SMT/09/55

| Health and Safety Executive Board | | | Paper No: HSE/09/ |
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| **HSE Coordinated Programme for Nuclear Safety Research 2009/10** | | | |

## Purpose of the paper

1. The Atomic Energy Act requires HSE to approve each year a nuclear safety research programme coordinated with nuclear licensees. It is a requirement of the Act that ND has approval from the Board to recover the costs of its nuclear safety research and appropriate management charge from the licensees. The Board are being asked to agree to the coordinated programme identified below and to approve an ND programme of nuclear safety research.

## Background

2. Responsibility for nuclear safety research was transferred in 1990 from the former DTI to HSC. In 2002 the HSC gave approval to expand the scope of the programme from a focus only on civil nuclear reactor sites to one that in addition covered all civil sites being decommissioned and where radioactive waste is being managed. Principally, it was extended to cover all sites in the scope of the Nuclear Decommissioning Authority (NDA). HSE through its Nuclear Directorate (ND) implements this policy and the ad hoc Research Review Group (RRG), formerly Review Group 6 of the disbanded Nuclear Safety Advisory Group, provides independent advice to the HSE Board on nuclear safety research matters.

3. ND uses its regulatory insights and interactions with nuclear licensees to develop research strategies that ensure the research addresses relevant safety issues, contributes to safety standards and maintains important competence.

4. Strategically and operationally, the programme has been coordinated wherever possible with other major hazards research commissioned by HSE but the uniqueness of much of the research to the nuclear industry means that opportunities to do so are limited. ND places responsibility for identifying, commissioning and financing the research on the nuclear licensees. The programme is predicated on safety hazards and continues to shift its emphasis from operating nuclear power plants to radioactive waste management and decommissioning. However the intention of Magnox North to extend the life of Wylfa and Oldbury plants means that there is an increasing emphasis in this year's programme given to operational safety issues. Some technical support to Generic Design Assessment for new civil reactors is provided by access to international codes made available through

the research programme and, in addition, cooperation in certain technical areas is provided through the programme.

**Argument**

5. ND's main role for nuclear safety research in the UK is to provide oversight that safety research undertaken by nuclear licensees is adequate and balanced across the hazards of the nuclear industry. Fundamental to the programme is the requirement for the nuclear licensees to identify, commission and finance the research needs. ND sets the framework for programme coordination and provides the strategic direction and where necessary the safety drivers and safety issues that help determine what research is undertaken. ND's production of the Nuclear Research Index (NRI) (Appendix 1) and research strategies continue to form the basis for defining research needs and in so doing provides a measuring stick by which the adequacy and balance of the research can be assessed. HSE has unfettered access to the research outcome arising from the programme and requires that safety critical information is shared across the licensees. The Nuclear Waste Research Forum (NWRF) and the Control and Instrumentation Nuclear Industry Forum (CINIF) are excellent examples where research is coordinated and outcomes shared across the civil and defence sectors. In addition, ND commissions its own research to provide it with independent technical advice, to access research undertaken abroad and to tackle research issues the licensees may decline to address.

6. The programme for 2009/10 covers two main parts; operating civil power reactors, and nuclear plant decommissioning and radioactive waste management. The civil power reactors include the two remaining Magnox plants, the Advanced Gas-cooled Reactors (AGRs) and the Pressurised Water Reactor (PWR), Sizewell B. The historical spend on this part of the programme since 1990 is provided in Annex 1. ND notes the intention of Magnox North to extend the operating life of Wylfa and Oldbury plants beyond their originally declared closure dates and their need to undertake research on life-limiting issues such as the material properties of graphite and control and instrumentation. ND is of the view that this research should be funded from the income generated from plant operation and should not be allowed to detract from priority work on radwaste management and plant. ND notes that it has concerns for both Magnox North and Magnox South related to asset management, plant degradation, decommissioning technologies, waste mobilisation and waste minimisation and would expect high priority research related to these issues to be undertaken.

7. The technology of the AGRs has reached a high level of maturity and in certain technical areas the main purpose of the research is to maintain essential capability. However, as a consequence of plant maturity some parts of the reactor structure and many metallic components have aged and have given rise to significant plant safety issues. This is reflected in the high level of research expenditure British Energy is proposing in areas such as plant chemistry, graphite core and the ageing of steel components. ND's research focuses on funding participation in international collaborative projects on plant modelling, fuel integrity and waste characterisation and

provides access to nuclear data through the OECD NEA. The plant modelling research, especially in the area of fault studies, provides valuable technical data and gives access to technical capability that will help support ND's Generic Design Assessment (GDA) of light–water reactor designs.

8. Therefore the 2009/10 programme excluding management charges relates primarily to existing operating reactors, although some of the costs are recovered from the Requesting Parties and relate to the Generic Design Assessment of new civil reactors. It is composed of an ND programme of £0.64m and a British Energy (BE) programme of £6.45m. Detailed programme breakdown against technical areas is provided in Annex 2 and a detailed breakdown of projects proposed in the ND commissioned programme are provided in Annex 3. The proposed total programme expenditure is similar in value to what was spent in 2008/09. In addition, BE and Magnox North declare that they will commission approximately £8.13m on research to meet reactor operational requirements; a breakdown of this expenditure against technical area is provided in Annex 4.

9. The second part covers all nuclear sites where plant is being decommissioned and radioactive waste is treated, managed and stored although the main focus of the programme is on the Magnox North and South, Sellafield and Dounreay sites. These sites are owned by the NDA on behalf of the Government and the NDA provides the funding to the Site License Companies (SLCs) to undertake research. ND identifies key areas and topics for research through licensee focused strategies. Based on these and their own operational needs, SLCs identify the safety research required and submit it in their Technology Plans to the NDA for funding. ND technically reviews these submissions once they have been submitted to the NDA and these inform ND's review of its own research strategies which takes place in autumn.

10. The SLCs submitted their Technology Plans at the end of March 2009 but this leaves insufficient time for ND to complete a proper assessment before making its report to HSE. Therefore ND is providing assurance of this long term safety research need from its review of the Technology Plans already in place, through the technical interactions it has with the SLCs and its interactions with the NDA on generic safety across SLC sites. Also through representation at the NDA Research Board, ND is able to raise any concerns it may have about the funding levels for SLC safety research communicated at that meeting. In conclusion, ND has determined that all urgent reactor safety issues are being addressed satisfactorily, notes that Magnox North should fund research on plant operation from income generated from those operations and subject to funding levels yet to be declared by the NDA, considers that the SLCs programmes are adequate and balanced.

**Presentation/Consultation**

11. The programme was presented in full on 3 March to the ad hoc Research Review Group (RRG) set up to replace Review Group 6 of NuSAC. The nuclear licensees and the NDA have been involved in the production of this paper and were represented at the RRG meeting along with the Chief

Scientists Unit. On the basis of these discussions and its own review through meetings with SLCs, the RRG provides its advice to HSE on the adequacy of the 2009/10 programme and this is in paper HSE/09/52. In short, the RRG has concluded that R&D to support the nuclear industry is now much better defined and the right issues are being addressed but that the aims should be better detailed in order to judge progress.

12. The research strategies and safety drivers for the programme are published on HSE's website for the technical community to access and the research outcomes for the ND commissioned research can be made available to the public where it is considered the research has no security implications. These commitments have been agreed with the Communications Directorate.

**Financial/Resource Implications for HSE**

13. HSE recovers all its research and management costs from the nuclear licensees and the Requesting Parties. In addition, ND provides access by other nuclear companies to international nuclear codes and nuclear data managed by the OCED NEA and by charging for these uses can offset some of these costs thereby reducing costs to the licensees. As a result there is an overall neutral cost of the programme to HSE. The financial aspects of this paper have been cleared with PFPD.

**Action**

14. Board approval is sought to enable ND and the nuclear licensees to commission the 2009/10 coordinated programme.

**Paper clearance**

15. The paper was produced by Peter Storey and will be cleared by the SMT on 3 June 2009.

**APPENDIX 1**

## Nuclear Research Index

The arrangements for implementing the reactor research programme require both HSE and the British Energy to commission research programmes to address safety issues identified by HSE in its Nuclear Research Index (NRI). The NRI, which is produced annually, is a compilation of generic nuclear safety issues generated by HSE as a result of its knowledge gained in regulating nuclear reactor sites and its broader dealings with other organisations, both nationally and internationally. The index provides a basis for: prioritising research; judging the balance and adequacy of the annual programmes; and ensuring that the support to the regulation of nuclear safety is optimised. It is necessary to ensure adequacy and balance within a technical area, between technical areas, and between different reactor types. The reactor safety research programme is drawn up following a dialogue based on the NRI with the reactor licensees.

This year's NRI is in the same format as last year and consists of three individual documents:

- A strategy document providing an overall strategy, which takes account of strategic regulatory and industry drivers as well as the individual technical area strategies, and an outline of the framework for the programme management.

- A live Issues Index which consists of all those issues which are not yet considered closed.

- A Closed Issues Index which provides details of all those issues raised in previous Indexes which are now considered closed together with details of why each issue is considered closed, with references where appropriate.

**ANNEX 1**

## Spend (£M) (excluding Management Charges) (1)

| | 90/91 | 91/92 | 92/93 | 93/94 | 94/95 | 95/96 | 96/97 | 97/98 | 98/99 | 99/00 | 00/01 | 01/02 | 02/03 | 03/04 | 04/05 | 05/06 | 06/07 | 07/08 | 08/09 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Levy | 15.0 | 10.3 | 9.6 | 11.0 | 5.4 | 2.0 | 1.6 | 1.9 | 1.5 | 1.4 | 1.5 | 1.4 | 1.2 | 1.6 | 1.2 | 0.9 | 0.7 | 0.5 | 0.5 |
| Licensees (2) | 0.0 | 0.0 | 0.0 | 0.0 | 5.0 | 8.1 | 8.5 | 7.2 | 6.4 | 7.0 | 6.7 | 6.3 | 5.4 | 6.6 | 7.4 | 4.3 | 4.3 | 3.2 | 6.5 |
| Levy + Licensees | **15.0** | **10.3** | **9.6** | **11.0** | **10.4** | **10.1** | **10.1** | **9.1** | **7.9** | **8.4** | **8.2** | **7.7** | **6.6** | **8.2** | **8.6** | **5.2** | **5.0** | **3.7** | **7.0** |
| Industry Direct non NRI Research (3,4) | 7.1 | 11.8 | 6.5 | 8.0 | 4.3 | 9.4 | 10.4 | 9.9 | 7.7 | 7.4 | 10.6 | 9.2 | 8.4 | 9.5 | 7.8 | 7.0 | 7.0 | 7.7 | 7.6 |
| **Total** | **22.1** | **22.1** | **16.1** | **19.0** | **14.7** | **19.5** | **20.5** | **19.0** | **15.6** | **15.8** | **18.8** | **16.9** | **15.0** | **17.7** | **16.4** | **12.2** | **12.0** | **11.4** | **14.6** |

**Notes:**

**(1) All figures are ex. VAT.**
**(2) Before April 2003 individual licensee's programmes were combined in the Industry Management Committee (IMC) programme.**
**(3) Before April 2003 the non-NRI Research Programme was called the Industry Direct Programme.**
**(4) Spend on non-NRI related research previously reported to HSC for the years up to 2000/01 included ~£6.5M/year of BNFL chemical plant research. This has now been excluded so that all data related to spend on reactor safety research.**

**Annex 2**

## REACTOR RESEARCH SPENDS £k: 2009/2010 versus 2008/2009

| Technical Area | LEVY | | LICENSEES (BE) | | TOTALS | |
|---|---|---|---|---|---|---|
| | 2008/2009 | 2009/2010 | 2008/2009 | 2009/2010 | 2008/2009 | 2009/2010 |
| Chemical Processes | 76 | 26 | 1110 | 1010 | 1186 | 1036 |
| Graphite | 59 | 20 | 1926 | 1837 | 1985 | 1857 |
| Fuel & Core | 34 | 32 | 177 | 0 | 497 | 458 |
| Plant Modelling | 0 | 144 | | | | |
| Nuclear Science | 286 | 282 | | | | |
| Radiological Safety | 0 | 0 | | | | |
| Waste & Decommissioning | 0 | 40 | 101 | 219 | 101 | 259 |
| Human Factors | 0 | 0 | 265 | 192 | 265 | 211 |
| Probabilistic Safety Assessment | 0 | 19 | | | | |
| Control & Instrumentation | 0 | 0 | 417 | 328 | 417 | 328 |
| Nuclear Systems & Equipment | 0 | 0 | 0 | 0 | 0 | 0 |
| Plant Life Management - Civil Engineering | 0 | 0 | 190 | 127 | 190 | 188 |
| Hazards (external & internal) | 0 | 61 | | | | |
| Plant Life Management - Steel | 0 | 0 | 2308 | 2740 | 2308 | 2740 |
| Various | 19 | 20 | 0 | 0 | 19 | 20 |
| **Programme Total** | **474** | **644** | **6494** | **6453** | **6968** | **7097** |
| Management Charges | 90 | 90 | **150** | **150** | **240** | **240** |
| **TOTALS** | **564** | **734** | **6644** | **6603** | **7208** | **7337** |

**Annex 3**

## HSE COMMISSIONED NSR PROJECTS 2009-10

| Technical area | Project reference | Title | Licensees | Research category |
|---|---|---|---|---|
| Coolant Chemistry | CC/1117 | PWR Primary chemistry | BE | ITC |
| ditto | CC/1047 | Reactor Secondary chemistry | BE/MXN | ITC |
| Internal Hazards | 11/1147- | OECD PRISME - | BE/NDA SLC/NB | - |
| Fuel | FC/GNSR/51 | OECD Cabri | BE | INTL |
| ditto | FC/GNSR/56 | OECD Studsvik Cladding Integrity Project | BE | INTL |
| Graphite | GRA/GNSR/4 | Microstructure/Property Relationships | BE/MXN | ITC |
| ditto | *GRA/1083* | Support for Eng.D Student at Manchester | BE | ITC |
| | | | | |
| Nuclear Science | PM/GNSR/17 | Membership of NEA Databank | BE | INTL |
| ditto | NS/GNSR/8 | European Group on Reactor Dosimetry | BE/MXN | INTL |
| Plant Modelling | *New Contract* | USNRC CSARP Programme | BE/NB | INTL |
| ditto | PM/GNSR/18 | USNRC Code Maintenance Programme (CAMP)[1] | BE/NB | INTL |
| ditto | PM/GNSR/19 | CAMP code administration[1] | BE/NB | INTL |
| ditto | PM/GNSR/22 | OECD PKL (Primary Circuit) | BE/NB | INTL |
| ditto | PM/GNSR/25 | OECD ROSA (JAERI thermal hydraulics project) | BE/NB | INTL |
| Probablistic Safety Analysis | PRA/GNSR/25 renewal | OECD ICDE Common Cause Failure Database | BE/MXN/NB | INTL |
| ditto | *New Contract* | FP7 ASAMPSA LEVEL 2 PSA | BE/NB | INTL |

| | | | | |
|---|---|---|---|---|
| Waste and Decommissioning | *New Contract* | Graphite Waste Characterisation | NDA | ITC |
| ditto | *New Contract* | Dewatering ILW Sludges | NDA | ITC |
| ditto | *New Contract* | Encapsulation of Mixed ILW Wastes | NDA | ITC |
| Various | *New Contracts* | Funding for Euratom FP 7 bids | BE/MXN | INTL |

[1] Income from external users is used to offset the levy charges to licensees

BE … British Energy, MXN … Magnox North, NDA … Nuclear Decommissioning Authority, NB … New Build Requesting Parties, SLC … Site License Company, INTL … International, ITC … Independent Technical Capability

**Annex 4**

## LICENSEES' 2009-10 PROGRAMMES OF REACTOR RESEARCH (£k)

## (Excluding project management and HSE Levy charges)

| Technical area | BE NRI | BE Non-NRI | ME Non-NRI |
|---|---|---|---|
| Chemical Processes | 1010 | 58 | 0 |
| Graphite | 1837 | 2630 | 500 |
| Fuel & Core | 0 | 1043 | 0 |
| Plant Modelling | | | |
| Nuclear Science | | | |
| Radiological Safety | | | |
| Waste & Decommissioning | 219 | 630 | (Note 1.) |
| Human Factors | 192 | 90 | 0 |
| Probabilistic Safety Assessment | | | |
| Control & Instrumentation | 328 | 60 | 120 |
| Nuclear Systems & Equipment (Fuel handling) | 0 | 142 | 0 |
| Plant Life Management - Civil Eng | 127 | 22 | 0 |
| Hazards (external & internal) | | | |
| Plant Life Management - Steel | 2740 | 1844 | 0 |
| Generic | 0 | 1000 | 0 |
| **Programme Total** | **6453** | **7519** | **620** |

Note 1. The entire Magnox research programme is now conducted under the decommissioning Licensees Nuclear Safety Research Strategy- rather than the NRI arrangements.