

Health and Safety Executive Board		Paper No: HSE/08/10	
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HSE Coordinated Programme for Nuclear Safety Research 2008/09			

Purpose of the paper

1. The Atomic Energy Act requires approval each year from HSE for a nuclear safety research programme coordinated with nuclear licensees. The Board are being asked to agree to the coordinated programme identified below and to approve an ND programme of safety research where the costs of the research and its management are recovered from the industry.

Background

2. Responsibility for nuclear safety research was transferred in 1990 from the former DTI to HSC. In 2002 the scope of the programme was expanded 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 Nuclear Safety Advisory Committee (NuSAC), through its Research Review Group (RG6) advises 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. ND places responsibility for identifying, commissioning and financing the research on the nuclear licensees. The programme continues to shift its emphasis from operating nuclear power plants to radioactive waste management and decommissioning. Additionally, some technical support to the Generic Design Assessment of potential future nuclear reactors is provided by access to international codes made available through the research programme.

Argument

5. ND's main role for nuclear safety research in the UK is to oversee that it is adequate and balanced across the risks and 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 outcomes arising from the programme. In addition, ND undertakes 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 2008/09 covers two main parts; operating civil power reactors and nuclear plant decommissioning and radioactive waste management. The civil power reactors include the two remaining operating Magnox stations at Oldbury and Wylfa, the Advanced Gas-cooled Reactors (AGRs) and the Pressurised Water Reactor (PWR), Sizewell B. Annex 1 provides details of programme spend since 1990 and Annex 2 provides a comparison against last year's spend. With one Magnox station ceasing operation this year and the remaining one planned for closure in 2010, ND has agreed that no new Magnox related safety issues will be identified and no new research is expected. 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 with 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 aging of steel components. ND's research focuses on the funding of research on PWR reactor coolant chemistry, in particular to help maintenance of in depth technical capability in this area and funding participation in international collaborative projects on plant modelling. The plant modelling research especially in the area of fault studies will provide valuable technical data and give access to technical capability that will support ND's Generic Design Assessment (GDA) of light-water reactor designs.

7. Therefore the 2008/09 programme excluding management charges relates only to civil nuclear power reactors and is composed of an ND programme of £0.75m and a British Energy (BE) programme of £6.49m. Detailed programme breakdown against technical areas is provided in Annex 3 and a detailed breakdown of projects proposed in the ND commissioned programme are provided in Annex 4. The total programme expenditure represents an approximate doubling of the 2007/08 programme but this is predominantly due to a more than doubling in the value of the BE programme. In addition BE and Magnox declare that they will commission approximately £8.9m on research to meet operational requirements; a breakdown of this expenditure against technical area is provided in Annex 5.

8. The second part covers all nuclear sites where plant is being commissioned and radioactive waste is treated, managed and stored although the main focus of the programme is on the Magnox, Sellafield and Dounreay sites. These sites are owned by the NDA on behalf of the Government and it provides the funding to the Site License Companies (SLCs). ND develops strategies across key areas and topics for research for each SLC. The SLCs then identify the safety research required and submit it along with their own operational research needs in their Technology Plans for the NDA to fund. ND through its representation on the NDA Research Board is able to have early indications of research to be funded by the NDA. For 2008/09 the programmes of safety research covering a wide range of topics proposed by the SLCs have been assessed as adequate by ND but await confirmation by the NDA that they will be funded.

Presentation/Consultation

9. The programme was presented in full to the NuSAC Research Review Group on 22 April. The key stakeholders were involved in the production of this paper and in particular nuclear licensees covered by the programme and the NDA were represented at the meeting along with the Chief Scientists Unit. On the basis of these discussions NuSAC provides its advice to HSE on the adequacy of the 2008/09 programme and this is in paper HSE/08/11. In brief, NuSAC recognises the substantial effort put in by ND and its success in improving the operation of the programme. It commends efforts across the programme to rebuild nuclear capability. It concludes that following its review the programme proposed by ND and the licensees is adequate and balanced.

10. 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

11. HSE recovers all its research and management costs from the nuclear licensees and from other nuclear companies and there is an overall neutral cost of the programme to HSE. The financial aspects of this paper have been cleared with PFPD.

Action

12. HSE Board approval is sought to enable ND and the nuclear licensees to commission the 2008/09 coordinated programme as laid out in Annexes 2 and 3 and explained in paragraphs 6-8.

Paper clearance

13. The paper was cleared by correspondence with the SMT.

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 (2)	03/04 (3)	04/05 (7)	05/06	06/07	07/08 (8)
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
Licensees (4)	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
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	5.2	3.7
Industry Direct non NRI Research (5,6)	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
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	12.2	11.4

Notes:

- (1) All figures are ex. VAT.
- (2) The figures reported here the final outturn spend until 2002/03
- (3) Planned spend from 2003/04.
- (4) Before April 2003 individual licensee's programmes were combined in the Industry Management Committee (IMC) programme.
- (5) Before April 2003 the non-NRI Research Programme was called the Industry Direct Programme.
- (6) 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.
- (7) This is the programme value as defined at the start of 2004/05.
- (8) Industry Direct figure includes Magnox Electric Contribution to NDA Funded Waste & Decommissioning Programme

REACTOR RESEARCH SPENDS £k: 2008/2009 versus 2007/2008

Technical Area	LEVY		LICENSEES (BE)		TOTALS	
	2007/2008	2008/2009	2007/2008	2008/2009	2007/2008	2008/2009
Chemical Processes	25	104	770	1110	795	1214
Graphite	6	49	900	1926	906	1975
Fuel & Core	157	30				
Plant Modelling	91	174				
Nuclear Science	0	247	26	177	274	628
Radiological Safety	0	0				
Waste & Decommissioning	0	62	217	101	217	163
Human Factors	0	0				
Probabilistic Safety Assessment	93	28	170	265	263	293
Control & Instrumentation	0	40	329	417	329	457
Nuclear Systems & Equipment	0	0	0	0	0	0
Plant Life Management - Civil Engineering	0	0	100	190	100	190
Hazards (external & internal)	0	0				
Plant Life Management - Steel	40	0	700	2308	740	2308
Various – Support for FP7	60	20	0	0	60	20
Programme Total	472	754	3212	6494	3264	7248
Management Charges	109	90		150	109	240
TOTALS	581	844	3212	6644	3373	7488

2008/2009 PLANNED HSE COMMISSIONED NSR PROGRAMME

Technical Area	Spend in £k by Category ⁽¹⁾			Spend in £k by Licensee/Requesting Party					No of PROJECTS						
	ITC	INTL	Top-up	BE	ME	NDA SLCs	NB ⁽²⁾	Total	BE only	ME only	BE/ME	NDA SLC	NB only	BE/NB	Total
<i>Nuclear Technology</i>															
Chemical Processes	104	0	0	97	7	0	0	104	1	0	2	0	0	0	3
Fuel & Core	0	30	0	30	0	0	0	30	2	0	0	0	0	0	2
Graphite	49	0	0	46	3	0	0	49	1	0	1	0	0	0	2
Plant Modelling	0	174	0	16	0	0	158	174	0	0	0	0	3	2	5
Nuclear Science	0	247	0	233 ⁽³⁾	14	0	0	247	1	1	0	0	0	0	2
Radiological Safety	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Waste & Decommissioning	62	0	0	0	0	62	0	62	0	0	0	3	0	0	3
<i>Risk Management</i>															
Human Factors	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hazards (internal & external)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Probabilistic Risk Assessment	0	28	0	6	1	0	21	28	0	0	0	0	0	2	2
<i>Plant Engineering</i>															
Control & Instrumentation	40	0	0	0	0	0	40	40	0	0	0	0	1	0	1
Nuclear Systems & Equipment	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Structural Engineering</i>															
Plant Life Management - Civil Engineering	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Plant Life Management- Steel	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Generic</i>															
Support for EU FP7	0	20	0	17	3	0	0	20							
Programme Total	255	499	0	445	28	62	219	754	5	1	3	3	4	4	20
Management Charges								90							
TOTALS								844							

Note 1 ITC = Independent Technical Capability

INTL = International activity.

Note 2 NB = New Build Requesting Parties

Note 3 Includes UK's annual NEA Databank subscription charged to BE. Actual cost to BE will be mostly offset by contributions from NDA and commercial subscribers.

HSE COMMISSIONED NSR PROJECTS 2008-09

Technical area	Project reference	Title	Licensees	Research category
Civil engineering	-	-	-	-
C&I	<i>New Contract</i>	Teleperm XS Reliability	NB	ITC
Coolant chemistry	CC/KT/30 renewal	PWR Primary chemistry	BE	ITC
	CC/KT/29 renewal	Reactor Secondary chemistry	BE/ME	ITC
	CC/1058	Development of New ITC – Coolant Chemistry	BE/ME	ITC
External events (&Fire)	-	-	-	-
Fuel	FC/GNSR/51	OECD Cabri	BE	INTL
	FC/GNSR/56	OECD Studsvik Cladding Integrity Project	BE	INTL
Graphite	GRA/GNSR/4	Microstructure/Property Relationships	BE/ME	ITC
	<i>New Contract</i>	Support for Eng.D Student at Manchester	BE	ITC
Human Factors	-	-	-	-
Nuclear Science	PM/GNSR/17	Membership of NEA Databank	BE	INTL
	NS/GNSR/8	European Group on Reactor Dosimetry	ME	INTL
Nuclear Systems &Equipment	-	-	-	-
Plant Life Management	-	-	-	-
Plant Modelling	<i>New Contract</i>	USNRC CSARP Programme	NB	INTL
	PM/GNSR/18	USNRC Code Maintenance Programme (CAMP) ¹	NB	INTL
	PM/GNSR/19	CAMP code administration ¹	NB	INTL
	PM/GNSR/22	OECD PKL (Primary Circuit)	BE/NB	INTL
	PM/GNSR/25	OECD ROSA (JAERI thermal hydraulics project)	BE/NB	INTL
PSA	PRA/GNSR/25 renewal	OECD ICDE Common Cause Failure Database	BE/ME/NB	INTL
	<i>New Contract</i>	FP7 ASAMPSA LEVEL 2 PSA	BE/NB	INTL
Radiological Safety	-	-	-	-
Radionuclides	-	-	-	-
W&D	<i>New Contract</i>	Graphite Waste Characterisation	NDA	ITC
	<i>New Contract</i>	Dewatering ILW Sludges	NDA	ITC
	<i>New Contract</i>	Encapsulation of Mixed ILW Wastes	NDA	ITC
Various	<i>New Contracts</i>	Funding for Euratom FP 7 bids	BE/ME	INTL

¹ Income from external users is used to offset the levy

LICENSEES' 2008-09 PROGRAMMES OF RESEARCH (£k)
(Excluding project management and HSE Levy charges)

Technical area	BE NRI	BE non NRI	ME Non-NRI(1)
Chemical Processes	1110	289	0
Graphite	1926	2765	0
Fuel & Core	177	732	0
Plant Modelling			
Nuclear Science			
Radiological Safety			
Waste & Decommissioning	101	760	1170
Human Factors	265	110	50
Probabilistic Safety Assessment			
Control & Instrumentation	417	82	0
Nuclear Systems & Equipment (Fuel handling)	0	181	0
Plant Life Management - Civil Eng	190	55	0
Hazards (external & internal)			
Plant Life Management - Steel	2308	1872	0
Generic		795	0
Programme Total	6644	7641	1220

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

Nuclear Research Index

The arrangements for implementing the reactor research programme require both HSE and the reactor licensees to commission research programmes to address safety issues identified by HSE in its Nuclear Research Index (NRI) (reference: www.hse.gov.uk/research/nuclear/index.htm). 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.