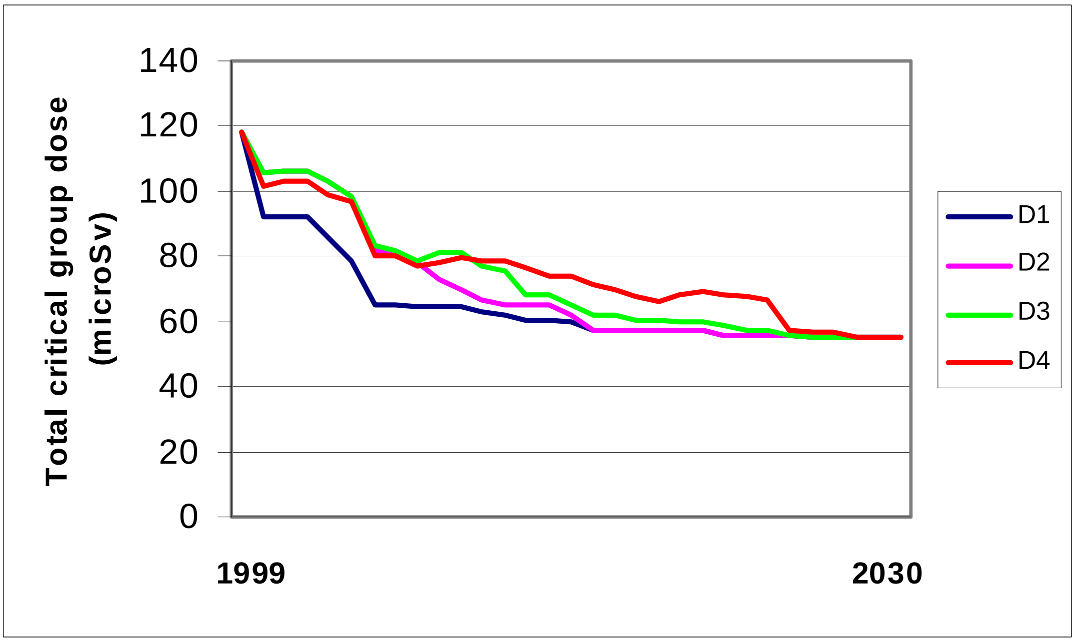


Figure 5.7: Indicative dose to critical group from aerial discharges

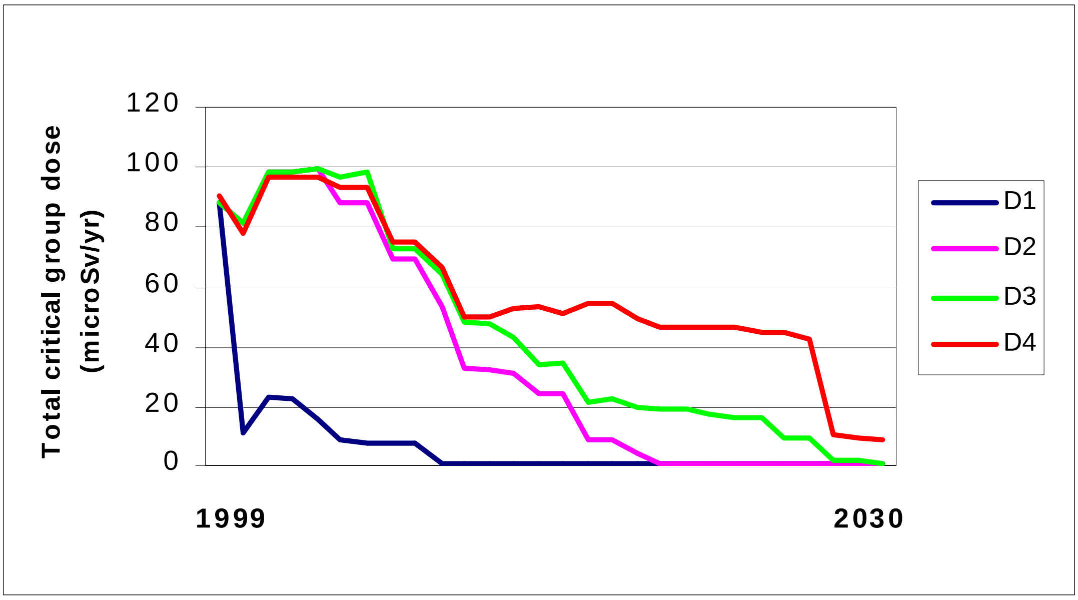


Figure 5.8: Contribution by nuclide to critical group dose from aerial discharges, exemplified by scenario D3

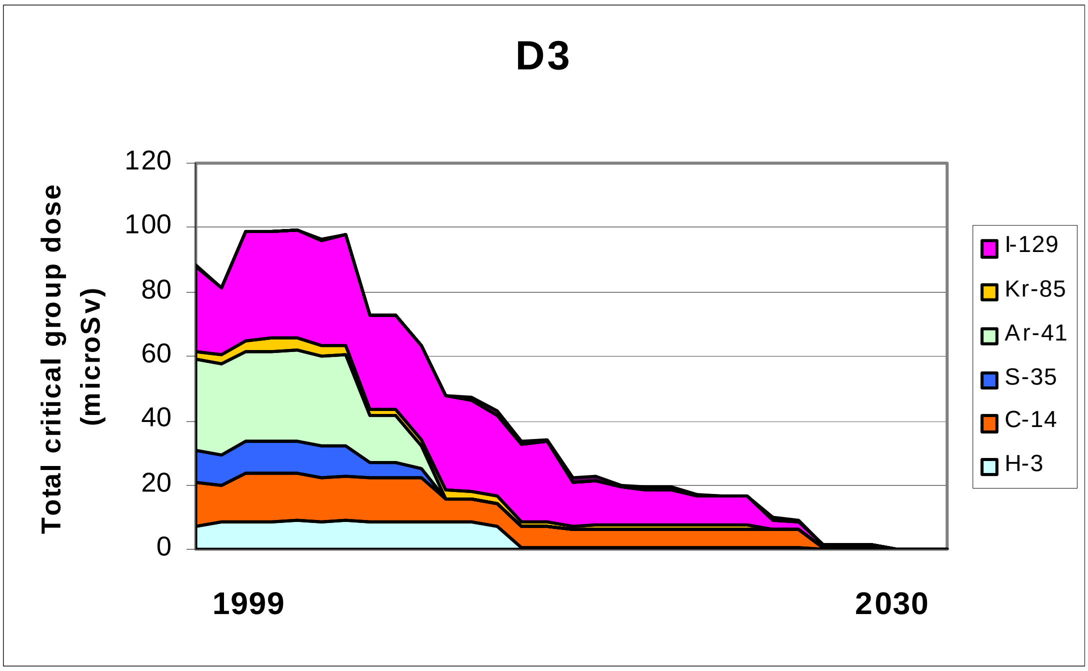
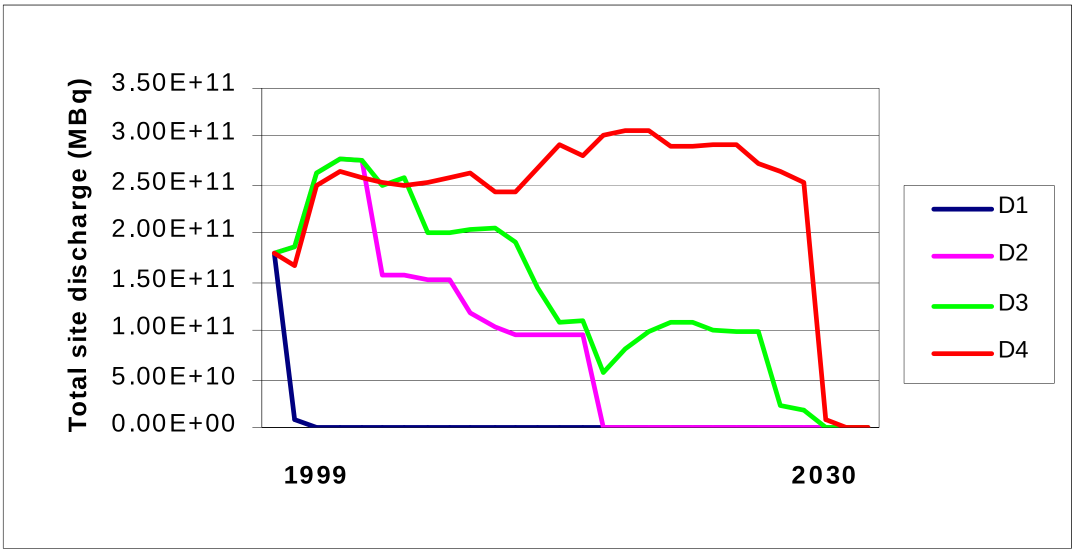
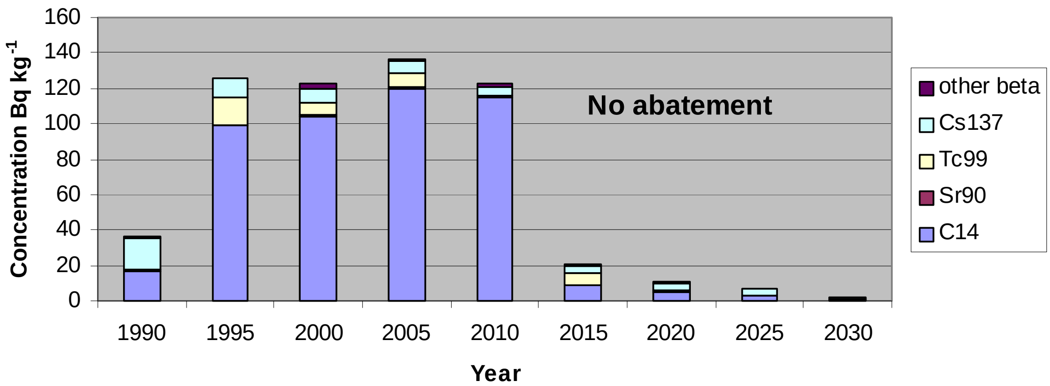


Figure 5.9: Total activity from aerial discharges



Note: the dominant contributor to activity discharged as aerial effluent is Kr-85, other nuclides are not significant on this scale.

Figure 5.10: Beta activity in Cumbrian fish with and without Tc-99 and C-14 abatement



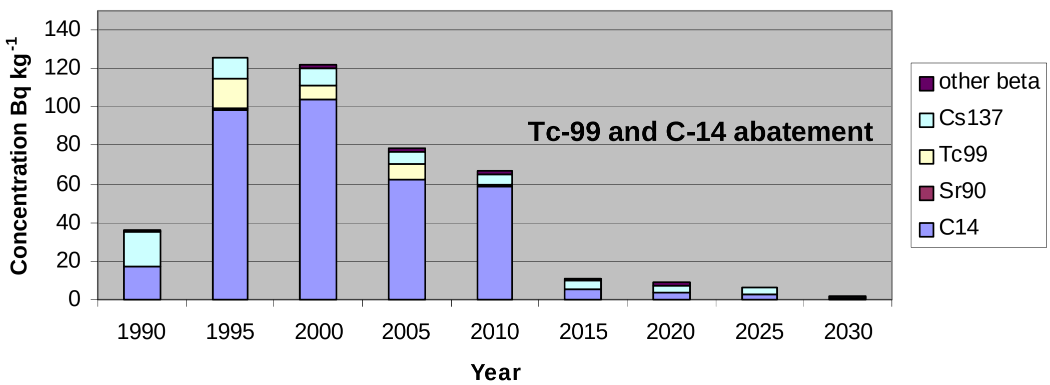
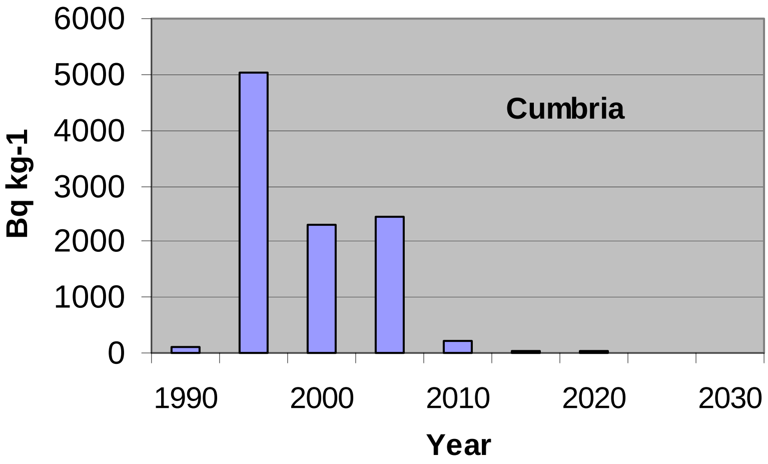
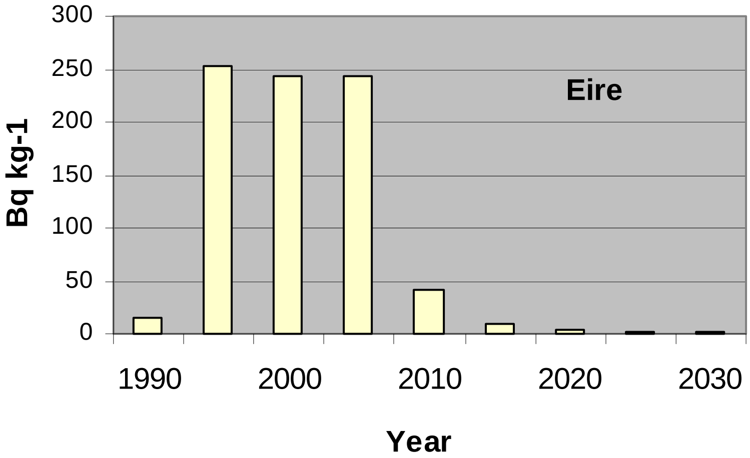


Figure 5.11: Tc-99 concentrations in lobsters from Cumbria and Eire, assuming the implementation of Tc-99 abatement





Appendix 6

BNFL Working Group Terms of Reference

Discharges Working Group

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BNFL Working Group Terms of Reference - DISCHARGES

Background

These terms of reference have been collated from the issues and conclusions of the BNFL Stakeholder Dialogue Main Group Meeting on 17th March 1999. It is open to the Discharges Working Group (DWG) to amend them, or to set itself wider or more restricted terms, always bearing in mind that it should not diverge from the consensus of the main group, and will be reporting back to the main group.

In the event of the DWG raising objections as to the interpretation of the following headings, the Co-ordinating Group (CG) might contact members of the original *Scope, Aims, Planning* & *Information Needs* sub-groups, to ensure that these summaries reflect their intentions.

Overall

The DWG needs independent facilitation.
The DWG will need to agree criteria for judging its own success.
Wherever possible there must be continuity of individuals as members of the DWG membership, with substitutes deputising only where absolutely necessary.
A decision should be taken as to whether feedback between meetings should be available only to members of the DWG, or should also be made available to the Main Group / Waste Group.
Should the DWG agree at the outset that its remit finishes on presentation of its recommendations in November, or is it preferable to let the Group decide as its work progresses?

Scope

The Scope should be defined by the Aim, currently proposed as:
"To recommend a framework for BNFL's management of radioactive discharges (liquid and aerial) with particular emphasis on a contribution towards achieving the OSPAR strategy".

Therefore, should the DWG redefine the Aim, the Scope may also need to be re-examined.

The proposed scope of radioactive discharges to be considered is as follows:
- BNFL radioactive discharges to air, land and water from the UK
- BNFL non-radioactive discharges where these are directly linked to radioactive discharges. All other non-radioactive discharges are expressly excluded

Timescale to be considered by the report:
- The framework should start from 2000 and its results have effect by 2020 (OSPAR deadline).

Scope of discharge impacts
- The report should consider local, national and international impacts from the discharges.
- The impacts for the November report should focus on human impacts, but the DWG may decide to expand this to include the natural environment. Impacts will include radioactive dose assessments, risk assessment methodology, collective dose.
- The DWG may decide to recommend a process for considering a similar report/set of recommendations for impacts to the natural environment, to be approached after November 1999.

Wider areas
- Economic aspects of discharge reduction/elimination to be considered (cost/benefit) as well as best practicable environmental, health and safety options.

Aims

The proposed aim is:
"To recommend a framework for BNFL's management of radioactive discharges (liquid and aerial) with particular emphasis on a contribution towards achieving the OSPAR strategy".
There will be other 'milestones' beyond this primary objective.

The report to the main group in November, will also include:

- An appraisal of radioactive discharges by BNFL (accepted as being objective), the processes giving rise to them, and the risks arising from these processes and discharges.
- The consideration of impacts and risks from the discharges will include values and perceptions as well as technical facts. Economic considerations (such as cost-benefits) also to be considered.
- An examination of where consensus (and disagreement) on the interpretation of OSPAR exists between the stakeholders.
- Recommendations on how the report should be used, and how the process of stakeholder involvement should be carried forward in contributing to BNFL's decisions on discharges.

The DWG may decide to expand these areas.

Planning

The DWG will agree its own Terms of Reference, liaising where necessary with the CG.
These will include a clear statement/confirmation of the DWG status and operating principles.
These may include:

Status
The working group's task is to inform and influence BNFL's decision-making, and that of the other stakeholders

Operating Principles

- The DWG needs administrative and logistical support (secretariat) which will be provided by the Environment Council.
- The DWG should be able to invite third parties to its meetings, for example experts on specific issues.
- The funding of the DWG and recovery of costs by individual members must be agreed. They must be transparent, and be seen not to affect the group's neutrality.
- There should be a convenient method of ensuring the free flow of information between DWG members between meetings. It has been suggested that the Environment Council might post DWG information on its website, accessible either only to DWG members, or also to the Main Group / Waste Group.
- The DWG will need to agree an Agenda for its term of operation - roles, meetings, timings. It has been suggested that the DWG meet every 3 months, with more frequent sub-group meetings.

Information Needs

Information will be needed both from BNFL and other sources, surrounding the issues to be addressed under *'Aims'*. This will provide an informed basis for discussion. All organisations represented on the DWG will make information needed by the Group available to it. Where information is held by third parties, a decision will be made as to whether the DWG or the CG will obtain it. The DWG will agree ground rules for the use of such information.
Information which the DWG may decide it needs (the focus should be on future discharges):

- Some historical discharge data - both because it is seen as relevant to the OSPAR process, and because it sets a marker for BNFL's goodwill in providing it.
- Predicted discharge data
- Insight into BNFL's interpretation of and plans for implementing the OSPAR agreement
- Information on current and future abatement technology, in the UK and abroad
- Information on fate of discharges
- Insight into the regulatory situation (discharge authorisation, international agreements)
- Insight into BNFL's current process giving rise to discharges, and future business options with associated potential discharges, together with impacts and cost/benefit information
- What information on discharges is available - and what is not available?

Appendix 7

Membership of the Discharges Working Group

Appendix 7
Membership – Discharges Working group

Roger Coates	**BNFL**
Jim Gray	**BNFL**
Mark Drulia	**BNFL**
Tony Free	**British Energy**
Jim Begbie / John Kane	**GMU**
Frank Barnaby	**Oxford Research Group**
Robert Gunn	**DTI**
Rick Nickerson	**KIMO**
Robin Simpson	**Copeland Borough Council**
Martin Forwood	**CORE**
Paul Holley	**MAFF**
Pete Roche	**Greenpeace**
Steve Kaiser	**European Commission DGXI**
Peter Addison	**NII**
Gerry McLaughlin	**Environment Agency**
Steve Jones	**Westlakes Scientific Consulting**

and facilitated by The Environment Council

Important note:

The views in this report are those of the working group members and their respective organisations with the exception of regulators who represent current government policy only.

The views expressed in the report may not reflect those of all the stakeholders present at the main group meeting on the 25/26 November 1999.

Appendix 8

Papers Considered or Generated by the Discharges Working Group

Appendix 8
Papers Considered or Generated by the Discharges Working Group

Any of the documents mentioned below may be obtained by contacting either Schia Mitchell or Erica Sutton at The Environment Council.

BNFL Ongoing Stakeholder Dialogue
Discharges Working Group - Summary of Documents Circulated

Date:	Document:	Provided by:
10 May 1999 (circulated at DWG meeting)	• OSPAR Action Plan 1998 - 2003 Annex 38 (Ref. § B-7.1) - *OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic, Ministerial Meeting of the OSPAR Commission, Sintra: 22-23 July 1998*	Pete Roche, Greenpeace
	• OSPAR Strategy with regard to Radioactive Substances (Reference Number: 1998-17) Annex 35 (Ref § B-6.5) - *OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic, Ministerial Meeting of the OSPAR Commission, Sintra: 22-23 July 1998*	Pete Roche, Greenpeace
	• Work Programmes 1998/1999 for PRAM's Third Tier Working Groups Annex 14 (Ref § A-6.3) - *OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic, Meeting of the OSPAR Commission, Sintra: 20-24 July 1998*	Pete Roche, Greenpeace
	• Prospects for Protection of the Environment in EU Radiation Protection Legislation - *A Janssens, European Commission, Directorate General Environment, Nuclear Safety and Civil Protection*	Steve Kaiser, European Commission
20 May 1999	• Discharges to the environment from the Sellafield Site, 1951-1992 - *J Gray, S R Jones, A D Smith* Journal Radiological Protection 1995,Vol 15, No 2, 99-131	Jim Gray, BNFL
	• The OSPAR Commission and Ministerial Meeting 20-24 July 1998, Sintra, Lisbon - *Jim Gray* Meeting Reports, Journal of Radiological Protection; Volume 18, Number 4, December 1998 Official Journal of The Society for Radiological Protection, Published by Institute of Physics Publishing	Jim Gray, BNFL

20 May 1999	• Observations on the redistribution of plutonium and americium in the Irish Sea sediments, 1978 to 1996: concentrations and inventories - *P J Kershaw, D C Denoon, D S Woodhead* Journal of Environmental Radioactivity 44 (1999) 191-221 • The radiological impact of actinides discharged to the Irish Sea inventories - *G J Hunt, B D Smith* Journal of Environmental Radioactivity 44 (1999) 389-403	Paul Holley, MAFF Paul Holley, MAFF
27 May 1999	• Draft Groundrules - Main Group Meeting, 17 March 1999 - *The Environment Council* • Draft Groundrules - Discharges Working Group, 2nd Draft, 27 May 1999 - *The Environment Council* • Discharges Working Group: Objectives/ Success Criteria/Outcomes - Discussion Draft - *The Environment Council* • OSPAR and Radioactive Discharges - *Pete Roche, Greenpeace* 20 May 1999 • Sellafield must be seen to be squeaky clean - *Nolan Fell* Nuclear Engineering International, Focus	The Environment Council The Environment Council The Environment Council Pete Roche, Greenpeace Pete Roche, Greenpeace
2 June 1999	• Aquatic Environment Monitoring Report Number 32: A Review of Radioactivity in the Irish Sea. A report prepared for the Marine Pollution Monitoring Management Group - *P J Kershaw, R J Pentreath, D S Woodhead and G J Hunt* MAFF, Directorate of Fisheries Research, Lowestoft, 1992	Jim Gray, BNFL
23 June 1999	• Second International Symposium on Ionizing Radiation. Environmental Protection Approaches for Nuclear Facilities 11-14 May 1999, Ottawa, Canada Meeting Report, 21 May 1999 (ICRP 40/218/99) - *R V Osborne, European Commission* • Fallacies in Ecological Risk Assessment Practices - *M Power, L S McCarty* Environmental Policy Analysis: Risk Volume 31, No 8, 1997, Environmental Science & Technology News	Steve Kaiser, European Commission Steve Kaiser, European Commission

23 June 1999	• A Comparative Analysis of Environmental Risk Assessment/Risk Management Frameworks *- M Power, L S McCarty* Environmental Policy Analysis: Risk 1 May 1998, Environmental Science & Technology News • Copy letter from Steve Kaiser accompanying above documents	Steve Kaiser, European Commission Steve Kaiser, European Commission
28/29 June 1999 (circulated at DWG meeting)	• Update on Events Post Sintra 1998 in Relation to Radioactive Issues Information for Discharges Working Group. *- J Gray, Head of Corporate Safety and Environment. Safety, Heath and Environment Directorate H270, BNFL* 28 June 1999 • Meeting of the OSPAR Commission Kingston-upon-Hull: 21-24 June 1999 Note for the Record *- J Gray, Head of Corporate Safety and Environment. Safety, Heath and Environment Directorate H270, BNFL* 25 June 1999	Jim Gray, BNFL Jim Gray, BNFL
6 July 1999	• a-particle-induced chromosomal instability in human bone marrow cells *- Munira A Kadhim, Sally A Lorimore, Mary D Hepburn, Dudley T Goodhead, Veronica J Buckle, Eric G Wright* The Lancet, Vol 34, 8 October 1994 • Transmission of chromosomal instability after plutonium a-particle irradiation *- M A Kadhim, D A Macdonald, D T Goodhead, S A Lorimore, S J Marsden & E G Wright* Nature, Vol 355, 20 February 1992 • [report on radiation damage to DNA] *- Rob Edwards* New Scientist, 11 October 1997	Frank Barnaby, Oxford Research Group Frank Barnaby, Oxford Research Group Frank Barnaby, Oxford Research Group

10 August 1999	• BNFL Stakeholder Dialogue Groundrules for the Working Groups 3rd Draft, 19 July 1999 *- The Environment Council* • Outline of Waste Working Group scenario approach *- The Environment Council*	The Environment Council The Environment Council
26 August 1999	• Summary of Radioactive Discharges and Impacts from BNFL/Magnox Sites other than Sellafield *- J Gray Head of Corporate Safety and Environment. Safety, Health and Environment Directorate H270, BNFL* 24 August 1999	Jim Gray, BNFL
2 September 1999	• Levels of ^{99}Tc in Seawater and Biota Samples from Norwegian Coastal Waters and Adjacent Seas *- J E Brown, A K Kolstad, A L Brungott, B Lind, A L Rudjord, P Strand and L Foyn* • Note for BNF Stakeholder Dialogue Discharges Working Group *- Pete Roche, Greenpeace* 2 September 1999 • Reference documents for Note from Pete Roche: A New Hazard Index for the Determination of Risk Potentials of Disposed Radioactive Wastes *- Gerald Kircher* Collective Doses from Proposed Sellafield Discharges. NRPB Note for COMARE *- A Mayall, T Cabianca, T P Morris, A Nightingale, J R Simmonds and J R Cooper* Discharge Regulation of the UK Nuclear Industry - *Anthony J Morris*	Pete Roche, Greenpeace Pete Roche, Greepeace Pete Roche, Greenpeace

7-8 September 1999 (Distributed at DWG Meeting)	• Information requested by the Discharges Working Group for use only within the Working Group: Magnox Fuel C14 Concentration data - *Roger Coates, BNFL* 6 September 1999 • Tritium - The Overlooked Nuclear Hazard The Ecologist, Vol 22, No. 5 September/October 1992 - *Ian Fairlie*	Roger Coates, BNFL Pete Roche, Greenpeace
13 September 1999	• ***Conclusions from report:*** Protection of the environment from the effects of ionizing radiation A report for discussion IAEA-TECDOC-1091 - *International Atomic Energy Agency* July 1999	Jim Gray, BNFL

Appendix 9

Glossary

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Appendix 9
Glossary

Am	Americium: all of the isotopes of the element americium are radioactive. The most important is americium-241 with a halflife of 433 years.
Ar-41	Argon-41: a radioactive isotope of the element argon with a halflife of 1.8 hours. Argon is an inert (chemically very unreactive) gas so that removal of argon from gaseous discharges is difficult. This also means that it does not bio-accumulate.
B205	The 'B205' plant at Sellafield was commissioned in 1964 for the reprocessing of used Magnox fuel from UK and overseas reactors and is still in operation.
Becquerel (Bq)	A unit used to define the quantity of radioactivity in discharges, environmental samples, etc. 1 Bq is only quite a small amount of radioactivity; the human body contains about 4000 Bq of naturally occurring radioactivity. 'Multipliers' are often used to conveniently describe larger quantities, e.g. in discharges: 1 gigabecquerel (GBq) = 1,000,000,000 Bq (10^9 Bq) 1 terabecquerel (TBq) = 1,000,000,000,000 Bq (10^{12} Bq)
C-14	Carbon-14: a radioactive isotope of the element carbon with a halflife of 5,730 years. In addition to its production in the nuclear fuel cycle, carbon-14 is produced in substantial amounts naturally by the action of cosmic rays on the Earth's atmosphere.
Calder, Calder Hall (reactors)	The Calder reactors, which began operation in 1956, are located on the Sellafield site and are the prototypes for the magnox reactor design.
Co-60	Cobalt-60: a radioactive isotope of the element cobalt, with a halflife of 5.3 years.

Collective dose	The total dose received by a specified population group as a result of discharges; that is, the summation of all the doses received by individuals in the population. The calculation of collective dose takes account of the persistence of radioactivity in the environment after discharge and is therefore 'integrated' over a specified period of time after the discharge has been made. Usually collective dose is calculated for large groups, e.g. the UK, European or world populations and for integration periods of hundreds to thousands of years following the discharge.
Critical group	A small group of people who, by virtue of location or habits (such as food consumption) receive the highest radiation doses as a result of discharges from a particular nuclear installation. For a particular nuclear installation there may be several critical groups; e.g. the group most highly exposed as a result of liquid discharges will generally not be the same as the group most highly exposed as a result of aerial discharges.
Cs-137	Caesium-137: a radioactive isotope of the element caesium, with a halflife of 30 years.
EARP	The Enhanced Actinide Removal Plant at Sellafield was commissioned in 1995 with the main object of removing plutonium and americium from liquid discharges and so reducing discharge to the environment of these radionuclides. Also effective in reducing discharges of Sr-90, Ru-106 and other nuclides (but not Tc-99).
Effluent	Liquid or gaseous material arising from a chemical process as waste which requires treatment and disposal.
Environmental Quality Standard (EQS)	A standard or limit for concentrations of pollutants in the environment, set in such a way as to protect both human health and potentially affected biota. EQS values are most commonly set as limits on concentration of pollutants in water, soil or air.
H-3	Hydrogen-3, more usually called tritium: a radioactive isotope of the element hydrogen, with a halflife of 12.3 years. As for carbon-14, tritium is produced naturally in substantial quantities by the action of cosmic rays.
Half life	The period of time required for the radioactivity associated with a particular radioactive isotope to diminish by half.

I-129	Iodine-129: a radioactive isotope of the element iodine, with a halflife of 16 million years.
Kr-85	Krypton-85: a radioactive isotope of the element krypton, with a halflife of 10.7 years. Like argon, krypton is an inert gas and so removal from gaseous discharges is difficult. It does not bio-accumulate.
Legacy (discharges)	A phrase used by BNFL to denote discharges which will arise from the decommissioning of old plants currently on the site and the ongoing conditioning of stored waste from old processes to convert it into a form more suitable for extended storage and/or ultimate disposal.
Magnox (reactors or reprocessing)	'Magnox' is the name given to a particular type of nuclear fuel used in the first generation of nuclear reactors used for electricity generation in the UK. Magnox fuel consists of a uranium metal bar encased in cladding made from a magnesium/aluminium alloy. Both the cladding and the uranium metal are potentially susceptible to corrosion and storage of the used fuel for any extended period (more than a few years) requires great care. (See also B205)
Medium Active Concentrate (MAC)	A liquid discharge stream from reprocessing which is evaporated to reduce its volume, stored to allow radionuclides with short half-lives to reduce in activity, and discharged to the environment after treatment through the EARP plant. The medium active concentrate from Magnox reprocessing (but not that from THORP) contains a significant amount of Tc-99, which is not reduced either by the delay storage period or by the subsequent treatment in EARP.
Microsievert (μSv)	A unit used to quantify radiation dose, that is a measure of the potential biological effects of exposure to radiation. For perspective the average annual dose to the UK population from natural radioactivity in the environment is about 2200 μSv; the Environment Agency judges the acceptability of proposed discharges from new nuclear installations against an upper 'dose constraint' of 300 μSv per year to the 'critical group'.
Offgas	Gases (typically, air plus acid gases plus water vapour plus trace contaminants) emanating from a chemical process vessel and passed into a suitable treatment system.

OSPAR	The Oslo and Paris Commission: an international commission which establishes conventions on the limitation of marine pollution in the North-East Atlantic.
Oxide (reprocessing)	'Oxide' nuclear fuels typically consist of pellets of uranium oxide, produced in a ceramic form, encased in cladding made of stainless steel or steel/zirconium alloy to make a fuel 'rod' or 'pin'. The second generation of nuclear electricity generation reactors in the UK (Advanced Gas cooled Reactors, or AGRs) used this type of fuel, as do the most common type of reactors in use worldwide - the Pressurised Water Reactor (PWR) and Boiling Water Reactor (BWR). Oxide fuel is much more corrosion resistant than Magnox and is easier to store for extended periods if necessary prior to reprocessing or disposal.
Pu	Plutonium: all of the isotopes of the element plutonium are radioactive. One of the most important is plutonium-239 with a half-life of 24,000 years.
Reprocessing	Reprocessing of nuclear fuel involves subjecting the used fuel to a series of mechanical and chemical processes, the end product being the separation of unused uranium, plutonium which has been produced within the fuel as a by product of the nuclear reactions which occur within the nuclear reactor, and highly radioactive waste products. In addition to these main 'products' the processes result in the production of liquid and gaseous discharges which, after appropriate treatment, may be discharged to the environment.
S-35	Sulphur-35: a radioactive isotope of the element sulphur, with a half-life of 87 days.
Scrubber	A method of offgas treatment in which the offgas is passed through a column or vessel and contacted with a liquid (e.g. caustic soda solution) with the object of absorbing pollutants from the gas into the liquid.
Sellafield	A site operated by BNFL, located in Cumbria, which is the main UK site for the reprocessing of magnox and oxide nuclear fuels and for the conditioning and storage of associated waste products.
Sintra (statement)	An intergovernmental statement made by the ministerial representatives of the signatories of the OSPAR convention at their meeting in 1998 at Sintra, Portugal. Some more details are given in paragraph 3.10 of the main text.

Sr-90	Strontium-90: a radioactive isotope of the element strontium, with a half-life of 29 years.
Tc-99	Technetium-99: a radioactive isotope of the element technetium, with a half-life of 213,000 years. Unlike all other elements lighter than lead, there are no stable (non radioactive) isotopes of technetium and the element itself does not exist naturally; in consequence the chemical properties of technetium have been studied relatively little.
THORP	The Thermal Oxide Reprocessing Plant is located at Sellafield and was brought into operation in 1994 for the purpose of reprocessing oxide fuels from reactors in the UK and overseas. The plant was financed by advance payments on reprocessing contracts and there are binding contractual commitments to reprocess a 'baseload' of fuel over the first decade of operation.

Appendix 10

Stakeholder Comments

COUNTY COUNCIL

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2nd February 2000

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The Environment Council
212 High Holborn
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FAO: Schia Mitchell
Project Operations Manager
BY FAX & FIRST CLASS POST

Dear Ms Mitchell

CUMBRIA COUNTY COUNCIL COMMENTS ON THE INTERIM REPORTS OF THE WASTE WORKING GROUP & DISCHARGES WORKING GROUP IN THE BNFL NATIONAL DIALOGUE

The following comments can be referred to and apply to both the Waste & Discharges Working Group reports.

Cumbria County Council welcomes both reports as a major step forward towards common understanding amongst all stakeholders as to the basic scenarios for managing waste and reducing discharges. We do not wish to offer any detailed observations or criticisms of the current text in the Interim Reports.

In respect of waste, we are pleased that the report emphasises the need to ensure all waste arisings are packaged in passively safe, monitorable and retrievable interim storage, while acknowledging that research must continue on long-term storage and the possibility of disposal. We are, however, particularly pleased that the report notes that the House of Lord's recommendation that the disposal programme be immediately re-launched, is not shared by members of the Waste Working Group.

We are also pleased that both reports see the need to urgently assess the socio-economic consequences for West Cumbria. There would be significant effects for West Cumbria from accelerated plant closures under the "Stop Now" or similar scenario. There could also be significant economic opportunities presented by the "Blue Sky" scenario. We consider there is thus a need to bring forward work urgently to provide baseline economic and social impact data and then assess the consequences of each scenario. The long-term role of Sellafield in the economy of West Cumbria needs to be given careful consideration, and the County Council would be pleased to assist the dialogue process in developing socio-economic data analysis and evaluation to inform the future proposed reports on Spent Fuel Management Options and Plutonium / Mox.

Yours sincerely

W Minto CBE DL
Leader, Cumbria County Council

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8 February 2000

MEMO

TO: Environment Council
FROM: Gordon Thompson
RE: BNFL National Stakeholder Dialogue

1. Introduction

This memo provides some brief comments on the 18 January 2000 draft interim reports of the Discharges Working Group and the Waste Working Group. Gordon Thompson has prepared these comments on behalf of the Institute for Resource and Security Studies (IRSS). Thompson has represented IRSS on the Main Group of the Stakeholder Dialogue, and attended a November 1999 meeting in Manchester, where earlier drafts of the two reports were discussed. IRSS requests that this memo be attached to the two interim reports when they are made public later this month.

2. Scope, nature and quality of the Working Group reports

Decision-making in the UK about nuclear projects has consistently suffered from the lack of a key ingredient. That ingredient is the comprehensive, objective assessment of options for action. Such an assessment should be performed prior to the commitment of resources to a particular course of action. The assessment should identify and characterize a range of options. It should be carried out within the culture of science, which calls for openness, accountability, objectivity, clear statement of assumptions, and the use of peer review. The publication of such an assessment would support an informed public debate, and would increase the probability that wise decisions are taken.

The two Working Group reports represent a step toward meeting this need. However, they require substantial improvement, as illustrated by the following examples:

(a) Both reports present quantitative findings which are derived from analytic models that are not identified, whose assumptions are unstated, and for which there is no accountability.

(b) Both reports combine technical analysis with judgements about what is politically or economically practicable, with no clear distinction between these modes of discussion.
(c) The Discharges Working Group report repeatedly refers to "dose" without defining this parameter. In fact, the report uses a composite, theoretical dose. This practice can obscure important information about the distribution of incorporated radioactivity within the human body.
(d) The Waste Working Group report presents its results almost entirely in terms of waste volume. In fact, volume is only one indicator of radioactive waste characteristics, and may not be the most relevant indicator when matters such as the cost and risk implications of a waste management option are being assessed. The report ignores the implications of storing high-level radioactive waste at Sellafield as a liquid, a practice which holds the potential for a very large release of radioactivity.
(e) Both reports employ a set of scenarios that reflect arbitrary judgements, unsupported by technical analysis, especially in connection with the ending of Magnox reprocessing.
(f) Both reports present quantitative findings in a manner that can obscure differences between the future outcomes of alternative scenarios. This occurs when the incremental outcomes (e.g., waste volume) of decisions yet to be taken are lumped together with the outcomes of decisions taken in the past.
(g) Both reports appear to imply that policy decisions can be made while viewing particular issues (e.g., waste volume) in isolation. In fact, an integrated analysis that addresses all significant issues is a necessary precondition for making wise decisions.

3. The model of dialogue that underlies these reports

In the UK, BNFL represents a large concentration of capital, has considerable political influence, and has connections throughout the power structure. Its business plan is seen as an extension of state strategy. It continues to perform military functions, and preserves a tradition of secrecy.

The participants in this stakeholder dialogue are representatives of: (1) BNFL and its employees or contractors; (2) central government agencies; and (3) nongovernmental bodies and local governments. For convenience, let us call the third set of participants the Outsiders. This is apt because these participants have no formal power, limited financial resources, and (like the general public) limited access to relevant information. The Outsiders are a diverse, argumentative group, and they rarely speak with a single voice. Yet, over the years they have accrued public support, and have a reasonable record of accuracy in their assessment of issues.

Why has BNFL decided to spend money and staff time on dialogue with Outsiders? The short answer is that problems have arisen in the implementation of BNFL's business plan. Having tried other approaches to solving these problems, BNFL has now decided to sit down with its critics, to identify possible areas of common interest. That should be a welcome development. Unfortunately, however, the dialogue in the Working Groups appears to have become focussed on the question: "Can a deal be made between BNFL and the Outsiders, wherein each side makes compromises?"

There are three big problems with a dialogue that follows a deal-making model of this type. First, there is a significant asymmetry between BNFL and the Outsiders, in wealth and access to the power structure. This asymmetry could skew the outcome of the dialogue. Second, the Outsiders have no mandate from the public, and there will inevitably be argument within the Outsider camp about the acceptability of particular compromises. As a result, any deal involving significant compromise by Outsiders will be a fragile thing, and may not last. Third, a deal-making model of dialogue does not address the true nature of the problems that hinder the implementation of BNFL's business plan. Those problems are real, were not created by the Outsiders, and can only be addressed by changing the business plan.

4. A better model for dialogue

In IRSS's view, this stakeholder dialogue would be more productive if it focussed on identifying, and characterizing as accurately as possible, the options for future action by BNFL. Those options must begin with present realities, but their future development should encompass changes, perhaps major changes, in BNFL's business plan. In this options-characterizing model, participants in the dialogue would resist the temptation to apply value judgments or make deals. Instead, they would concentrate on developing a full suite of options, and on characterizing those options in an objective, clear-headed manner. The findings of this exercise would be made available to the general public. Any deals would then be made openly, in the political arena, which is where they belong.

As evidenced by the two Working Group reports, dialogue participants have put effort into examining options for future action by BNFL. This work could provide a basis for some useful analysis. To date, however, the analysis has suffered because the participants' attention has been diverted to deal-making. If that diversion were to cease, what steps could be taken to move this stakeholder dialogue toward an options-characterizing model? One step would be to examine future scenarios in an integrated, instead of a piecemeal, fashion. All of the significant issues would be considered in parallel. Another step would be to analyse issues by employing the culture of science. Political judgements would be made in other fora.

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First Update

Meeting: 31 October 2000

Discharges Working Group

An Addendum to The BNFL Stakeholder Dialogue Discharges Working Group Interim Report of February 2000

1.0 Addendum November 2000

1.1 A further one-off meeting of the Discharges Working Group was held on 31st October 2000 to provide an addendum to the Interim Report in the light of BNFL's May 23rd Announcement on Magnox Lifetimes and the UK Strategy for Radioactive Discharges Consultation Document. The meeting was not to open up any new areas of discussion or re-open any areas noted, but not pursued, in the previous report.

1.2 Appendix A1 is BNFL's 23rd May 2000 Press Release on Magnox Lifetimes. The UK Strategy for Radioactive Discharges 2001-2020: Consultation Document. (DETR June 2000) is available at http://www.environment.detr.gov.uk/ras/index.htm

1.3 The October 2000 DWG meeting was also able to consider briefly the OSPAR Decision 2000/1 (See Appendix A2) agreed by 13 countries at the June 2000 OSPAR meeting held in Copenhagen. Since this resolution refers to the non-reprocessing option, the group agreed to refer further discussion of this to the SFMOWG.

2.0 The Work Process

2.1 The group looked first at the impact of the 23rd May announcement on forward projections of radioactive discharges from the Sellafield site.

2.2 We then went on to discuss the impact on discharges from Sellafield if either the proposed Magnox station lifetimes are not achieved or if the increased throughput at B205 is not achieved.

2.3 BNFL then updated the group with regard to its work on various discharge abatement options and technologies.

2.4 Finally we re-visited the Findings and Recommendations of our February 2000 Interim Report to assess progress.

3.0 Additional Data presented by BNFL

Appendix 3 – Liquid Discharge Projection: Region of Optimisation

This graph shows projected future critical group dose from liquid discharges from Sellafield, based on Magnox reprocessing throughputs derived from the May 2000 announcement of reactor lifetimes together with Thorp reprocessing continuing until 2023/4. The data are plotted onto the 'region of optimisation' taken from Figure 1 in the Interim Report. Alternative Tc99 discharge scenarios are presented – with and without Tc abatement commencing at the end of Financial Year 2005/6.

Appendix 4 – Future Discharge Scenarios

These graphs show projected Sellafield discharges, as defined above, plotted alongside three other operational scenarios which were defined by RWMAC for their recent work on Sellafield discharges.

Nb: The data has been amended from that given to RWMAC, whose interest was Reprocessing operations, by also including Calder reactor discharges.

Appendix 5 – Sellafield Historic Discharges and Impact
This data updates tables 1.1 and 1.2 in the Interim Report by including 1999 discharge data and associated environmental impact, together with 'Notional Full Throughput' discharge data based on full plant operations at Sellafield over the short term future.

Appendix 6 – Magnox Fuel Position

This table presents the Magnox fuel stocks and forward projections consequent upon the May 2000 Magnox reactor lifetime announcement. The Group also considered information on B205 Magnox reprocessing plant throughputs.

Appendix 7 – Sellafield Abatement Technology

These tables give the current status of work on abatement options for the principal radionuclides, and therefore update Tables 5 and 6 of the Interim Report. It was noted that the data on projected discharges in Appendices 3 and 4 do not reflect any of the potential reduction measures which may be implemented upon successful completion of developments shown in this table, other than the re-routing of discharges arising from the Street 3 Scrubber and the Tc option discussed above.

Appendix 8 – Sellafield Liquid Discharges – Beta

This appendix gives an explanation of the term 'Total Beta' and the link between historic recorded Total Beta data and forward projections.

4.0 Discharge and Dose Profiles for Discharges

4.1 The joint submission by Greenpeace, FoE, CND, CORE and WANA on the UK Strategy was also circulated to the group. This states that

(1) The UK Strategy in fact proposes a massive increase in discharges from nuclear reprocessing plants compared to 1998 levels, including a doubling of the throughput of the Magnox reprocessing plant at Sellafield;

(2) The UK Strategy actively seeks to hide this massive increase in discharges by choosing a baseline for its graphs of the period 2001-2005, instead of 1998, when the OSPAR Strategy was adopted;

(3) The proposal that the THORP reprocessing plant at Sellafield will continue to operate to 2020 is completely unacceptable in view of the large quantities of radioactive waste it discharges into the environment;

(4) The consultation is rendered largely meaningless by BNFL's decision to begin work in September 2000 on increasing the throughput of its ageing Magnox plant. This decision pre-empts any Government consideration of our views, and is in total contradiction to the UK's OSPAR commitment to reduce and eliminate discharges;

(5) The UK Strategy also treats with contempt the views of the majority of OSPAR Contracting Parties, as expressed in OSPAR Decision 2000/1, that current discharge authorisations for reprocessing plants should be reviewed as a matter of priority with a view to implementing the non-reprocessing option (for example dry storage) for spent nuclear fuel. The omission of any consideration of the dry storage option is inexplicable and wholly wrong, since this is a technically feasible means of eliminating the massive discharges from nuclear reprocessing;

(6) The UK Strategy also misrepresents the views of many of the NGOs, consultants and Local Authority bodies that have been taking part in the BNFL Stakeholder Dialogue.

The exchange of correspondence between The Environment Council and the DETR is attached as appendix A9.

4.2 In considering the above NGO statement, other members of the Group noted that BNFL are not seeking to increase the underlying throughput capacity of the B205 Magnox Reprocessing Plant – rather they are undertaking changes to operations and the plant to reinstate the design throughput which has historically been achieved and to give confidence that the intended plant throughput can be sustained. It was also noted that Sellafield discharges in the short term future would inevitably be higher than in the second half of the 1990s because of the anticipated return to normal throughput for the Magnox reprocessing plant and the full operation of Thorp which had been ramping up over the previous 5-6 years of initial operation. Some members considered that this scenario is fully in line with both expectations and authorised discharge levels.

4.3 A new scenario was presented at the October 2000 meeting. This is basically THORP continuing until the third decade and Magnox reprocessing operating as per the May 23rd announcement. (See Appendix A3). Members of the group noted that the new scenario shows that BNFL's forward discharge projection, taking account of the Magnox lifetime announcement, falls within the area of optimisation identified in the Interim Report (noting that the bounds of the optimisation region are illustrative only), provided that Technetium-99 abatement is introduced by 2006.

4.4 The Group noted that the discharge profile given in Appendix 3 does not assume the introduction of any specific abatement technology (other than the possibility of Tc abatement) which may become available in the future, as

4.5 described later in Section 6. Successful abatement introduction would move the discharge profile further towards the bottom left hand corner. In particular it is likely that the longer term projection which shows a small increase in discharges post 2015, linked to clean-out activities prior to decommissioning, would be further influenced by abatement.

4.6 The ‘D1plus’ scenario favoured by some members of the group, which would maximise the amount of Magnox spent fuel going into dry storage (see Interim Report paragraph 3.6.1), was not re-visited at the October 2000 meeting.

4.7 Additional scenarios are also included in Appendix A4.

5.0 Magnox Fuel Outcomes

5.1 The 23rd May 2000 lifetime strategy announcement means that the Magnox reprocessing plant (B205) at Sellafield will close once all Magnox fuel has been reprocessed. It is expected that this will be around 2012. The group went on to look at what might happen if the expected throughput schedules are not achieved.

5.2 Appendix A6 gives the current and projected stocks of Magnox spent fuel as at 1st April 2000. This shows that there were about 7500 tonnes of Magnox spent fuel in reactor cores or in cooling ponds at the stations or at Sellafield on that date. Over the remaining lifetime of the Magnox reactors, assuming they achieve the lifetimes set out in the May 23rd announcement, around another 3,600 tonnes of Magnox spent fuel can be expected to be added to the inventory, bringing the total BNFL expects to reprocess to just over 11,000 tonnes.

5.3 Achieving the 2012 closure date therefore depends on B205 achieving a throughput of around 1,000 tonnes per year for the next twelve years. The company provided DWG with information on historic throughputs, which shows that similar throughputs have been achieved in the past on a routine basis.

5.4 BNFL made it clear to the group that, whilst the company is confident that it will be able to achieve the expected throughputs, if the improvements are not as high as is hoped, the likelihood is that a review of reactor lifetimes will be undertaken rather than expecting B205 to operate much beyond 2012.

5.5 The group noted two factors which mitigate against running B205 much beyond this period:

Firstly, as can be seen in Table 7 of the DWG Interim Report there is a time lag for reductions in discharges of some liquid radionuclides of up to 5 years after the closure of B205. Although the group has not been able to agree an interpretation of OSPAR, it is clear from the DETR's draft UK Discharges Strategy that there is an expectation that discharges from Magnox reprocessing will have significantly reduced or ended by 2020. B205 would have to close by around 2015 at the latest in order to achieve this, otherwise significant abatement provision would be needed.

Secondly BNFL would not intend to operate the B205 facility and some of the associated older plant significantly beyond the indicated dates for technical operational reasons.

5.6 It was also pointed out that if B205 does achieve the throughputs expected, but the planned Magnox reactor lifetimes are not achieved due to economic, technical or safety reasons, then B205 could close earlier than 2012.

6.0 Technologies

6.1 It was also noted that the Environment Agency is shortly to launch a special consultation on Tc-99 discharges and abatement options, when this issue will get a further airing.

6.2 BNFL provided an update on abatement technologies by submitting a revised version of Tables 5 and 6 from the DWG's interim report. (Appendix A7)

6.3 Notwithstanding concern expressed by some members of the group about discharge increases in the shorter term between now and 2012, the closure of B205 and the introduction of Tc-99 abatement, provided that this proves to be viable, were seen by the group as having a major welcome impact on discharges, although some members of the group would still wish to see an earlier closure date.

6.4 BNFL reported to the group that diverting Tc-99 into the HLW stream is still its preferred option, and that some work will be done on assessing the technical feasibility of this option during the current B205 shutdown. This re-routing could also contribute to reducing some other liquid discharges including Sr-90, Cs-137 and the a certain extent Ru-106.

6.5 On aerial discharges, forward projections of dose to the critical group are dominated by the contribution from I-129. BNFL believes that the current models for I-129 overestimate dose. However, the group noted that the new caustic scrubber recently installed at Sellafield to re-route C-14 generated at High Level Waste Plants from the air to sea, will also reduce I-129 discharges to the atmosphere.

6.6 It was noted that the 23rd May announcement shows that the Calder Reactors will close in the earlier half of the range given in the DWG Interim Report with a consequent end to Ar-41 discharges. [NB The 23rd May announcement gives a range of dates for the closure of Calder Hall and Chapelcross. This is because both stations have four reactors. So in the case of Calder, the first reactor will close in 2006 and the last reactor will close in 2008].

7.0 Progress since the Interim Report on DWG Recommendations

(The Findings and recommendations are reproduced here for ease of reference in italics)

The following caveat applies to this Addendum as it did the Interim report:-

We submit the following findings and recommendations subject to the caveat that they do not indicate any change of views by those members of the group who believe that early cessation of reprocessing is the best way of reducing discharges.

4.1 We were unable to agree the meaning of the details of the OSPAR strategy implementation but did agree that it implied substantial reduction of discharges. We recognise that BNFL's indicative reduction profiles potentially provide a good first step in achieving the OSPAR recommendations. We recommend that BNFL show a very clear commitment to timescales where plant closures are involved and also show that they are striving to the utmost to secure discharge reductions over and above their pre-OSPAR plans

7.1 The May 23rd announcement has set out BNFL's commitment to plant closure timescales. Although the closure date for B205 is towards the end of the range given in Table 7 of the Interim Report, the decision has firmed up BNFL's indicative discharge profile (see Appendix A3). The group recognised that the Magnox closure decision does not address all the aspirations of all members of the Group.

4.2 We recognise that other factors, principally socio-economics, cost and safety, may produce a pressure against discharge reductions. We did not have time to discuss and evaluate these factors and we recommend that suitable studies should be commissioned.

7.2 The DWG welcomes the work of the socio-economic sub-group and looks forward to seeing the consultants report in the New Year. Information about socio-economic pressures in Norway and Ireland, which argue in favour of discharge reductions will be provided to the sub-group following correspondence initiated by KIMO (See Appendix A10).

4.3 Notwithstanding our inability to quantify the above factors, we recommend on a qualitative basis, that BNFL should reduce its discharges within a region of optimisation between continuing business scenarios D1 plus/D2 minus and D3 plus.

7.3 Although some members of the group were disappointed that the anticipated improvement in throughput at B205 will mean an increase in discharges, the graph in Appendix A3 shows that BNFL's discharge profile is still within the region of optimisation, provided that efforts to develop Tc-99 are successful.

4.4 Tc-99 liquid discharges are specifically referred to in the Sintra statement and as such are a 'special case'. We therefore recommend BNFL make utmost endeavours and be seen to be doing so to achieve Tc-99 reductions by 2005. We also recommend that liquid discharges of C-14, Sr-90, Ru-106 and Pu/Am are addressed as 'second tier' priorities.

7.4 The May 23rd announcement does not impact on this recommendation. We note that BNFL is continuing work on Tc-99 discharge abatement and that Tc-99 discharges will be the subject of a forthcoming consultation by the Environment Agency when this issue will get a further airing.

4.5 We recommend that the current indicative timetable for shutdown of the Calder reactors should be implemented. We see this as the only effective means of reducing Ar-41 gaseous discharges. [Table 7 of the Interim Report said Calder Hall is likely to close around 2006-10]

7.5 We note that BNFL is committed to closure of the Calder reactors well within the previously indicated time-scales. [NB The 23rd May announcement gives a range of dates for the closure of both Calder Hall and Chapelcross. This is because each station has four reactors with the first reactor closing at the beginning of the range (i.e. for Calder 2006) and the fourth closing at the end of the range (ie2008)].

4.6 We recommend that uncertainty on predicted critical group dose arising from gaseous discharges of I-129 be resolved.

4.7 We recommend that in parallel with resolution of uncertainties in critical group dose for I-129, BNFL formulate by 2002 appropriate abatement strategies for the reduction of I-129 aerial discharges.

7.6 and 7.7 We note work is ongoing on these two recommendations (See Appendix A7). We note that work is ongoing to look at whether the models need revising. However, we also note that BNFL are seeking to reduce **I**-129 aerial discharges.

4.8 We recommend that a subsequent working group should examine in detail all the issues associated with prolonged dry storage of spent Magnox fuel, in order to properly determine whether earlier cessation of Magnox reprocessing is feasible and appropriate; if so, to consider what further reductions in discharges might be achieved.

7.8 SFMOWG is looking at a range of spent fuel management options including Magnox dry storage.

4.9 We recommend BNFL conducts further studies on the impact of future decommissioning operations on the discharge profile.

7.9 This recommendation is not affected by the Magnox announcement.

4.10 We recommend that BNFL should use a methodology similar to that described in this report to develop a strategy for discharge reduction at each of its sites in the UK

7.10 Further work is required on the strategy for other sites, although the Magnox announcement will impact on every other BNFL site, including Springfields.

4.11 We recommend that the government and regulators are urged to set criteria for the acceptability of waste forms which should inspire confidence that they will lead to best practicable environmental options being adopted. Consideration should be given to reviewing those criteria and their application to remove unnecessary barriers to the achievement of reduction objectives.

7.11 We note that there has been no progress on this recommendation and urge the Government and the Regulators to take steps to bring all the parties together within the time-scale of the Tc-99 consultation. The re-convened DWG recommends that the Main Group writes to the DETR to this effect.

4.12 We recommend that the main group should make the results of our work to date available to the UK government, as a contribution to the government's development of the UK OSPAR strategy.

7.12 This recommendation was carried out, but we note with regret that the DETR's UK Discharges Strategy quoted selectively from the Interim Report and created a false impression of work by the Group. Representations have been made to the DETR about this by The Environment Council. We now recommend that the main group should make this Addendum available to the UK Government as a contribution to the DETR UK Discharge Strategy Consultation and the upcoming Waste Management Consultation

Appendices:-

A1 BNFL's Press Release dated 23rd May 2000. "BNFL confirms Magnox station lifetimes"

A2* OSPAR Decision 2000/1

A3 Interim Report - Revised Figure 1

A4 Future Discharge Scenarios.

A5 Sellafield Historic Discharges and Impact - New Tables 1.1 and 1.2

A6 Stocks of Magnox Spent Fuel

A7 Revised Abatement Technology Tables.

A8 Sellafield liquid discharges – beta

A9* Correspondence between The Environment Council and DETR

A10* Correspondence initiated by KIMO (available from The Environment Council offices.)

* These appendices are available by request from The Environment Council.

APPENDIX 1

BNFL's Press Release dated 23rd May 2000
"BNFL confirms Magnox station lifetimes"

News Release

BNFL/1566/00
23 May 2000

EMBARGOED UNTIL 16:00 ON TUESDAY 23 MAY 2000

BNFL confirms Magnox station lifetimes

BNFL is today announcing a lifetime strategy for its fleet of Magnox nuclear power stations. The strategy provides a phased programme for the cessation of electricity generation at the eight stations, most of which began operating in the 1950s and 1960s.

The reactors are licensed to operate for between 33 and 50 years and this early announcement of the Company's strategy for the lifetimes of the stations will allow operational plans to be optimised. For business reasons, Hinkley Point A will not be brought back into service from its current shutdown.

With today's announcement the Magnox station lifetimes will be planned as follows: -

Station	Licensed lifetime	Age at Cessation of Generation	Latest date for end of Generation
Calder Hall	50	50	2006 – 2008
Chapelcross	50	50	2008 – 2010
Bradwell	40	40	2002
Hinkley Point A	40	35	2000
Dungeness A	40	40	2006
Sizewell A	40	40	2006
Oldbury*	40	45	2013
Wylfa*	33	45 / 50	2016 / 2021

* Continuing to run Oldbury and Wylfa to these dates depends upon the development and use of Magrox fuel. Magrox is a fuel in which uranium is used in ceramic oxide rather than metal form. A decision on the use of Magrox fuel will be taken in around 2003. Oldbury and Wylfa will also need to undergo a Periodic Safety Review in order to secure operation to these dates.

BNFL's Chief Executive Norman Askew said: "Everyone knows that these stations have a finite life and there has been speculation as to our intention regarding their operating lives.

-more-

The reason we are making this announcement today, well ahead of time, is to provide certainty about the future for all concerned. It will bring clarity to the Company's business plans, explains our plans to our employees and provides us with time to work with the communities around our stations on plans for decommissioning.

"These stations were pioneers in the nuclear industry and have made, and are continuing to make, a huge carbon-free contribution to the electricity generating industry. This decision will mean that the reactors will not be run beyond the dates announced. However, both market conditions and technical issues could result in earlier closure."

The lifetime strategy announcement means that the Magnox reprocessing plant (B205) at Sellafield will close once all Magnox fuel has been reprocessed. It is expected that this will be around 2012 although this could be later depending on throughput schedules achieved. Based on the same programme, Magnox fuel production, which is carried out at the Company's fuel manufacturing site at Springfields, near Preston, will cease by 2010.

The end of Magnox reprocessing at Sellafield will significantly reduce discharges even further and virtually eliminate the already low discharges of Technetium. Total liquid discharge impact, which is already minute, will further reduce by more than 80 per cent. In the meantime BNFL will continue to work on abatement technology for Technetium and, if successful, will reduce discharges even sooner.

-ends-

Notes to Editors

BNFL took over responsibility for the UK's Magnox power stations in January 1998 when the former Magnox Electric plc was merged into BNFL.

There are three other stations in the Magnox fleet which are currently undergoing decommissioning – Berkeley (which closed in 1989), Hunterston A (1990) and Trawsfynydd (1993).

In December 1999, BNFL announced that the Bradwell Power station in Essex will close in 2002 when it reaches its 40th birthday.

The stations employ on average around 350 people each and we expect job numbers to remain fairly constant for up to a year after cessation of generation. From experience at other Magnox sites, we would expect to retrain around 250 staff for the next phase, defuelling, which usually takes 3-4 years. After this phase we would expect numbers employed at the sites to fall gradually to around 50 people.

B205 is the plant built in 1964 to reprocess fuel from the UK's Magnox power stations. Overseas and UK oxide fuel is reprocessed in the separate, more modern, thermal oxide reprocessing plant (Thorp) at Sellafield.

For further information please contact:

BNFL Risley Press Office on 01925 832450/2984/2146
BNFL Magnox Press Office on 01453 813219/812970
BNFL Sellafield Press Office on 019467 85838/42/43/39

APPENDIX 2

OSPAR Decision 2000/1

ANNEX 14
(Ref. § 6.20)

OSPAR CONVENTION FOR THE PROTECTION OF THE MARINE ENVIRONMENT OF THE NORTH-EAST ATLANTIC

MEETING OF THE OSPAR COMMISSION

COPENHAGEN: 26-30 JUNE 2000

OSPAR Decision 2000/1 on Substantial Reductions and Elimination of Discharges, Emissions and Losses of Radioactive Substances, with Special Emphasis on Nuclear Reprocessing[1]

HAVING REGARD to Article 2.1(a) of the OSPAR Convention, whereby the Contracting Parties have the legal obligation to "take all possible steps to prevent and eliminate pollution and to take the necessary measures to protect the maritime area against adverse effects of human activities so as to safeguard human health and to conserve marine ecosystems and, when practicable, restore marine areas which have been adversely affected";

MINDFUL of the OSPAR Strategy with regard to Radioactive Substances, adopted at the Ministerial Meeting of the OSPAR Commission in Sintra in July 1998, whereby "the objective of the Commission with regard to radioactive substances, including waste, is to prevent pollution of the maritime area from ionising radiation through progressive and substantial reductions of discharges, emissions and losses of radioactive substances, with the ultimate aim of concentrations in the environment near background values for naturally occurring radioactive substances and close to zero for artificial radioactive substances";

TAKING ACCOUNT of the need to act in compliance with the time frame, laid down in Paragraphs 4.1.(a) and (b) of the OSPAR Strategy with regard to Radioactive Substances, whereby the Commission by the year 2000 for the whole maritime area, will work towards achieving further substantial reductions or elimination of discharges, emissions and losses of radioactive substances;

NOTING the national reports on the implementation of the OSPAR Strategy with regard to Radioactive Substances submitted to OSPAR 2000;

TAKING ACCOUNT of PARCOM Recommendation 94/9 Concerning the Management of Spent Nuclear Fuel, whereby Contracting Parties agreed that they have a legitimate international interest in assessing the alternative options for spent fuel management, in relation to their effect on the reduction or elimination of discharges of radioactive substances;

NOTING that a study of the alternative nuclear fuel cycles has now been carried out by the Nuclear Energy Agency (NEA) of the Organisation for Economic Co-operation and Development (OECD);

NOTING FURTHER that the NEA-study has demonstrated that implementing the non-reprocessing option (dry storage) for spent fuel would eliminate the discharges and emissions of radioactive substances that currently arise from reprocessing it;

NOTING FURTHER that discharges from nuclear reprocessing facilities can be traced through the Irish Sea, the North Sea, along the Norwegian coast into the Arctic and Atlantic Oceans giving rise to elevated levels in biota;

---

1 France and the United Kingdom abstained from voting. Luxembourg was not present at this vote.

RECOGNISING that the reduction of discharges and emissions of radioactive substances from nuclear reprocessing facilities would be beneficial for the legitimate uses of the sea, technically feasible, and would diminish the radiological impacts of radioactive substances on man and biota;

CONCERNED that nuclear reprocessing facilities in the North-East Atlantic area are the dominant sources of discharges, emissions and losses of radioactive substances and that implementing the non-reprocessing option for spent nuclear fuel would, therefore, produce substantial reductions of discharges, emissions and losses of radioactive substances into the North-East Atlantic;

ENCOURAGING relevant Contracting Parties to immediately begin negotiations with regard to all existing contracts for the reprocessing of spent nuclear fuel, with the aim of implementing the non-reprocessing option for spent nuclear fuel;

ENCOURAGING Contracting Parties not to authorise new nuclear reprocessing facilities or substantial increases of capacity of existing nuclear reprocessing facilities.

THE CONTRACTING PARTIES TO THE OSPAR CONVENTION FOR THE PROTECTION OF THE MARINE ENVIRONMENT OF THE NORTH-EAST ATLANTIC DECIDE:

1. Programmes and Measures

1.1 **The current** authorisations for discharges or releases of radioactive substances from nuclear reprocessing facilities shall be reviewed as a matter of priority by their competent national authorities, with a view to, *inter alia*:

- implementing the non-reprocessing option (for example dry storage) for spent nuclear fuel management at appropriate facilities;
- taking preventive measures to minimise the risk of pollution by accidents.

2. Entry into Force

2.1 This Decision enters into force on 16 January 2001.

3. Implementation Reports

3.1 Reports on implementation of this Decision shall be submitted to the appropriate OSPAR subsidiary body in accordance with OSPAR's Standard Implementation and Assessment Procedure. This reporting shall commence in the intersessional period 2002/2003.

3.2 When reporting on implementation, the format at Appendix 1 shall apply.

Appendix 1

Implementation Report Format on Compliance

The format for implementation reports concerning OSPAR Decision 2000/1 on Substantial Reductions and Elimination of Discharges, Emissions and Losses of Radioactive Substances with Special Emphasis on Nuclear Reprocessing as set out below should be used to the extent possible.

Country: [ ]

Reservation applies yes/no *

Is measure applicable in your country? yes/no *

If not applicable, then state why not (e.g. no relevant installation or activity)

....

....

....

Means of Implementation:

by legislation	by administrative action	by negotiated agreement
yes/no*	yes/no*	yes/no*

Please provide information on:

a. specific measures taken to give effect to this measure;

b. any special difficulties encountered, such as practical or legal problems, in the implementation of this measure;

c. the reasons for not having fully implemented this measure should be spelt out clearly and plans for full implementation should be reported;

d. if appropriate, progress towards being able to lift the reservation.

....

....

....

....

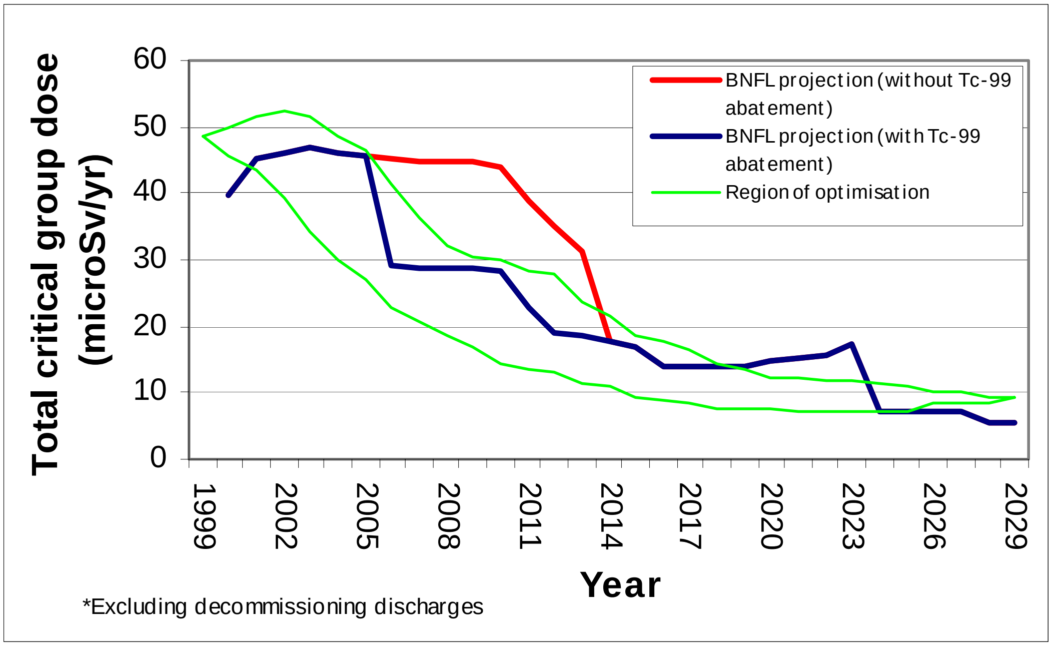
* Delete whichever is not appropriate

APPENDIX 3

BNFL National Stakeholder Dialogue – Discharges Working Group

Interim Report - Revised Figure 1

Liquid Discharge Projection from Sellafield: Region of Optimisation
As at October 2000



APPENDIX 4

Future Discharge Scenarios

The attached graphs show BNFL projected Sellafield discharges, together with discharge scenarios as requested during recent work for RWMAC. The scenarios are as follows:

- BNFL projection
  Magnox – operations as per lifetime announcement
  Thorp – operations continue for third decade (to 2023/4).

- M1T1
  Magnox reactors operate to 45-50 years: all Magnox fuel is reprocessed
  Thorp operates for third decade (16,500 tonnes above baseload)

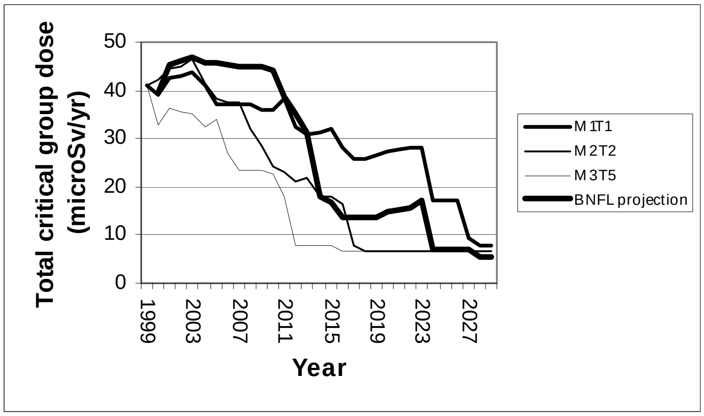
- M2T2
  Calder/Chapelcross to 50 yrs, other reactors to average 37 yrs: all Magnox fuel is reprocessed.
  Thorp fulfils existing contracts plus some additional (1600 te) new business in the second decade (5,400 tonnes above baseload).

- M3T5
  No more fuel loaded into reactors post 1 April 2000: all Magnox fuel processed.
  Thorp reprocessing terminated at 31 March 2000.

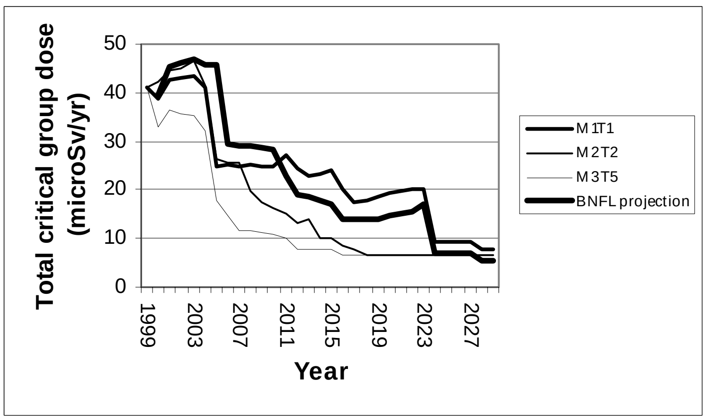
BNFL
October 2000

Indicative assessment of critical group doses from Sellafield operations
(excluding decommissioning discharges)

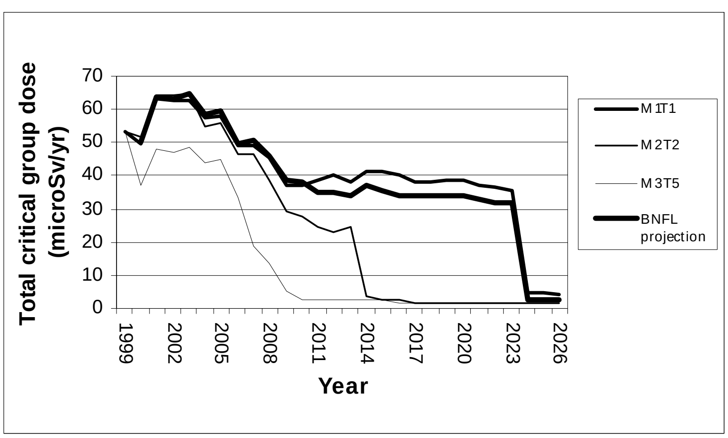
(a) Indicative dose to critical group from liquid discharges (excluding Tc-99 abatement)



(b) Indicative dose to critical group from liquid discharges (including Tc-99 abatement)

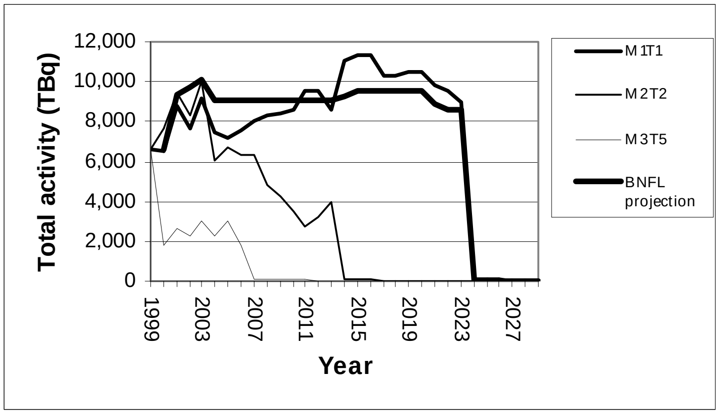


(c) Indicative dose to critical group from aerial discharges

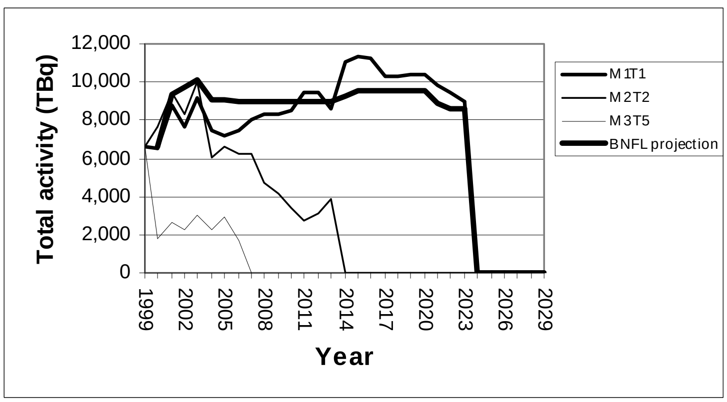


Indicative assessment of discharge activity from Sellafield operations (excluding decommissioning discharges)

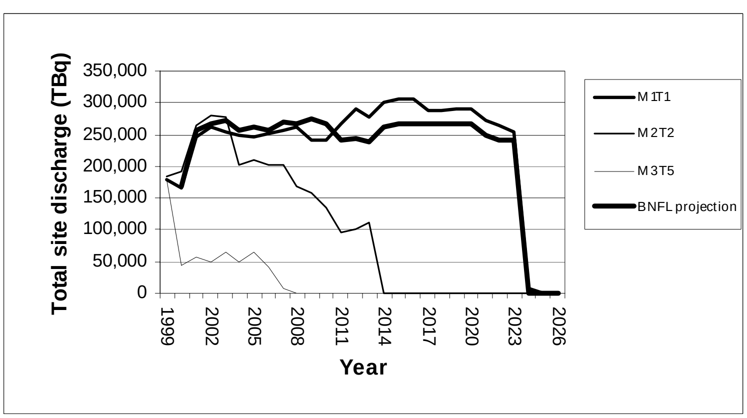
(a) Indicative activity from liquid discharges (excluding Tc-99 abatement)



(b) Indicative activity from liquid discharges (including Tc-99 abatement)



(c) Indicative activity from aerial discharges



APPENDIX 5

Sellafield Historic Discharges and Impact – New Tables 1.1 and 1.2

Sellafield Historic Discharges and Impact

Tables 1.1 and 1.2 updated to include 1999 data and notional full throughput data.

Table 1.1 Discharges & Impacts - Aerial

Radio-nuclide	Notional Full Throughput	1995	1996	1997	1998	1999	Critical group dose (uSv) Derived from monitoring data (contains historic discharge component)	Modelled (1999 discharge component only)	Concentration in biota in 1999 Milk 0-3 km zone	Milk Ravenglass est.	Beef Seascale	Pheasant Gosforth	Potatoes Seascale, Gosforth	Blackberries Calder valley
									Bq/l		Bq/kg wet weight			
H-3	550	590	530	170	250	250	0.06	1.1	9.3	5.5			31	26
C-14	2.5	4.6	4.2	2.2	2.9	2.9	1.4	5.1	1.7	0.38	1.5	1.8	1.4	4.5
Ar-41	2800	2700	2600	2500	2500	2600	42	53						
Kr-85	300,000	97,000	100,000	95,000	99,000	100,000	1.3	1.4						
	GBq/y													
S-35	170	140	140	89	150	100	0.05	1.2	<1.1	<1.0			<1.0	3.4
Co-60	0.15	0.055	0.05	0.06	0.053	0.04	0.02	0.0078						
Sr-90	0.17	0.095	0.13	0.1	0.06	0.063	4.4	0.0021	0.21	0.18	<0.097	<0.11	0.22	4.8
Ru-106	22	0.81	0.88	7.1	1.1	0.95	2.5	0.0028	<0.34	<0.34	<0.64	<0.82	<0.85	<2.9
Sb-125	0.5	1	0.76	0.22	0.18	0.25		0.00066						
I-129	50	20	25	25	27	25	1.4	6.4	0.043	0.02	<0.006		<0.005	0.028
I-131	1.4	1.1	2.3	2.6	3.2	4	0.28	0.043	<0.052	<0.07				
Cs-137	0.72	0.6	0.85	0.62	0.44	0.57	5.3	0.25	0.23	0.39	0.096	1.3	0.13	5.4
Pu-alpha	0.11	0.054	0.064	0.1	0.03	0.1	1.1	0.23	<0.0004	0.0008	<0.001	<0.002	<0.002	0.033
Pu-241	0.96	0.76	0.59	0.79	0.27	0.83	0.29	0.017						
Am-241	0.084	0.039	0.039	0.065	0.05	0.07	0.9	0.098	0.0002	0.0006	0.002	0.002	0.002	0.019
Total							**61**	**69**						

Comments - NB: Based on interim pre-publication data for 1999

Atmospheric discharges

The 1999 discharge data have been taken from the third draft of the 1999 BNFL Annual Discharge Report and may be subject to revision

In the past stack efficiency factors have been reviewed periodically and have led to occasional revisions to estimated aerial discharges. The data used here are believed to be the best currently available.

Am-241 discharge contains Cm-242 component

Pu-alpha includes Pu-238, Pu-239 and Pu-240 discharges but is assessed at Pu-239

Only the discharges of authorised radionuclides and other radionuclides most frequently included in the monitoring programme are shown

Aerial critical group dose

The dose from monitoring data are as presented in the third draft of the 1999 BNFL Annual Discharge Report

The dose for modelling data are as prepared in support of SALDAR 2 and presented in a second draft Westlakes report

Immersion dose from Ar-41 and Kr-85 is derived by modelling only

In principle no direct comparison should be made between doses derived from monitoring data and by modelling

There may be some discrepancies between the monitoring and modelling approaches taken, for example critical group habits

In the BNFL Annual Discharge Report a dose of 4 uSv from external exposure over sediments on Seascale beach is added to the aerial critical group dose

No modelling of the historic contribution to the aerial critical group dose is carried out presently

Aerial monitoring data

All data are pre-publication and therefore subject to verification

Notional Full Throughput

Assumes 1200 te pa Magnox and 1020 te pa Thorp, with generally conservative assumptions for burn-up and cooling time etc

Assumes operation of the Street 3 Scrubber (due to be commissioned 2001) which will re-route some C14 (and also some I129 and I131) from aerial to liquid discharge

Table 1.2 Discharges & Impacts - Liquid

Radio-nuclide	Discharge (TBq/y)						Critical group dose (uSv)			Concentration in biota in 1999 (St Bees - Selker)					
	Notional Full throughput	1995	1996	1997	1998	1999	Derived from monitoring data (contains historic discharge component)	Modelled: 1999 discharge component only	Modelled: Including historic discharge component	Plaice	Cod	Winkles	Mussels	Crabs	Lobster
										Bq/kg wet weight					
H-3	11,000	2700	3000	2600	2300	2500		0.014	0.014						
C-14	16	12	11	4.4	3.7	5.8	4.3	1.4	1.4	120	65	120	170	140	180
Co-60	3.8	1.3	0.43	1.5	2.4	0.89	1	0.98	0.98	0.26	<0.29	23	14	7.7	6
Sr-90	36	28	16	37	18	31	1.8	3.3	3.3	0.19	<0.14	4.8	3.6	1.2	<0.32
Zr-95	} 2.0	0.34	0.52	0.18	0.3	0.1	0.05	0.042	0.042	<0.46	<0.04	<1.8	<1.3	<0.72	<0.92
Nb-95	}	0.4	0.63	0.18	0.35	0.08	0.007	0.0019	0.014	<0.11	<0.1	0.69		<0.48	
Tc-99	64	190	150	84	53	69	19	14	14	6.1	2.1	630	1300	95	4400
Ru-106	26	7.3	9.0	9.8	5.6	2.7	2.1	1.4	1.4	<1.7	<1.6	20	19	<3.9	<2.8
I-129	1.2	0.25	0.41	0.52	0.55	0.48		0.073	0.073						
Cs-134	1.1	0.51	0.27	0.3	0.32	0.34	0.16	0.23	0.23	<0.24	<0.24				
Cs-137	18	12	10	7.9	7.5	9.1	4.6	3.2	10	5.5	7.3	11	3.7	2.7	3.3
Ce-144	1.8	1.1	0.78	0.49	0.76	0.6	0.26	0.22	0.22			<2.3	<1.8	<1.4	<1.2
Np-237	-	0.18	0.04	0.03	0.04	0.04	0.08					0.036	0.072	0.0086	0.035
Pu-alpha	0.26	0.31	0.21	0.15	0.14	0.11	25	0.44	14	0.04	0.02	15	11	0.7	0.47
Pu-241	5.9	7.7	4.4	3.3	3.5	2.9	4.1	0.25	14			130	99	<4.9	4.2
Am-241	0.12	0.11	0.07	0.05	0.05	0.03	33	0.19	15	0.04	0.02	20	17	1.6	7.4
Total							**95**	**26**	**75**						

Comments **NB: Based on interim pre-publication data for 1999**

Marine discharges

The 1999 discharge data have been taken from the third draft of the 1999 BNFL Annual Discharge Report and may be subject to revision

Pu-alpha includes Pu-238, Pu-239 and Pu-240 discharges but is assessed as Pu-239

Only the discharges of authorised radionuclides and other radionuclides most frequently included in the monitoring programme are shown

Marine critical group dose

The dose from monitoring data are as presented in the third draft of the 1999 BNFL Annual Discharge Report

The dose from modelling data are as prepared in support of SALDAR 2 and presented in a first issue Westlakes report

All doses are reported for adult consumers who form the overall critical group, although other groups may derive higher doses from individual nuclides

In principle no direct comparison should be made between doses derived from monitoring data and by modelling

There may be some discrepancies between the monitoring and modelling approaches taken, for example critical group habits

The dose from Zr-95 includes the contribution from the ingrowth of daughter Nb-95

The dose from Pu-241 includes the contribution from the ingrowth of daughter Am-241

Marine monitoring data

All data are pre-publication and therefore subject to verification

Notional Full Throughput

Assumes 1200 te pa Magnox and 1020 te pa Thorp, with generally conservative assumptions for burn-up and cooling time etc.

Assumes operation of the Street 3 Scurbber (due to be commissioned 2001) which will re-route some C14 (and also some I129) from aerial to liquid discharge.

Tc99 and Sr 90 discharges are dependent on the management regime for MAC liquors

APPENDIX 6

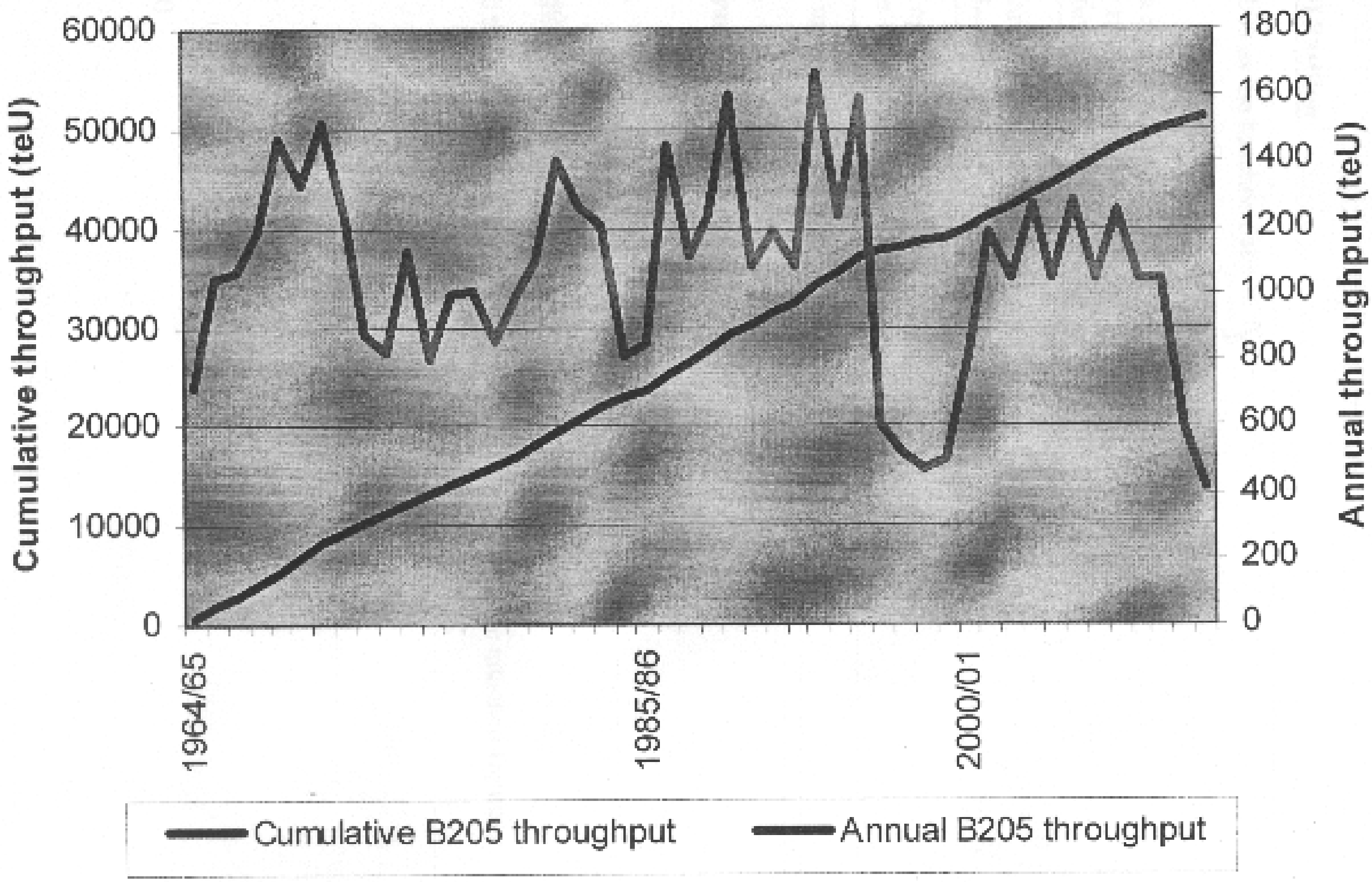
Magnox Fuel Position

Taking 1.4.2000 as the baseline date:

		TeU
Wylfa ex-reactor		730
Other reactor sites		600
Sellafield ponds	1130	
Irradiated fuel ex-reactor		2460
UK station cores		5100
Total opening stocks		7560
Future fuel load[1]		3600
Total Magnox reprocessing		11160

Note (1) Assuming MagRox implemented from 2006.

B205 past and planned performance



APPENDIX 7

BNFL NATIONAL STAKEHOLDER DIALOGUE

DISCHARGES WORKING GROUP

SELLAFIELD ABATEMENT TECHNOLOGY UPDATES FOR THE DISCHARGES WORKING GROUP

31 October 2000

Sellafield Abatement Technology Updates for the Discharges Working Group

The following tables detail recent developments in abatement technologies for key radionuclides discharged from the Sellafield site. The tables are not exhaustive, rather they provide a summary of the key areas of research, development and engineering currently being pursued by BNFL.

Liquid	**Abatement**
Tc-99	BNFL are committed to the introduction of measures which will reduce technetium discharges from Sellafield and are examining a range of technical options. The Company has committed to reducing these discharges to work within a limit of 10 TBq per annum from March 2006, subject to the achievement of a technically viable process, which is acceptable to regulators and government departments. BNFL's preferred strategy for achieving this reduction is to re-route the main Tc-bearing liquors from B205 into vitrification. Assuming the current discharge limits are not significantly reduced in the short-term, the overall effect on backlog MAC/SEC would be expected to be such that upon completion of re-routing, at the latest by 2005/6, a residual level of Tc-99 would be decay stored in B211. BNFL considers the use of 'TPP' to precipitate the residual Tc-99 for encapsulation into an ILW waste form for long term storage is the most appropriate waste management strategy. Resolution of the issue of the acceptability of this waste for repository disposal will require further discussions involving BNFL, EA, NII, DETR and NIREX. Despite increasing pressure to reduce discharges of technetium, it should be stated that current Tc-99 discharges do not pose a significant risk to health and that a recent assessment, carried out by BNFL, demonstrated that continued discharge to sea is the Best Practicable Environmental Option (BPEO).
C-14	There have been no significant advances in abatement technology for C-14 in liquid streams over recent years. Precipitation at Magnox is considered possible, but not cost effective, and can cause several additional problems. A recent assessment carried out by BNFL indicated that ceasing operation of the existing precipitation plant, at Thorp, is BPEO, therefore it is clear that no additional precipitation processes should be added to the site.
H-3	No abatement technology is considered viable in the near future. A watching brief is being kept on technology, despite current discharges resulting in very low doses. A recent study demonstrated that BNFL's current discharge strategy for tritium is BPEO.
Sr-90	Initial work on removal by enhancement of the EARP process has shown some promise, but optimisation of the process for Sr can result in a reduced performance for other radionuclides. The overall impact of any changes is assessed as part of BNFL's commitment to employing Best Practicable Means (BPM). The recent BPEO assessment carried out by BNFL indicates that re-route of the B27 pond purge from SETP to SIXEP is a practicable option for reducing discharges of Sr-90, combined with the current practice of marine dispersion. Further possible reductions of Sr-90 discharges may be achieved if the B205 liquor re-route, discussed above for Tc-99, is successful.
Pu/Am	The EARP plant was commissioned to reduce discharges of these nuclides and has proved to be highly effective. Discharges are only a fraction of historic levels and BNFL keeps the effectiveness of this process under review.
I-129	Liquid discharges arise mainly from abatement of aerial discharges, diverting the I-129 to marine discharges, which have a relatively lower dose impact. Once in the marine environment, rapid dispersion and dilution in the huge amounts of natural I-127 means that resultant doses are very low. The recent BPEO assessment carried out by BNFL supported BNFL's current discharge strategy for I-129.
Ru-106	Ru-106 is a short-lived radionuclide and therefore the major treatment involves storage of concentrated waste over a period of years to permit decay. Modelling is used to allow optimum decay storage and therefore minimum Ru-106 discharges. This has been demonstrated to be the BPEO.
Cs-137	It is hoped that a strategy of routing B38 liquors through SIXEP, if successful, will have major benefits in terms of controlling Cs-137 discharges. In addition, the continuing high performance of EARP ensures that discharges have negligible impact. Further possible reductions of Cs-137 discharges may be achieved if the B205 liquor re-route, discussed above for Tc-99, is successful.

Gaseous	Abatement & plant modification
Ar-41	Not considered feasible using existing technology because argon is an inert gas and because very large volumes of air are involved, adding substantially to cost and technical feasibility. BNFL's recent announcement on Magnox station lifetimes stated that the latest date for generation at Calder Hall will be 2006 - 2008, after which Ar-41 discharges from the reactors will reduce to zero. In the meantime, the Calder Hall reactors provide a substantial carbon-free contribution to the electricity generating industry in this country. Continuation of atmospheric dispersion has been demonstrated to be the BPEO.
C-14	A new caustic scrubber has been constructed at Sellafield, which will treat C-14 generated in the high level waste plants. This will substantially reduce discharges of C-14 from this source. The "scrubbed" C-14 will then be discharged to sea, which has a relatively lower dose impact than the corresponding aerial discharges. Extensive work has also been carried out at Thorp, including an operational change to the DOG caustic scrubber, which resulted in improved abatement performance. Ongoing work includes additional sampling and collaboration with Cogema, the aim of which is to better understand the process, hence allowing further reductions to be made.
Kr-85	Research on possible processes is ongoing, but currently known candidate technologies are not viable at the necessary scale on cost, technical, engineering and safety grounds. BNFL will continue to take a pro-active stance on Kr-85 research and development work, whilst believing that, for the foreseeable future, the BPEO for the management of Kr-85 from a safety and environmental viewpoint is 'dilute and disperse'.
I-129	It is anticipated that the new scrubber, referred to in relation to reduction of C-14 aerial discharges, will also reduce I-129 discharges. In addition, the recent BPEO assessment carried for I-129 indicated that there was merit in investigating the addition of iodate to the Thorp dissolver. If successful, this process alteration would reduce aerial discharges of I-129, routing a greater proportion to sea, which results in a correspondingly lower dose. Work also continues with an external contractor, to develop a modified filter, which could abate iodine from off-gas streams. This work is at an early stage however, and various issues still need to be resolved before the filters could be employed on plant, such as performance and disposal. It is estimated that over 90% of the current arisings of I-129 are currently routed to sea, with less than 7% discharged to the atmosphere. As each new improvement is made, it becomes increasingly difficult to treat the residual I-129. It is worth noting that given the extremely long half-life of I-129, about 16 million years, it is widely accepted that indefinite storage will not be possible and that release into the environment will be inevitable. The abatement philosophy at Sellafield, to minimise aerial discharges and route the majority to sea, therefore ensures the controlled dispersion of I-129 into the environment. This avoids the potential for an acute release and potentially higher doses in the future associated with non-reprocessed fuel.
H-3	A significant amount of work has already been carried out to reduce discharges of H-3 at Sellafield. Operational improvements have been made to the de-humidifier scrubber in the centralised off-gas system at Thorp, with the result that H-3 is being more effectively abated. Abatement of elemental tritium is more difficult, there being no currently viable technologies which can operate in the large gas-flows and very low tritium concentrations existing on the Sellafield plants. It is worth noting that the impact of aerial discharges of H-3 from the site is very low, and that the cost of developing novel abatement technologies could be extremely high, and is therefore unlikely to be justifiable.

APPENDIX 8

BNFL National Stakeholder Dialogue

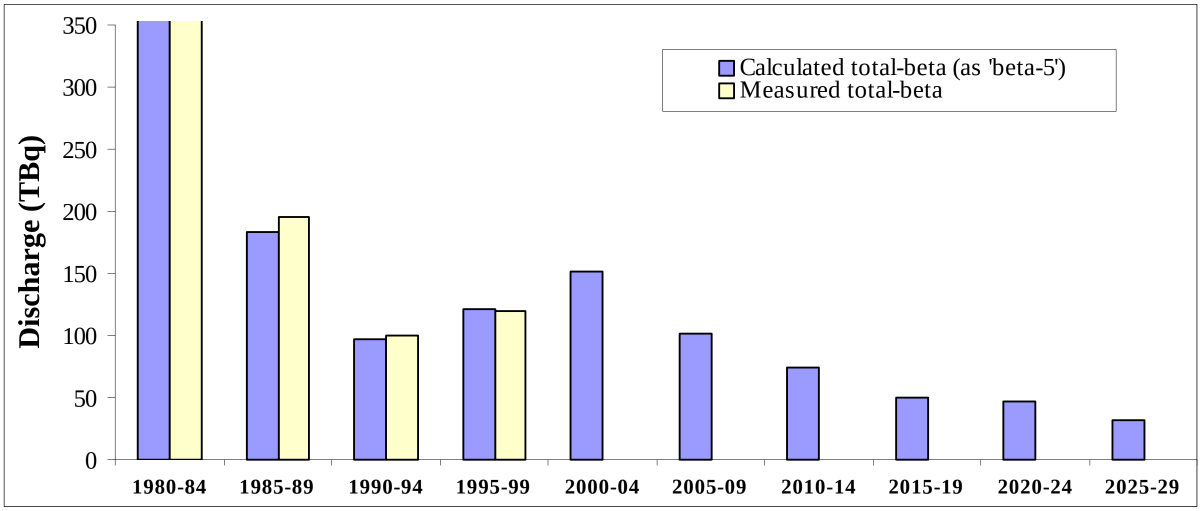
Discharges Working Group

Sellafield Liquid Discharges – Beta

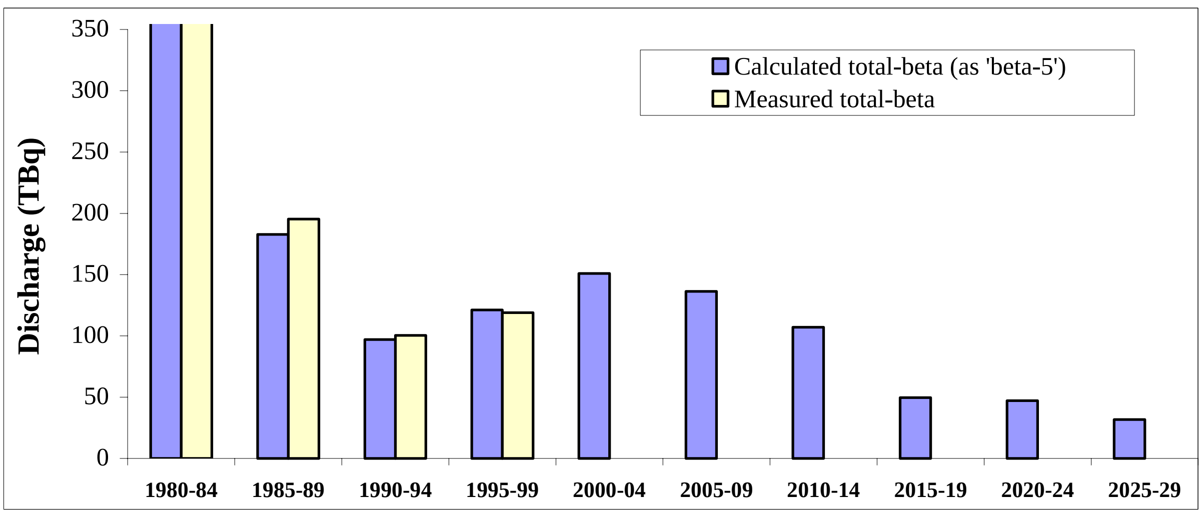
There is potential confusion over the representation of beta discharges from Sellafield and, in particular, to the use of the term 'Total Beta'. This term is referred to in the Sellafield Discharge Authorisation and supporting documentation where it is defined as a measurement made using a specific instrumentation system using a $5mg/cm^2$ detector window (and hence often referred to as 'Beta-5'). This measurement regime effectively gives a summation of the constituent beta-emitting nuclides weighted according to the energy of their beta emissions. Hence whilst it is broadly representative of the totality of the beta discharge, it nonetheless 'overcounts' the contribution of higher energy emitters and 'undercounts' the contribution from lower energy emitters. In this sense it must not therefore be confused with either a simple summation of the activity of all beta emitters, nor with a more practicable simple summation of a defined group of identified beta emitters.

The attached figure presents data for Sellafield beta discharges calculated by taking the summed principal beta nuclides (including the Sr^{90}/Y^{90} and $Ru^{106/}Rh^{106}$ daughter contributions), weighted with appropriate factors. For historic years the data are compared with measured and reported Total Beta discharges to demonstrate the good approximation of this method for comparison with discharge returns in accordance with Authorisation requirements.

a) Calculated and measured discharges of total-beta – Tc abatement assumed from 2006



b) Calculated and measured discharges of total-beta – no Tc abatement assumed



BNFL October 2000

APPENDIX 9

Correspondence between The Environmental Council and DETR

The Environment Council

Mr Gary Chapman
Radioactive Discharges Consultation
DETR
4/E6 Ashdown House
123 Victoria Street
London SW1E 6DE

29 June, 2000

Dear Mr Chapman,

DETR Consultation Document on Radioactive Discharges – references to the BNFL National Stakeholder Dialogue

I write to you following a telephone conversation with a member of your staff yesterday.

As you may be aware, the recent DETR consultation document on radioactive discharges made a number of references to the BNFL National Stakeholder Dialogue, a process that The Environment Council has been responsible for convening over the last two years. While we are pleased to see that reports from this dialogue are being referred to in government documents, the references in question have raised concerns amongst several of the constituencies engaged in the dialogue.

I understand that Brian Oliver has already been sent a fax from a number of the NGOs involved in the dialogue detailing their concerns. At The Environment Council, our main concern at present is to discuss how this issue is to be taken forward. Steve Robinson, our Chief Executive would be pleased to meet with an appropriate representative from DETR to discuss this, to clarify any issues that have arisen and to discuss how further outputs may be referred to. In the meantime, we would be grateful if all future references to the BNFL National Stakeholder Dialogue were checked first with us prior to publication.

For your information, the Waste and Discharges Working Groups will be meeting in the near future to review their interim reports in the light of the recent Magnox Closure announcements.

Thank you for your help. We will be in touch to discuss next steps and to arrange a meeting.

Yours sincerely,

Schia Mitchell

Schia Mitchell
Project Operations Manager
Direct dial: 020 7632 0119

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www. the-environment-council.org.uk

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The Environment Council

CC Brian Oliver, DETR
Roger Mendonca, DETR
Nigel Chamberlain, CND
Martin Forwood, CORE
Mark Johnston, Friends of the Earth
Pete Roche, Greenpeace
Rick Nickerson, KIMO
Gordon Thomson, IRSS
Stewart Kemp, Nuclear Free Local Authorities
Hugh Richards, WANA
Colin Duncan, BNFL
Steve Robinson, The Environment Council

Our Reference: I:\teams\projects\projects\072bnfl\participants correspondence\detr letter.doc

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RADIOACTIVE SUBSTANCES DIVISION

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26 JULY 2000

Ms Schia Mitchell
Project Operations Manager
The Environment Council
212 High Holborn
London
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Dear Ms Mitchell

UK Strategy for Radioactive Discharges 2001-2020, Consultation Document

Thank you for your letter of 29 June to Gary Chapman about references in the consultation draft of the UK Strategy for Radioactive Discharges 2001-2020 to the BNFL National Stakeholder Dialogue. You also referred to a fax signed by some members of the stakeholder dialogue setting out their concerns about these references.

I am enclosing a copy of my reply. We are concerned that some members feel that the draft strategy misrepresents the role of the stakeholder dialogue. I would welcome suggestions from the Environment Council for a brief passage on the stakeholder dialogue to be included in the final version of the Strategy so that we can avoid these concerns occurring again. In the meanwhile we would, of course, also welcome any comments you would like to make about the draft strategy generally. I do not think that a meeting at this stage is necessary.

Yours sincerely

Brian Oliver

B P OLIVER

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Mitchell 260700.doc

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26 JULY 2000

Nigel Chamberlain Esq
Campaign for Nuclear Disarmament
Glover's Cottage
Lazonby
Penrith
Cumbria
CA10 1AJ

Dear Mr Chamberlain

UK Strategy for Radioactive Discharges 2001-2020, Consultation Document

Thank you for sending me a copy of your letter of 27 June to the OSPAR Secretariat commenting on the consultation draft of the UK Strategy for Radioactive Discharges 2001-2020.

We are naturally sorry if some members of the stakeholder dialogue feel that the draft misrepresents the role of the Discharges Working Group and the status of its report. I would like to assure you that any misrepresentation was purely inadvertent and that we are happy to amend the final version so that any concerns about this are addressed.

You say that the text at paragraph 7.3.7 of the draft strategy is untrue and that it misquotes the Discharges Working Group Interim Report. You make the point that there was no unanimity within the Discharges Working Group on the need to reprocess all the Magnox spent fuel from Calder Hall. Although, as you will recognise, this paragraph quoted more or less directly from paragraph 3.6.1 of the Interim Report, we would be content to include a brief reference to the various views held by the members of the Working Group on this issue. The draft strategy does not, of course, set out to describe the stakeholder dialogue in detail or to evaluate its findings. The intention was to demonstrate that independent consideration had been given to ways in which future radioactive discharges from Sellafield, and the resulting doses to the local critical group, could vary with different business scenarios. In particular, it is useful to show that doses are likely to remain within an envelope bounded by upper and lower assumptions, as shown in the "region of optimisation" diagram reproduced at figure 14 of the draft strategy. It is also helpful to show the conflicting pressures on this envelope from, for instance, public perceptions, OSPAR commitments and regulatory requirements on the one hand and costs, employment and site safety on the other.

I have written to Schia Mitchell at the Environment Council to invite her to provide us with

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material for inclusion in the final version of the strategy so that any further concern on your part can be avoided. Naturally we would also be happy to receive comments on the strategy generally.

I am sending copies of this letter to the other signatories of your letter and to Schia Mitchell. (We do not have an address for Di McDonald. If you or those to whom copies of this letter are being sent have an address for her, I would be grateful if a copy could be passed on.)

Yours sincerely

Brian Oliver

B P OLIVER

APPENDIX 10

Correspondence Initiated by KIMO

OFFICE OF THE MINISTER OF STATE
Oifig an Aire Stáit
DEPARTMENT OF PUBLIC ENTERPRISE
An Roinn Fiontar Poiblí
25 CLARE STREET, DUBLIN 2.
25 Sráid Chláraa, Baile Átha Cliath 2.

Tel: (01) 670 7444 Fax: (01) 604 1320 http://www.irgov.ie/dec

8 December, 1999.

13 DEC 1999

Mr. Rick Nickerson,
UK Co-Ordinator,
KIMO,
Local Authorities International
Environment Organisation,
Environment and Transportation Department,
Grantfield,
Lerwick,
Shetland ZE1 0NT,
Scotland.

Re: BFNL Stakeholder Process (Discharge Working Group)

Dear Mr. Nickerson,

I refer to your letter of 24 November, 1999 and previous correspondence concerning the above.

The subject matter raised in your letter - information on the economic or social impacts of these emissions - is an important one. The objective outlined in the OSPAR Strategy is to eliminate discharges from nuclear installations by the year 2020. Among the reasons for pursuing this aim is the need to preserve the "legitimate uses of the sea", which in effect means the protection of sea-based livelihoods which might otherwise be at risk due to contamination of the seas. In my view, the promotion of consumer confidence in sea food and sea produce and the use of the amenities of the Irish Sea will benefit from implementation of the OSPAR Strategy on radioactive substances.

As your letter recognises, many of the social and economic effects of radioactive discharges may be difficult to quantify. However, this does not call into question what are often intangible influences on marine-based livelihoods and the use of marine amenities. There is no doubt that there are legitimate concerns among the general public and consumers about the

Lino/Nickerso.

effect of discharges and it is for that reason that Ministers agreed the Strategy in Portugal in July, 1998. My Department is consulting with Bord Iascaigh Mhara (the Irish Sea Fisheries Board) about what can be done to respond to the request for information sought by you about measurable effects of such discharges. As soon as I hear from Bord Iascaigh Mhara I will write to you again.

I regret to the delay in responding to your correspondence.

Yours sincerely,

Joe Jacob, T.D.,
Minister of State

[illegible]

DET KONGELEGE
MILJØVERNDEPARTEMENT

KIMO
Environment and Transport Department
Grantfield
Lerwick
Shetland ZE1 0NT

23 DEC 1999

39599.

Your ref	Our ref	Date
RN/PN/EP3(b)	99/210– IKP/FJT	13 DES 1999

Dear Rick Nickerson,

Reference is made to your letter of 21 July 1999 to Minister of Environment Ms Guro Fjellanger, and your letter of 24 November regarding the BNFL Stakeholder Process. As we informed you in our letter 5 August 1999, your request for assistance has been forwarded to the Norwegian Radiation Protection Authority (NRPA) for consideration. We apologize for our late reponse, but hope the following data and assessments will still be useful as input to the further investigations of KIMO into the issue of social and economic impacts of radioactive emissions from Sellafield.

As you mention in your last letter, the social and economic impacts of radioactive emissions from Sellafield are difficult to quantify. According to NRPA, it is important to bear in mind that the individual radiation doses from human consumption of seafood from Norwegian waters are probably low, due to the present low levels of contamination and the low dose conversion factor of technetium-99 (Tc-99). However, many uncertainities exists in relation to the behaviour of TC-99 in the Norwegian marine environment. Also, sufficient information regarding possible pathways of TC-99 to man is lacking. These questions need to be answered before a full dose assessment for man and biota can be undertaken.

Clearly, a slight increase in radiation doses to consumers of seafood in Norway can be expected as a result of the increased discharges of Tc-99 from Sellafield. Compared to a 1 mSv limit (IRCP 1991) which applies to the overall exposure of the general public from man-made radiation, it appears clear that increased doses will be low.

The direct impacts of contamination of TC-99 in Norway are difficult to evaluate, but can be expected to be negligible. On the other hand, media focus and increasing public awareness of the TC-99 contamination of Norwegian waters has led to some fear, in particular among representatives of the fisheries and the seafood industry, but also among the general public. We have no data concerning impacts on tourism, but we have no reasons to believe that the

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discharges from Sellafield have any measurable effects on tourism in Norway. In the following we will try to shed some light on possible present and future impacts of the pollution from Sellafield on the export of seafood, the kelp industry, expenditures related to monitoring, and future commercial development opportunities.

Export of fish and seafood

The export of saltwater fish from Norway was 2.8 million tons in 1998, representing a value of 10.4 billion NOK. This means that important economic interests are at risk if the perception of Norwegian seafood in the marked is tainted by the contamination from Sellafield. From experience we know that even rumours of radioactive contamination may influence the export of fish and seafood. In connection with the publicity related to dumping of radioactive waste in the Kara and Barents sea the sunken nuclear submarine "Komsomolets" near Bear Island, importers of Norwegian seafood contacted Norwegian exporters to ensure that the seafood products they received were "clean". This, in turn, has created a need for monitoring of radioactivity in the marine environment and continuous information to industry and the general public.

Expenditures related to monitoring of the marine environment

The Norwegian government spend NOK 2.5 million each year on monitoring of radioactive substances in the marine environment. The purpose of this monitoring to improve our general knowledge about status and trends for radioactive pollution of Norwegian waters. The contamination from Sellafield is a key motivation factor for establishing and operating such a monitoring program.

The kelp industry

In Norway, kelp has traditionally been used both as an additive in food, as a fertiliser and as animal food. To day 190 000 tons of kelp is harvested annually to produce alginate used in food, printer's ink and for medical purposes. The export value of Norwegian alginate products mounts to 320 million NOK. The leading Norwegian corporation within this field has so far not received any negative signals from the marked due to Sellafield. On the other hand, the discharges and the related publicity has led to some extra research-activity and monitoring of radioactivity in raw materials.

Impacts on future development opportunities

It is difficult to predict the extent to which pollution from Sellafield will influence future development opportunities based on living marine resources. Even though we can not at the present stage document any effects on the marine environment or on the quality of living marine resources, the possibility that new knowledge will document such effects in the future can not be ruled out. The most vulnerable economic sector is likely to be the kelp industry. Kelp has a strong tendency to accumulate pollutants, including radioactive substances. Technetium-99 has a very long half-life of 213 000 years, and is effectively spread over large areas by ocean currents. With regard to transport and uptake of technetium in the marine food-chain knowledge is limited. Another source of uncertainty, to which little attention has yet been paid, is the possibility of synergistic effects from different pollutants.

We hope the information given above will be useful in your further assessment.

Yours sincerely,

Magne H. Røed
Deputy Director General

Fredrik Juell Theisen
Adviser

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22 June, 2000.

Mr. Rick Nickerson,
UK Co-ordinator,
KIMO,
Local Authorities International Environmental Organisation,
Environment and Transportation Department,
Grantfield,
Lerwick,
Shetland ZE1 0NT,
Scotland.

Date 26 JUN 2000 RN
Action:
46/12

Dear Mr. Nickerson,

Re: BNFL Stakeholder Process (Discharge Working Group)

I refer again to your letter of 24 November, 1999 and to my reply of 8 December, 1999 concerning the above.

I have been in touch with An Bord Iascaigh Mhara (BIM), the Irish Sea Fisheries Board, who are the State Body charged with promoting and marketing Irish seafoods both in Ireland and on the international market. BIM put my Department in touch with Mr. J. M. Somers who prepared in November 1996, a submission on behalf of BIM and the Irish seafood industry, to be presented to the British-Irish Parliamentary Body's Committee on Education, Culture and the Environment. I enclose a copy for your perusal.

I think you will find the report relevant to the work of your group. You will note in particular that -

- Market research carried out on behalf of BIM showed that 55% of respondents were concerned to some degree about radiation in seafood, with 23% claiming to avoid eating fish for this reason;
- For periods following an "incident", the above figures more than double;
- Queries as to the Irish Sea environment are regularly received from overseas customers and at BIM stands at international trade shows, particularly in Germany.

Mr. Somers has indicated to my Department that these concerns will have probably become more acute since he wrote this submission as a result of high levels of Technetium-99 detected in the Irish Sea.

Furthermore, the recent publicity in regard to the falsification of quality control data in BNFL has given rise to a number of telephone calls to BIM from worried seafood retailers and customers.

As I mentioned in my earlier letter, many of the social and economic impacts of radioactive discharges may be difficult to quantify. However, there is no doubt about the genuine and legitimate concerns felt by the public and customers about the effect of such discharges.

I regret the delay in getting back to you. I hope that the above information will be of some help in your work.

Yours sincerely,

Joe Jacob, T.D.,
Minister of State.

The Irish Sea - Environmental Issues

Impact on The Irish Fishing Industry

with particular reference to

British Nuclear Fuels (BNFL) Operations

and

Dumping at the Beaufort Dyke

Submission

to the

British-Irish Inter-Parliamentary Body

Committee on Education, Culture and Environment

Dublin - 5th. November 1996

Prepared by J. M. Somers
for
The Irish Fishermens Organisation(IFO)
The Irish Fish Producers Organisation (IFPO)
The Irish Fish Processors and Exporters Association (IFPEA)
Howth Fish Auction Sales Ltd.
Bord Iascaigh Mhara (BIM) - Irish Sea Fisheries Board

Submission on The Irish Sea Environment
to the
Committee on Culture, Education and Environment
of the
British-Irish Inter-Parliamentary Body

Introduction

We would like to thank the Committee for this opportunity to meet, so that we can express the real fears of the fishing communities which depend for their livelihood on a clean and healthy environment in the Irish Sea.

In total, on some 420 vessels of all sizes, almost 1,700 fishermen representing almost as many families, are gainfully employed in the Irish Sea from Carnsore Point in Wexford to Omeath in Carlingford Lough. This does not take seasonal workers, such as drift net salmon fishermen into account. Employment in aquaculture in Carlingford Lough, the Boyne estuary, and south Wexford provides a further 100 jobs.

In addition almost 2,000 persons are employed on shore in processing, retailing, with perhaps an additional 400 in related industries such as transport, refrigeration, packaging, engineering and direct and indirect related services are reliant on Irish sea fishing and aquaculture activities. This is a very substantial number of people, especially when family and other dependents are taken into account. Furthermore, a high percentage of this employment is in rural coastal areas, where there is little other alternative employment, particularly in winter.

The Economic and Social Affairs Committee (C) of your body met with representatives of The Irish Fishermen's Organisation in 1994 in regard to Sellafield and also they consulted with our colleagues in the industry in Northern Ireland and in the Firth of Clyde.

We are pleased to note from an extract of their report that:

> **"The Committee shares the concerns of the fishermen regarding the environmental dangers in the waters around our two islands and urges both Governments to ensure that standards of protection are appropriate to the level of threat posed to the marine environment. If radioactive material is to be transported by sea there must be stringent and enforceable regulations to ensure that it is securely contained, and that such containers can be retrieved in the event of an accident at sea."**

At least, a committee of your body has recognised that a risk does exist, which is more than can be said for some UK government politicians and officials.

The Sellafield operations including the THORP plant, which the IFO formally objected to in 1992, is just one of the matters on which we wish to comment on here to-day. Others are the Beaufort Dyke, the other nuclear installations (power stations) and general industrial and agricultural pollution, sewage discharges, oil spills and general "flotsam" type disposals into the Irish Sea.

Sellafield/Thorp and other Nuclear Installations

For over forty years operations at the Windscale (now Sellafield) and the long catalogue of "incidents" have been a constant source of worry, added to by concealment, misinformation, the changing of goalposts in relation to so called acceptable standards and arrogance on behalf of the operators of the plants, British Nuclear Fuels Ltd. (BNFL), and the British authorities. We see no point in going over this ground to-day.

We in the Irish seafood industry need to be able to reassure our consumers and our sea going members, and to ensure we have full information to enable us to do so. They have a right to be kept properly informed. The confidence level of the Irish public in the data issued by the spin doctors of the British Nuclear industry and officialdom is very low.

These nuclear operations have long had a negative effect on consumers' views of fish as a safe food. Experience has shown that consumers are extremely sensitive to any suggestion of radioactive contamination in the Irish Sea and adjust their purchase patterns accordingly. This has also been well demonstrated in the case of a different food safety issue in relation to beef over the past seven months.

According to market research carried out on behalf of BIM - Irish Sea Fisheries Board about 55% of respondents are concerned to some degree about radiation in seafood, with 23% claiming to avoid eating fish for this reason. This survey was carried out at a time when there was no current adverse publicity. For periods following an "incident", such as the conviction secured against the British Electric nuclear plant in North Wales, these figures more than double. Additionally, queries as to the Irish sea environment are regularly received from overseas customers, and at BIM stands at international trade shows, particularly in Germany. Consequently, the industry is keen to avoid controversy, and can well do without emotionally charged headlines - such as "Chernobyl-on-Sea", "Risk doubles for 'heavy' fish eaters", "Sellafield, our nuclear nightmare". These are just some recent headlines in quality Irish newspapers.

Even the last issue of "Time" has an extensive comment on the matter, and mention of the problem amid the discussion of the other current food controversies.

This adverse publicity affects the fishing industry on both sides of the Irish Sea.

We are gratified that the report on the Irish Sea for 1993-1995 released last week by the Radiological Protection Institute of Ireland, indicates that the

> **"....latest findings show that the level of contamination is so low that it should not deter people from eating fish caught in the Irish Sea...".**

However the RPI does indicate that first effects of the commissioning of THORP reprocessing plant, which began in 1994, have been identified by in a sharp increase in the levels of the radionuclide Technetium 99 in seaweed collected along the east coast of Ireland. The report also points out that discharges, albeit very much reduced from the levels of the eighties. It is our belief that any further discharge, even a single atom or molecule is too much and unacceptable to the peoples of these islands.

We further believe that the addition of THORP and of the NIREX storage facility are extremely dangerous developments, as they raise the further the possibility of accidents or of sabotage. The latest RPI report correctly highlights this real and most serious danger, and which we ask your committee to stress this in your report.

Apart from discharges into the sea or the atmosphere, the threat of serious accident is ever-present. The consequences of such accidents are potentially catastrophic. It is our view that the polluter should pay for the effects of any incident large or small.

There are many of the "lunatic fringe" of terrorists who would be well capable of seeking the high publicity impact of an attack on or hijacking of shipping transporting the nuclear waste, and who would have no regard for even their own lives, and less still for Irish or British citizens.

Action Sought on Nuclear Issues

We ask the Irish members of this committee to continue to raise these matters with their respective parties, and to insist that the government uses every means possible in the European Union institutions to bring pressure to bear on the British authorities. In addition we ask the British members to explain our fears within their political organizations, and to seek a resolution to the mutual satisfaction of two peoples, in the spirit of good neighbourliness. We also ask that stricter independent monitoring of discharge levels and internal safety arrangements at the Sellafield and other sites such as Dounarey and North Wales be carried out by the relevant European Agencies.

We also ask our that there is better co-ordination and liaison within the governments concerned, such as Environment, Marine, Energy and Health, as was promised some months ago. There is a perhaps a case for co-ordination of all these matters from the Department of the Taoiseach.

We welcome the decision of the Irish Supreme Court recent judgment allowing the petition of the Dundalk "STAD" group of four individuals, and of the Irish Government's willingness to continue the case. The bringing of a case to the Irish or the International Courts has been long talked of.
While we are apprehensive of the effect of the publicity which the case will generate on our industry, we hope that it will be effective, as a closure is the only way in which the issue will diminish in the public perspective. Unfortunately, with the long life of the effluents already discharged, and the difficulties in decommissioning the plants, it will never be totally gone.

Munitions Dumps

With a reported one million tons of assorted munitions deteriorating in the Beaufort Dyke, close to the Antrim coast, this is a hazard to all mariners, fishermen included. We need a reliable assessment of actual scale of the problem, including the physical area over which the waste is spread and the risk to life, both at sea and on the shore, and to the general environment, including chemical pollution of all marine life. In addition expert consideration as to the safe disposal of the offensive material, if this is going to be realistically and a safe option. We need information on all the options. The added complication of the proximity of the inter-connector gas pipeline makes the problem more acute.

Also, other dumping site for munitions and chemical waste off the Donegal coast and further into the Atlantic must be stopped.

Submarines.

In areas of heavy traffic, such as the Irish Sea, there is, as many fishermen have found out to their cost, an unacceptably high risk of accidents involving submarines, some nuclear powered. We do not believe that submarines when travelling submerged are able to identify the obstacles in their vicinity, especially fishing gear. In these situations of heavy friendly traffic all submarines should be obliged to operate on the surface, where they can see and be seen. There is no reason why this cannot occur, especially in view of the changed international political situation.

Industrial Pollution

We also note the continued high level of industrial and sewage discharges from the Mersey and some other areas. There is particular concern about heavy metals. We hope to see full compliance with the relevant European Directives in accordance with the agreed time scales set down by the Commission. We recognise that much has been some progress in this regard already, but there is still much room for improvement on both sides of the Irish Sea.

Agricultural/Horticultural Chemicals.

The amount of chemicals used in agriculture has been increasing over the past decades, with more intensive farming methods . We are particularly concerned about pesticide, herbicide and other residual chemicals finding their way into the marine food chain. It is now a regular feature of international seafood marketing that products must be certified as being with in limits. The multiple retailers are also making difficult demands as to traceability. In a water mass where there is relatively little interchange with others, such as the Irish Sea the accumulation of chemicals can be a problem.

There are possible areas for joint co-operation in the research and the monitoring of the problem.

Oil Spillage

As in our comments on the transportation of nuclear waste, accidents are always a real threat. The "Sea Empress" oil spill near Milford Haven earlier this year, which also affected the Wexford coast illustrates this point. The damage to marine life, including fish and shellfish from the oil itself and the dispersant lasts for many years.

We need more effective control on the movement of such vessels, with stiff penalties for infringements, including the banning of the practice of washing out tanks while at sea.

Conclusion

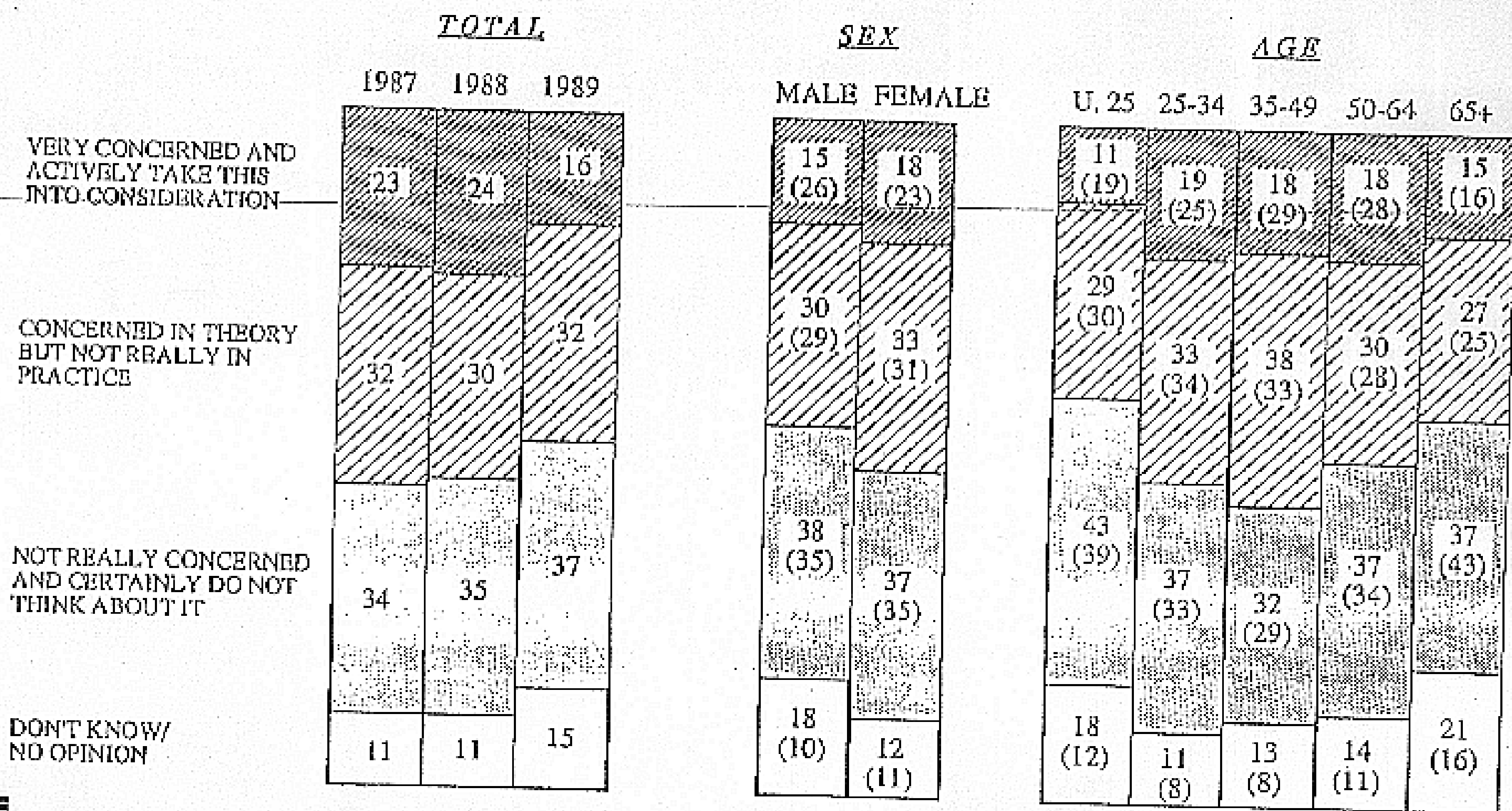
We again wish to thank the Chairman and the members of the Committee from both parliaments for giving us this opportunity of presenting our case. We hope that you will view our remarks in a positive way involving some constructive criticism.

There has always been a strong feeling of common purpose and practical co-operation between the fishing communities on both sides of the Irish Sea which we know will continue. We ask the members of the Committee to play their part in ensuring that they can carry out their age old tradition of harvesting the sea to provide good wholesome food in absolute security.

J. M. Somers - 4th. November 1996

CONCERN ABOUT RADIATION LEVELS IN FISH - I

(Base: All adults)



FIGURES IN BRACKETS RELATE TO 1988

To: Darien Carter
Fr: Joe Sorces
604/654
BIM.

Second Update

Meeting: 31 January 2002

The Environment Council

DISCHARGES WORKING GROUP (DWG) MEETING 31/01/02

MANCHESTER HILTON

1. ATTENDEES

Frank Barnaby	Oxford Research Group
Gerry McLaughlin	Environment Agency
Rex Strong	BNFL
Mark Drulia	BNFL
Roger Coates	BNFL
Steve Jones	Westlakes Research
Richard Harris	Facilitator
Erica Sutton	The Environment Council

Apologies for absence were received from Peter Addison, Stuart Conney, Steve Kaiser, Rick Nickerson, John Kane, Tony Free and Pete Roche.

Those present believed that the small number of attendees reflected a reluctance by participants in the dialogue process, to revisit old themes. In this case some 2 years after the publication of the original DWG report. This is an issue that would be worth discussing at the main group meeting.

2. PURPOSE/OBJECTIVES OF THE MEETING

The DWG had been reconvened at the request of the Co-Coordinating Group and asked to:

- Review the recommendations made in the original DWG report in the light of major/significant changes that have occurred since the report was published
- Take a view as to whether or not the findings of the report had influenced those participating in the dialogue.

3. PROCESS

Those present agreed a four-stage approach to address the tasks set. The stages were:

3.1 A general update from those present as to the current output from all the groups involved in the dialogue process.

3.2 Identification of what the group consider to be the major, legal regulatory, Governmental and operational changes that had occurred since the DWG report had been issued.

3.3 An assessment as to whether or not any of these changes would lead the DWG to amend any of its conclusions or recommendations.

3.4 A review to ascertain whether or not the recommendations made in the DWG report had influenced those participating in the dialogue process and other parties outside of the dialogue process.

4. UPDATE OF OUTPUTS FROM THE DIALOGUE GROUPS AND OTHER GROUPS

An update on general progress of the dialogue was given by Richard Harris. Other members of the group also contributed where they had direct involvement with groups. The update covered the following

- Pu WG
- Pu WG Sub Group
- SFMO WG
- WWG
- Co-ordinating Group
- Magnox Task Group
- LLR Task Group
- Transport Group
- BF WG Group
- JASM
- Socio-Economic Study Group
- LMA

5. MAJOR CHANGES SINCE THE PUBLICATION OF THE DWG REPORT

The reconvened DWG identified 13 changes that could have an impact on the conclusions and recommendations made in the original DWG report. Each of these changes and their possible impact on the report findings is discussed below, but in no particular order of priority.

5.1 The Socio-Economic report by ERM

The WWG and the DWG had suggested the production of the ERM report as both groups had seen the paucity of realistic socio-economic data as a detriment to balanced decision making in relation to the future of the Sellafield site.

The group welcomed the production of the report. Many of its findings had been anticipated by the DWG. The reconvened group felt that the report in itself would not impact on the original recommendations and conclusions, but would be of considerable benefit to SFMO WG during its deliberations.

5.2 Liabilities Management Authority (LMA)

The formation of the LMA was seen as a very significant development in that it:

- Emphasises the shift in focus from discharges from re-processing operations, to discharges from reprocessing operations PLUS discharges generated by legacy wastes. In its original deliberations the DWG gave little recognition to the discharges arising from Legacy Wastes.

- Raised questions as to the strategy the LMA might adopt for both reprocessing and dealing with legacy wastes. The formation of the LMA could lead to a change in strategy from that currently being pursued by BNFL, which would no doubt lead to a discharge profile significantly different from that envisaged by the DWG.

- Raised questions, in the minds of some members of the group as to how £35 billion of liabilities was to be funded. Clearly funding is crucial to the rate as which legacy wastes can be processed and therefore impacts the profile over time of discharges to the environment.

- Raised questions in minds of the group as to whom will actually “call the shots” re activities on the various BNFL sites. Will it be the LMA or will it be the contractor? Clearly activity directly correlates with discharges.

The group raised other questions relating to the formation of the LMA, such as relationships with the regulators and possible impacts on the national plan.
The group felt it could not answer such questions at the present time but reached the broad conclusion that the formation of the LMA has the potential to impact the profile of discharges from all sites. Until the group has more information about the LMA and its strategy we are unable to assess the impact the LMA will have on discharges.

5.3 Tc99 Decision Document

The decision reached by the EA in respect of discharges of Tc99 to the environment aligns closely with the discharge profile for this radionuclide, envisaged by the DWG in its original report. The decision exerts downward pressure on future discharges from the Sellafield site.

The group notes that implementation of the decision reached by the EA is dependant on approval by the Secretary of State and development of an abatement process by BNFL which is acceptable to NII, and possible NIREX, if the TPP abatement option as opposed to (or as well as) the MAC diversion option is pursued.

5.4 DEFRA Rad Waste Consultation

In the opinion of the reconvened group the DEFRA Rad Waste Consultation has the potential to impact the magnitude of discharges made to the environment.

However, until the group has sight of the output from the consultation, it is unable to quantify the impact it may have on the recommendations made in the DWG report.

5.5 CERRIE

As with the Rad Waste Consultation, the members of the group will need the output from the CERRIE process in order to assess the impact on discharges.

5.6 OSPAR

The group prior to publishing its report took all aspects of the OSPAR agreement into consideration.

5.7 Magnox Reactor Closure Programme Issues

As there have been no changes to the closure programme since the original DWG report was written there is no impact on the recommendations made in the report.
It was noted that for operational reasons at Magnox Reactors slightly reduced quantities of spent fuel will be produced. This in turn means a reduction in the cumulative amount of radioactive material being discharged to the environment compared to that originally envisaged by the DWG.

5.8 BNFL sites other than Sellafield

Although not part of the central considerations of the DWG, the reconvened group noted that the EA decision documents for the Magnox reactor stations propose reductions in some limits.
The EA's decision is very much in line with the sentiment expressed in the DWG report, to maintain downward pressure on all discharges.
Similarly the group noted that the announced reactor closure programme will lead to significant decrease in discharges from Springfields site with the cessation of the manufacture of Magnox fuel, around 2006.

5.9 Security September 11 2001

The work of the DWG focussed on routine authorised discharges. Consideration of discharges arising from the activity of terrorists was and continues to be outside the brief given to the DWG group. The group has concluded that the impact of terrorist activities is a matter for the Business Futures Group.

5.10 NII – HAL Limitation

In order to meet the restrictions imposed on the company by the NII Direction in respect of HAL stocks, it is unlikely that BNFL would discharge more to the environment that originally envisaged by the DWG. The group notes that the HAL stock restriction could in fact decrease the cumulative burden of total discharges (by restricting reprocessing), if BNFL fails to meet the targets imposed upon it.

5.11 The Sellafield Authorisation Review Consultation

The proposals in the EA consultation document regarding discharges from the Sellafield site support the spirit of the DWG report, which was for continued reduction of discharges.

5.12 Commercial Considerations

In developing its original report the DWG assumed that there would be a full order book for THORP until 2023/24. As far as the reconvened group is aware this assumption remains valid for assessment purposes, although it is noted that current contracted business would be completed well before this date.

Should this not prove to be the case, it needs to be brought to the attention of the BF WG for their consideration.

To summarise, some of the changes that have occurred since the publication of the DWG report have the capacity to impact the profile of discharges from the Sellafield Site. However for certain changes e.g. LMA, CERRIE, Rad Waste consultation, due to the lack of real information the reconvened DWG found it impossible to comment on the impact such changes may have on the discharges profile. That said a number of changes notably the EA decision documents, the Sellafield consultation documents, the magnox reactor closure programme and the NII HAL strategy, do exert downward pressure on discharges very much in line with the spirit of the original DWG report.

6. IMPACT OF CHANGES ON THE RECOMMENDATIONS MADE IN THE ORIGINAL DWG REPORT.

6.1 Recommendation 1 made reference to OSPAR. None of the changes reviewed are likely to change the OSPAR recommendations, but might increase the rate at which discharges to the environment are reduced between now and 2020.

6.2 Recommendation 2 dealt with the need for improved socio-economic information. The publication of the socio-economic report commissioned by the SFMO WG, has gone a long way to fulfilling this need but there is no direct impact on the work of the DWG.

6.3 Recommendation 3 urged BNFL to work within the region of optimisation for discharges profiled in the DWG report. Most of the changes discussed move the discharges profile towards the lower end of the region of optimisation. Actions by BNFL and the regulators similarly move the discharges profile downwards.

6.4 Recommendation 4 dealt with the need to reduce Tc99 discharges as a priority. The EA decision document on Tc99 currently with the Secretary of State, recommends an early reduction of Tc99 discharges, subject to BNFL development and getting agreement to the use of a suitable technology. The decision is very much in line with the recommendation make in the original DWG report.

6.5 Recommendation 5 dealt with the closure of the Calder reactors as the only means of reducing Ar41 discharges. As there has been no change to the original closure date, the recommendation stands as written in the original report.

6.6 Recommendations 6 and 7 dealt with the uncertainty surrounding the dose arising from discharges of 1-129. These uncertainties remain. However the group notes that I129 concentrations in the environment continue to be much below the levels predicted by some models. This remains valid for THORP related discharges as well as Magnox.

The reconvened DWG further notes that BNFL are working to resolve the issue of uncertainty and as importantly taking action to reduced 1-129 emission, e.g. THORP iodic acid trials and the commissioning of the street 3 caustic scrubbers.

6.7 Recommendation 8 was that a subsequent group should examine in detail issues associated with the prolonged dry storage of Magnox fuel. The reconvened DWG group is pleased to see that this issue has been taken up by the SFMO WG, and we look forward to their final report.

6.8 Recommendation 9 was that BNFL conducts further studies on the impact of future decommissioning operations on the discharge profile. The reconvened DWG notes and welcomes the fact that BNFL has created a Sellafield Historic Waste Management project. It is expected that this group will in time provide quantitative data on the impact of decommissioning operation on discharges. The reconvened DWG recommends that the BF WG monitor progress being made by the BNFL project team.

6.9 Recommendation 10 was that BNFL develop a strategy for discharge reductions at each of its UK sites. The reconvened DWG noted that some of the changes have resulted in decreases in discharges at other BNFL sites, notably

- Reduction in discharges at Springfields due to the closure of the Magnox fuel production line. A consequence of the reactor closure programme announced by BNFL.

- The EA Decision documents on discharges from Magnox reactor sites reduce limits for a significant number of radionuclides.

The group also notes that while it has not seen the publication of discharge reduction strategies at other BNFL sites, the fact that BNFL and other are involved in the development of the UK strategy for the reduction of radioactive discharges, must inevitably lead to the production of site specific plans.

6.10 Recommendation 11 dealt with the need for government and regulators to set criteria for the acceptability of waste forms.

The reconvened group notes that there has been no real progress on this recommendation.

Despite this lack of progress the group noted that BNFL are developing proposals for a trial of the TPP process (Tc99 abatement option), which they will discuss with the regulators shortly. The reconvened DWG group hopes that the discussions will lead to a way forward on setting criteria for the acceptability of waste forms.

6.11 Recommendation 12 was that Government should make use of the work due by the DWG. The reconvened group believes this had happened.

In summary none of the changes that have occurred since the publication of the original DWG report would lead the reconvened group to change or even significantly modify the original recommendations made in the DWG report.

7. EVIDENCE THAT THE WORK OF AND OUTPUTS FROM THE DWG HAD INFLUENCED OTHERS.

The reconvened DWG group came to the conclusion that both indirectly and directly the work of the group has influenced others. The evidence supporting and view is as follows:

- The DWG together with the WWG recommended the production of a socio-economic report. A report has been produced and is proving to be a useful document.

- Discharges have become a business critical issue for BNFL, with Senior Management giving discharges significant attention.

- Decisions by the regulators are seen to put emphasis on reducing discharges, in line with recommendations made by the DWG.

- Government has made reference to the work of the DWG.

As stated above we believe the influence of the group has been both direct and indirect. Despite a lengthy discussion, the group could not decide which of the two had the more impact. The discussion did highlight the importance of the dialogue as a “mixing zone” for the exchange of views. It appeared to the group that interaction and exchange of ideas within this “mixing zone” was/is as influential as that brought about by the formal reports produced by the Dialogue Process.

Finally one caveat. The reconvened group noted that a number of stakeholders, who were part of the original DWG group were not present at the reconvened group therefore their views about the impact of changes and the influence of the DWG may not be fully reflected in this report.