

**WEST CUMBRIA SITES STAKEHOLDER GROUP
ENVIRONMENTAL HEALTH SUB-COMMITTEE**

**MEETING 63 OF THE EHSC
HELD AT CLEATOR MOOR CIVIC HALL
ON 27th MAY 2005.**

Present:

Prof. J Haywood (Chairman)	Radiation Protection Advisor, N.Cumbria Health Authority
Mr R Hargreaves	Six Parish Councils
Rev J Hetherington	Cumbria County Council
Mr M Emptage	EA
Mr T Parker	BNFL
Mr N Hobson	NII
Dr J Vickers	Cumbria Primary Care Trust
Mr V Emmerson	Copeland Borough Council
Prof. S Jones	Westlakes
Dr Nigel Calvert	Health Protection Agency, Cumbria and Lancashire Unit
Ms S Allen (Secretary)	BNFL

Apologies:

Mr W Harvey	Six Parish Councils
Cllr T Johnston	Copeland Borough Council
Dr Frank Atherton	Director of Public Health, Morecambe Bay Primary Care Trust

Public and Press

Ms J Allis-Smith	CORE
Mrs M Higham	Drigg
Cllr C McCarron Holmes	Allerdale Borough Council
Mr A Irving	Whitehaven News
Mr G Brown	Freelance Journalist

AGENDA ITEM 1. CHAIRMANS INTRODUCTION

- 1 The Chairman welcomed attendees, this was the second EHSC meeting to be held in public. Future meetings will be held on fixed days, but the days set would need to be changed because there was now a clash with other newly set-up stakeholder groups.

AGENDA ITEM 2 - MINUTES OF MEETING 62.

2.1. Amendments to the minutes.

- 2 The minutes of the previous meeting were approved, subject to a minor amendment.

2.2. Matters arising.

- 3 None raised

AGENDA ITEM 3. CORPORATE RESPONSIBILITY REPORT

- 4 Mr Tim Parker advised that he was taking over attendance at the EHSC from Dr Rex Strong, who now had a wider remit beyond environmental matters.
- 5 He drew attention to the CRR report, which had been distributed to members. A separate company Health & Safety report used to be issued, this information was now combined into the CRR report with other social aspects. The report was a demonstration in a transparent way of how the company deals with various issues. Section 2, Chapter 2 was a statement on environmental health and assurance, showing an excellent environmental performance. The highlights on page 22, showed BNFL listed as one of the top 10 companies in the Business Community Index. Lowlights were 6 non-compliances, an increase in discharges from FHP (from corroded Magnox fuel – discharges were within authorised limits), pieces of plastic pipeline were lost during the sealine

decommissioning and had to be recovered. There was a summary of performances, and the part nuclear power plays in CO₂ savings (6.6M tonnes). Tc99 discharges were reduced. Sellafield total alpha and beta discharges were shown – the increase due to the FHP issue was shown. Air quality (non-radioactive discharges), energy conservation and usage against targets for electricity and water, and waste minimisation were covered. ILW stocks were increasing as the site treated waste and converted it into a form suitable for long-term storage.

- 6 There was a public issues section, covering what people raised as issues and the current view, eg reprocessing and discharges, security and safeguards, legacy waste management, nuclear energy and climate change, the NDA and the new working arrangements.
- 7 Professor Haywood congratulated BNFL on the quality of the report which gave a broader less detailed focus. The issues section was welcome as a demonstration of engagement with the public. There was a risk of dwelling on internal changes, these were of no interest to the outside world.
- 8 Dr Emptage welcomed the update section and the section on radioactive discharges, this stresses that a strong environmental performance is vital for the business, in order to get ahead in the international business community.

AGENDA ITEM 4. 2004 PRELIMINARY DISCHARGES REPORT.

- 9 Mr Parker advised that as some of the analyses were not complete yet, discharge figures were complete but monitoring and doses data was provisional.
- 10 Sellafield aerial radioactive discharges. Reprocessing rates (calendar year) in 2004 were similar to 2003 (Thorp more, Magnox less). The majority of the discharges were similar. Intermediate level stacks showed C14 from WVP was up slightly (12% to 27% of limit), this was under investigation.
- 11 The new authorisation came into force in October 2004, results were calculated under the old limits which covered most of the year. Calder was shut down, therefore Calder discharges were low. Thorp discharges were similar to 2003.
- 12 Drigg radioactive aerial discharges were similar to 2003, at a very low level.
- 13 Doses to the public (critical group doses, ie doses to the most affected individuals assessed from environmental monitoring) from Sellafield's discharges, were 40 µSv/y in 2004 against 31 µSv/y in 2003 due to the reassessment of direct radiation (19 µSv/y). The Drigg dose from discharges via foodstuffs was down 5 µSv/y. Direct radiation pathways gave 84 µSv/y (compared to the allowed dose of 1000 µSv/y).
- 14 NO_x discharges from Sellafield had increased slightly as WVP output increased.
- 15 Sellafield liquid radioactive discharges in 2004 were similar to 2003. C14 was the highest proportion of the limit at 78%, due to reprocessing throughput. Tc99 was decreased following diversion of liquors and the TPP trial, which was now an ongoing operational technique. Tc99 had decreased from 95% to 16% of the limit. The limit had been decreased but discharges were still within the new limit. Am241 and Pu241 discharges had decreased because of management of legacy fuel stocks.
- 16 Drigg liquid radioactive discharges were similar to 2003, at low levels, 1% of the limits.
- 17 The Sellafield dose (critical group dose, ie dose to the most affected individuals) had declined from 209 to 193 µSv/y, due to the Tc99 reductions. Am241 was the largest contributor, as a result of historic discharges.
- 18 The Drigg dose was not distinguishable from Sellafield, so predictive models were used, these indicated 0.01 µSv/y, a very low level.
- 19 Sellafield non radioactive liquid discharges had increased slightly, nitrate discharges were increased from higher reprocessing (more nitric acid used).
- 20 Dr Emptage asked if the C14 from WVP was accounted for by the increase in production in the facility. Mr Parker advised that the C14 discharge per container had gone up, an investigation was ongoing.
- Cllr C McCarron Holmes asked if the dose to the public was determined from samples, Mr Parker confirmed that it was. Cllr C McCarron Holmes asked about environmental

samples and soil. Mr Parker advised that in addition to foodstuffs, there were soil, air and mud pathways for exposure of the public. The pathways combined with people's habits gives the radiation exposure. Cllr C McCarron Holmes suggested that only the top level of soils were sampled, if a deeper sample was taken a higher reading than BNFL or the EA reported would be found. Mr Parker replied that this was correct in some locations, but this would have been reported years ago when it had been at the surface. Surface levels now were what was affecting the public, though there was an appreciation that this may change due to tidal events etc. Cllr C McCarron Holmes suggested that kicking with a foot would expose these sediments. Dr Emptage said there was a historical series of reports with doses assessed, these had been higher in the past (2.5 mSv/y). There were annual programmes and research reports to look at radioactivity in the environment. Dr Steve Jones said that where radionuclides in soils etc affect the public, the radiation reading goes into the calculation of doses.

AGENDA ITEM 5. ENVIRONMENTAL HEALTH MATTERS

- 21 Dr Steve Jones gave a report on the ICRP recommendations, a written brief had been issued, this is appended to the minutes at Appendix 1.
- 22 The ICRP 1991 recommendations (Publication 60) were due for review following a change in the process. Historically ICRP advice had been produced by an expert conclave. Now they had exposed the developing recommendations for consultation/comment via a web site from last summer to earlier this year. The draft recommendations were not on the website now, but a copy can be provided.
- 23 The draft recommendations for environmental radiological protection are – the ICRP Publication 60 publication limits can still be used, dose constraints can be used – not greater than limit (1mSv/yr is the recommended value). The recommended minimum constraint value is 10 µSv implying that further control is not needed for materials with levels lower than this – outside the scope of ICRP recommendations. Changes in dose terminology are recommended. The recommendations attach greater emphasis to qualitative considerations – and encourage greater public engagement. Environmental summed doses are difficult due to geographic area/timescales, there are recommendations for dealing with this. A framework for achieving protection of the environment and flora and fauna is proposed. Most of human protection recommendations reinforce the 1991 publication, but the introduction of environmental issues is new.
- 24 Comments received by the ICRP have indicated the scientific underpinning was not clear. Five 'foundation documents' have been developed to provide this, and are now open for consultation on the ICRP website. The documents cover dose limits, health risks, reference animals and plants, assessing doses and optimisation of protection.
- 25 Radiation doses to group – change in terminology from 'critical group' to 'representative individual'. External discussion of uncertainties and probabilistic assessment – will always give more pessimistic results. Reduced age categories from 6 to 3 (infants, 10year olds and adults). Involvement of stakeholders is encouraged.
- 26 Optimisation of protection (broadening the process) sketches out principles – qualitative and quantitative factors. Stakeholder involvement is recommended. Recommends breaking down collective dose according to timescales, levels of individual dose and other factors.
- 27 Reference animals and plants. Outlines models to derive doses. Discusses 'derived consideration levels' based on natural background doses.
- 28 Health risks attributable to radiation – based on research since the 1991 publication. Concludes that nominal probability co-efficients for cancer are identical to ICRP 60 (cancer risk not changed). The nominal probability co-efficients for hereditary detriment are lower – ie the risk of inherited diseases is considered smaller. Radiation weighting factors for individual organs are altered. Long-term studies of bomb survivors, show other health problems (seen at doses above 1 Sv), though evidence is limited.

- 29 Dosemetric quantities. Update on doses/terminology – doesn't change the terminology which we use.
- 30 Professor Jones concluded by advising that the documents can be accessed on the website and comments registered.
- 31 Professor Haywood commented on the probabilistic dose assessment to the representative individual, noting the importance of treating 'limit of detection' measurements correctly in order to avoid falsely inflating the resulting calculated doses.
- 32 Ms J Allis-Smith said there was evidence in Russia of heart disease attributed to radiation, and evidence from workers in B30 of a high incidence of strokes etc. She asked if BNFL was doing work on workers on these conditions. Professor Jones replied that he would have to check on this, he was aware that an epidemiological study programme was ongoing and that some information on non-malignant diseases had already been published. (Report from Professor Jones - see Appendix 2) Ms J Allis-Smith asked if only cancers were included in the compensation scheme, she was aware of concern among workers, how was this being addressed.

AGENDA ITEM 6. NEWS ITEMS OF ENVIRONMENTAL INTEREST

- 33 Mr Tim Parker spoke of the creation of the Nuclear Decommissioning Authority, as the NDA came in BNFL restructured and we were now British Nuclear Group Sellafield Ltd, operating the Sellafield site, a new structure interacting with the NDA – including environmental aspects.
- 34 Last year the Vitrification Plant had produced 478 containers, a record year, 40% higher. 3 lines were running to reduce highly radioactive liquors to solid glass block storage. The target for this year was higher.
- 35 Reprocessing was higher. Magnox was higher and included 145 tonnes of legacy fuels which were harder to reprocess.
- 36 The old B241 plant, the original seatank complex from the 1950s, for the settling of sludges, was being decommissioned. The stored sludges had a radioactive inventory. One of the tanks had been emptied in March, re-fluidised and pumped out (98.5% of the material had been removed), so that half the inventory of the complex was now in modern containment for treatment through Vitrification Plant.

AGENDA ITEM 7. WORKS UPDATES

- 37 Mr Parker commented on the Thorp feed clarification cell incident, a pipe entering a stainless steel vessel where liquor was sampled had fractured and 83m³ of the liquor had leaked into a contained cell. There was no leak to the environment and no discharges. A recovery plan had been formulated. 10 m³ had been recovered, the retrieval was ongoing and there would then be an assessment on how to deal with the failed pipe/vessel. The plant was to be brought back into operation ASAP. This had been classed as an INES3 incident (100 down on the Windscale incident). The INES level was set by the quantity of material which entered the secondary containment.
- 38 The Magnox plant was currently shut-down for 3 months, for routine maintenance, not related to the Thorp problem.
- 39 The sea pipe-line had achieved a major milestone – the beach section had been entirely removed and taken out to sea for cutting up and disposal at Drigg. The concrete retaining structures on the beach had been removed. On 24 April, during routine monitoring on the barge, 2 pieces of radioactive material had been discovered. These had been brought back to site for investigation.
- 40 A liquid effluent audit by the EA had raised issues, which were being addressed.
- 41 There would be a forthcoming IPPC application. Sellafield was a chemical plant under PPC regulations and needed a permit to handle these substances. For nitrates, for plants and associated plants on site (but not Calder), an application had to be made by August 2005. Noise, abatements, emissions and effects on the environment had to be considered. This was a major piece of environmental work.
- 42 Drigg - DEFRA were reviewing LLW disposal policies and consulting with local

stakeholders. Discussions were ongoing regarding Vault 9 (the next vault) and a temporary disposal area.

43 For World Environment Day on Wednesday 5 June there would be supporting activities by BNGSL. Locally sourced foods would be served in the canteens, employees would be encouraged to walk. The EA web-site has an area for entering pledges – employees were being encouraged to enter pledges on this.

44 Mrs Higham asked what the progress was on the removal of plutonium from Drigg to site, she understood that higher levels of plutonium were needing extra care to be taken, and was the work due to finish next year. Mr Parker advised that he would need to obtain answers to these questions, for inclusion in the minutes. Dr Emptage said that stacking was still being discussed, Vault 8 was filling up rapidly and permission was being requested to stack above ground level. Mr Parker said he was unable to comment on this, it was an operational issue rather than environmental.

[Note1: In answer to Mrs Higham's question, Mr Parker supplied the following information - "The PCM retrieval programme continues to make good progress, with the despatch from the LLW Repository site to Sellafield of larger items and drums continuing to plan. BNGSL has found an item which has had higher levels of activity than previously seen. This is within the safety and security arrangements, but the levels have required BNGSL to carry out additional work. As would be expected this additional work is slowing the rate of return of some of the items. However, as well as working on this item, BNGSL has accelerated the return rates of drums and other items and continue to be sending PCM to Sellafield ahead of schedule."

Note 2: With regard to stacking above ground level, this issue is covered in the Environmental Statement supporting the submitted Planning Application – "The assessment concludes that the maximum dose rate at the site boundary for the stacking regime will be 0.25 micro-Sv per hour. This is well within the target criteria of 0.6 micro-Sv per hour".]

AGENDA ITEM 8. MULTIMEDIA OBJECTIVES AND PRINCIPLES

45 Mr Parker advised that the authorisation uses 'multimedia' to cover aerial, liquid and solid discharges. His paper covered the radioactive discharge authorisation.

In November there had been a report on the environmental monitoring programme, the programme was subject to review between British Nuclear Group and the EA. At the last review there had been a discussion on objectives, the EA had suggested that BNGSL put together a set of objectives for the monitoring programme. This was an attempt to establish the objectives early in the process this year, before the review, and expose them for comments so they can be worked into the programme (which sits in the CEAR document).

46 The objectives from the BNGSL perspective were to minimise pollution and apply BPM to reduce discharges to the marine environment (OSPAR). There were no specific aerial objectives, they were being treated the same as liquid. For Sellafield the objective was "To reduce the radiation exposure to the critical group to 30 μ Sv per annum from marine discharges by 2020." If the site doesn't have a monitoring programme, BNGSL can't assess if this is being achieved.

47 The primary objective for the marine monitoring programme is an annual retrospective assessment of the critical group dose, to have enough measurements, from enough places, to be able to calculate this.

48 The proposed secondary objectives were the detection of abnormal discharges, furtive emissions, changes in behaviour of environmental radionuclides (these are used for predictions for modelling, and the maintenance of public confidence (reassurance of the public was sometimes needed more than scientific measurement)).

49 The principle was what to measure, where, when and to what extent. With food doses, the death of animals was involved to get analytical samples. Animals were being killed where the results were already known, because the FSA had done the same sampling.

50 The NDAWG, of which Mr Parker and Professor Jones are members, specifies how

- retrospective doses should be assessed, the BNGSL programme needs to tune into that. The limits under the authorisations should be reflected in the monitoring programme.
- 51 The BNGSL monitoring programme will take account of the FSA monitoring programme and will provide approximately 10% comparison results. Currently the FSA monitoring programme is duplicated, so double samples are being taken – the aim is to reduce sampling. Food safety is the responsibility of the FSA and they have stated that their programme will be kept at the level necessary to demonstrate food safety. The current BNGSL programme is very expensive and there is little point in continual monitoring of locations that never change year on year. A limit needs to be decided for the distance from Sellafield to which the sampling extends.
- 52 The presentation was aimed at seeking views from the meeting as to whether the proposal on what the monitoring programme should achieve was acceptable.
- 53 Mr Hargreaves commented on the proposal to look at pathways of greater than 2 $\mu\text{Sv}/\text{yr}$ against an ICRP recommended 10 μSv constraint, and asked if they were measuring something that doesn't matter. Mr Parker replied that the issue was the large number of radionuclides involved – they had to sum the radionuclides. This needed to be looked into.
- 54 Dr Vickers queried why 10% duplication was proposed, when the FSA were doing all the programme. Mr Parker replied that having a local programme, rather than having a government agency do all the sampling provided a lot of confidence to the local community. Professor Jones asked about funding for the FSA monitoring programme – Mr Parker advised that BNGSL funded the programme – under the 'polluter pays' principle. The monitoring programme was part of the monitoring specified by the EA.
- 55 Dr Emptage said the proposals were a welcome approach, he had some issues with the objectives and principles, information had been provided to Mr Parker. A review of the programme was due 30 September 2005. The EA will work with BNGSL to develop the programme to bring to the EHSC at the autumn meeting. Implementation was intended for 1 January 2006.
- 56 Ms J Allis-Smith queried the interpretation and analysis of samples, mentioning a sample they had taken to London for analysis, which had produced different results from the EA. Dr Emptage explained that it was important to have different laboratories undertaking work, but labs will give different results and subsamples (taken next to each other) will give different results. Large samples were sometimes taken and subsamples of these passed as 'blind' samples to different labs for comparison. Dr Emptage said they look at all the errors and do some check monitoring of the sampling, it was not physically practical for the EA to do all the sampling, so duplicate samples were taken for them. All this was reported in the annual report, there was generally a good comparison between results. The EA met with labs to find out why there were differences in analyses when this occurred.
- 57 Mr Parker commented that it was possible to have a certified, but slightly different analytical method, comparison of results by slightly different methods can be useful. Professor Haywood suggested that labs couldn't guarantee to get the same results twice from the same sample. Mr Hargreaves commented that mixing and dividing samples was fine to get analytical reliability, but to get a range of answers, samples are needed from nearby locations.
- 58 Ms J Allis-Smith said that their sampling had always varied from the samples in the monitoring report, and suggested that the monitoring programme should look for high areas such as Waberthwaite. She suggested that more samples should be taken in areas where people play – on river banks for example, there was a need to understand the extent of contamination in these areas. Dr Emptage said a lot of work had been done on an area of contamination in the Esk estuary on sediments and radioactivity levels – information on this could be provided. Mrs Higham suggested that doubts about the accuracy of results undermined confidence in the monitoring. Professor Haywood said it was recognised that a programme, which the public had confidence in, had to be provided

AGENDA ITEM 9. REGULATORY ISSUES

EA ISSUES

- 59 Dr Emptage reported that the EA were reviewing the Windscale (UKAEA) authorisation, they had published an explanatory document and proposals. A 3 month consultation period was due to end 30 June 05. The new authorisation was scheduled for 1 January 2006. Information can be obtained from the web-site or a copy could be provided.

(<http://www.environment->

[agency.gov.uk/yourenv/consultations/1012290/?version=1&lang=_e](http://www.environment-agency.gov.uk/yourenv/consultations/1012290/?version=1&lang=_e)]

- 60 Gaseous discharges of Sb125 from FHP, was a specific issue raised in the decision document on the Sellafield Authorisation. Dr Emptage said this went back to under-reporting on the site of Sb125 going through sampling systems undetected. Standards had been reviewed and Sb125 sampling arrangements reviewed. A report against the new authorisation had been requested by the end of June 06. There was evidence that a significant amount of Sb125 was passing through, but its impact was low in relation to the overall dose. More information was awaited through the report due in June, the EA may need to review this when the report was received.

- 61 Dr Emptage reported that in February 05, a joint audit on aqueous effluents was carried out. The emphasis previously had been on Tc99 and SIXEP, they had now turned their attention to unabated effluent plants. The audit had highlighted - failures in management procedures, failure to exclude solids, shortcomings in the written arrangements with regard to BPM reduction of aqueous effluents, records of discharges, failure to export Sr90 in the lagoon and issues with sentencing of waste for disposal off-site. Contamination was found in one area of site, possibly from past authorised discharges. There were a number of findings giving cause for concern in the overall management of aqueous discharges. The EA will issue an Enforcement Notice requiring a programme to be raised to address the issues.

- 62 Dr Emptage said he understood that the Euratom Article 35 report from their inspection in March 2004, was now published, though he couldn't find it on their website. This had been an inspection of UK arrangements (DEFRA, FSA and Sellafield), a verification of facilities for monitoring radioactivity in air, soils and liquids. The conclusion was that the situation was broadly satisfactory, some shortcomings were identified and recommendations made - aimed at DEFRA and would be followed up.

- 63 Mr Parker said that the Article 35 audit had been significant, it had audited the sampling done 'in the field', followed samples to labs, reviewed methods, reviewed reports and how they were dealt with, reviewed reports to the EA. It had been a very thorough review. There were generic recommendations, but generally they were happy with the handling of sampling at Sellafield. Dr Emptage suggested that the recommendations could perhaps be brought to the EHSC, DEFRA was responsible for responding, but members could be kept informed. The report could be circulated. Professor Haywood thought this could be discussed and the response process followed.

NII ISSUES

- 64 Mr Hobson reported that the BNFL work on contaminated land had been presented to the NII, the NII were continuing to work with BNFL. Meetings were being held, he would report further at the next meeting. A technical group was being set up with regard to groundwater (including Copeland Borough Council), a summary of the meetings would be brought to the EHSC.

AGENDA ITEM 10. SLLC to WCSSG

- 65 Professor Haywood reported that at the SLLC meeting on 7 April 05, the SLLC with subcommittees evolved into the West Cumbria Sites Stakeholder Group (WCSSG), with subcommittees, subgroups specific to sites and issue panels (up to 5 a year). The main stakeholder group deals with Sellafield.

- 66 An invitation was issued to apply for membership of the WCSSG, for a 2 year term.

‘Whole community representatives’ would get votes. Membership should include Copeland Borough Council, Allerdale Borough Council, Cumbria County Council, parishes, the supply chain etc. Members will be offered training – induction and issue specific programme.

- 67 There would be opportunities for information, understanding and engagement; events and meetings, advertising, a website, a stakeholder database. Single issue workshops would be prioritised by the Site Planning subcommittee. Single issue framework documents would be raised by the site operator. The LCBL committee would be co-ordinating activities on decommissioning – organising single issue panels.
- 68 Ms J Allis-Smith queried the size of the proposed committee – would it still be workable, would the meeting take a full day instead of half a day? Professor Haywood replied that this was not known yet, it would depend on the involvement of the public. Mr Hargreaves said the WCSSG would be the same size as the SLLC, he understood there would be the chairman of a subgroup plus 1 member, it will metamorphose, not step change to the new state as work progressed. Mrs Higham asked if a council would appoint its own representatives and how would the local supply chain be represented? Professor Haywood said such questions should be directed to the WCSSG, they have aspirations to get representatives, but this was not yet achieved. Mrs Higham queried the 2 year term, there would be a high turnover, Professor Haywood replied that turnover was encouraged rather than stagnation.
- 69 Dr Emptage suggested that the title ‘West Cumbria Sites Stakeholder Group’ did not convey what the group is about ie nuclear sites. Professor Haywood agreed to feed back the suggestion that the title should be amended to ‘West Cumbria Nuclear Sites Stakeholder Group’

AGENDA ITEM 11. CONSTITUTION

- 70 If the EHSC is to cover different sites, this has implications for reports and membership. Health – a Health Protection Agency representative to be added, WCC Health Council (Patient & Public Involvement Forum) or Local Strategic Organisation to be added.
- 71 The constitution will be redrafted and sent out with the minutes for comments. Members to be confirmed with organisations represented and replacements requested where nominated members no longer attend.

AGENDA ITEM 12. ANY OTHER BUSINESS

- 72 None raised.
- 73 The meeting closed at 15:53.

Appendix 1: Environmental Health sub-Committee, 27 May 2005

Summary of ICRP's developing Recommendations

Consultation draft – 2005 Recommendations of the ICRP

A draft of ICRP's revised recommendations was available for consultation and comment on the ICRP website up until January 2005. A large number of comments have been made to ICRP, which can all be accessed on the ICRP website.

The main point of the draft Recommendations, relating to environmental radiological protection, are:

- Dose limits recommended in ICRP Publication 60 (1991) are confirmed.
- Within the limits, the use of constraints is recommended – these to be determined by the relevant national authorities.
- Maximum values for the constraints are however recommended – the value for environmental exposure is 1 mSv per year, consistent with current UK practice.
- A *minimum* value for any constraint is recommended – 0.01 mSv per year – implying that radiation exposures at dose rates lower than this need not be limited.
- Exclusion levels for concentrations of radionuclides, below which materials would be excluded from the scope of ICRP recommendations, are recommended.
- Some changes in dose terminology are introduced – ‘equivalent dose’ is replaced by ‘radiation weighted dose, but ‘effective dose’, as the weighted sum of ‘radiation weighted doses’ in individual organs, is maintained.
- Some changes to the scheme for weighting the sum of doses in individual organs are recommended, but these seem unlikely to greatly affect the calculated values of effective dose.
- On the optimisation of protection, the emphasis on qualitative factors is increased and the involvement of stakeholders in decision making is encouraged.
- With regard to the use of collective dose in optimisation, it is recommended that collective dose should be disaggregated into a ‘matrix’ of elements to provide information on factors such as the number of people exposed, magnitude of individual doses, dose distribution in time, etc.
- The concept of protecting the environment in addition to humans who are exposed in it is introduced, and a framework for achieving this is sketched out.

A feature of many of the comments received by ICRP is that the scientific underpinning for its revised recommendations are not clear. This is because ICRP has been developing a number of ‘foundation documents’ which provide this underpinning, but these were not complete when its draft recommendations were made available for consultation. These ‘foundation documents’ are now available, and ICRP has agreed it will open its recommendations for a final consultation once comments have been received on the ‘foundation documents’.

Foundation documents

Five ‘foundation documents’ are now open for consultation:

Topic	Deadline for comment
Optimisation of protection	10 July 2005
Assessing doses to representative individuals	10 July 2005
Health risks attributable to radiation	24 July 2005
Dosimetric quantities	24 July 2005
Reference animals and plants	24 July 2005

Assessing doses to representative individuals

The document on *assessing doses to representative individuals* comprises ICRP's advice on selection of 'critical groups'. The terminology is changed – the term 'critical group' is no longer used. Instead we have a 'representative individual':

'the hypothetical individual receiving a dose that is representative of the most highly exposed individuals in the population'.

The means of specifying the habits of the 'representative individual' appear, however, to be broadly consistent with those currently used to determine the habits of the 'critical group'.

Other important points from the document are:

- The concept of uncertainty, and probabilistic assessment methods, is covered. Here the recommendations are less than clear but appear to imply the evaluation of uncertainties around the dose to a 'representative individual' and applying a criterion that the probability of exceeding the constraint should be less than 5%. This may mean that probabilistic assessments would always be more restrictive than the current, 'deterministic', approaches.
- The age categories to be considered are reduced from 6 to 3 – this simply endorses what has normally been done in current practice.
- The involvement of stakeholders in specifying the habits of the 'reference individual' is encouraged.

Optimisation of protection

This document is subtitled 'broadening the process' and is, indeed, couched in very broad terms. It deals with general principles rather than giving specific recommendations or a 'recipe' for the optimisation process. Some important points are:

- The importance of qualitative, as well as quantitative, factors is emphasised.
- The involvement of stakeholders in the optimisation process is recommended.
- The 'disaggregation' of collective dose to reveal individual, geographical, and temporal distribution of dose is recommended.

Reference animals and plants

This document:

- Defines a number of Reference Animals and Plants which will form the basis of ICRP's system for the protection of the environment from ionising radiation;
- Outlines models for evaluating radiation doses to these animals and plants;
- Discusses 'derived consideration levels' in relation to the range of natural background exposures experienced by animals and plants.

The document is formative in nature and does not make specific recommendations for the limitation of radiation doses to animals and plants in the natural environment.

Health risks attributable to radiation

This is a very extensive compilation of information, much of it derived from other reviews which have been undertaken since the publication of ICRP 60 in 1991. Key points from the summary of conclusions are:

- The nominal probability coefficients for cancer detriment (fatal plus non-fatal) are almost identical to those in ICRP 60;
- The nominal probability coefficients for hereditary detriment are markedly lower than in ICRP 60 ($0.2 \cdot 10^{-2}$ per Sv for the whole population, compared to $1.3 \cdot 10^{-2}$; $0.1 \cdot 10^{-2}$ per Sv for workers, compared to $0.8 \cdot 10^{-2}$);
- Some adjustments are recommended to the radiation weighting factors for individual organs (see above);

These Minutes were approved for issue by the EHSC on 24 November 2005.

- The current linear-no-threshold basis for extrapolation of risks from high to low doses is endorsed as the appropriate assumption for radiation protection;
- The knowledge of emerging mechanisms such as genomic instability and bystander effects is judged insufficient to affect radiological protection recommendations;
- Emerging evidence for enhancement of the incidence of non-malignant disease following high dose (>1 Sv) exposure is acknowledged, but the lack of evidence at low doses provides no reason to amend radiation protection recommendations.

Dosimetric quantities

This document updates the definitions of radiation dose units and quantities but does not signal any substantial change in current practice.

Professor Steve Jones

26 May 2005

Appendix 2: Mortality of Sellafield workers from non-malignant conditions

A number of reports have been published on the mortality of the workforce at Sellafield. One of the most recent is a study¹ by researchers at the London School of Hygiene and Tropical Medicine: '*Cancer mortality and morbidity among plutonium workers at the Sellafield plant of British Nuclear Fuels.*' Although the main focus of this study is cancer in plutonium workers, it also provides mortality statistics for over 20 causes of death due to non-malignant diseases. The statistics relate to all 14,319 workers employed at the Sellafield site between 1947 and 1975, and mortality is followed up through to the end of 1992.

Mortality is reported separately for plutonium workers, for other radiation workers and for the workforce as a whole. Mortality rates are compared with those of the population of England and Wales and, for some causes of death, with those for the population of Cumbria. As one would expect when examining many causes of death, some mortality rates are higher than expected and some are lower. Overall, mortality rates from diseases of the circulatory system are elevated slightly over those expected for England and Wales, but slightly lower than those expected for Cumbria. Mortality rates for radiation workers and non-radiation workers are similar.

Researchers at the Clinical Trial Service Unit and Epidemiological Studies Unit at Oxford University have recently published a review² of epidemiological data on radiation and circulatory system disease, other than that for the atomic bomb survivors. This considers results from twenty-six studies, including the above mentioned study of Sellafield workers, and concludes: '*We conclude that the other epidemiological data do not at present provide clear evidence of a risk of circulatory diseases at doses of ionizing radiation in the range 0-4 Sv, as suggested by the atomic bomb survivors. Further evidence is needed to characterize the possible risk.*'

Having contacted British Nuclear Group, I understand that epidemiological surveillance of the Sellafield cohort is continuing and that updated statistics will be published in future, subject of course to the normal procedures of scientific peer review, consultation with the study subjects, and continued availability of funding.

Professor Steve Jones

23 June 2005

¹ Omar RZ, Barber JA and Smith PG 1999. *Cancer mortality and morbidity among plutonium workers at the Sellafield plant of British Nuclear Fuels.* British Journal of Cancer **79** 7/8 1288-1301.

² McGale P and Darby SC 2005. *Low doses of ionizing radiation and circulatory system diseases: a systematic review of the published epidemiological evidence.* Radiation Research **163** 247-257.