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NUCLEAR SAFETY ADVISORY COMMITTEE

REVIEW GROUP 6 (RESEARCH)

22 APRIL 2008

HSE PROGRAMME OF NUCLEAR SAFETY RESEARCH

UPDATE ON 2007/08 PROGRAMME

& PROPOSED PROGRAMME FOR 2008/09

Paper by HSE

INTRODUCTION

1. This paper gives an update on the 2007/08 programme and presents the proposed HSE commissioned part of the programme for 2008/09. It is to inform NuSAC's advice to HSE. In reaching its recommendations to NuSAC regarding the adequacy and balance of the programme, RG6 should consider the totality of the programme as described in the next paragraph and presented by the licensees in subsequent papers, and not just the programme described in this paper. The HSE commissioned part of the programme focuses on international collaboration in research programmes where the nuclear regulator is required to take the lead for the UK and the maintenance of independent technical capability to support ND's regulatory duties. The opportunities for international collaboration and the need to support independent technical capability fall predominantly in the operating reactors part of the programme, although for 2008-09 there are additional plans to develop independent technical capability in the Waste and Decommissioning area.

2. The HSE programme currently comprises:
 - the HSE's Levy funded reactor research programme of Nuclear Research Index (NRI) related nuclear safety research (NSR);
 - work re-charged to the new build requesting parties for participation in international research programmes to support ND's Generic Design Assessment of new build candidate designs;
 - the reactor licensees' programmes of NRI related NSR;
 - the reactor licensees' programmes of non-NRI related NSR;
 - Sellafield licensee research related to the HSE Sellafield (i.e. 'nuclear chemical plant') research strategy
 - Dounreay research related to the HSE Waste and Decommissioning Licensee Research Strategy Statement.

This paper does not cover research undertaken by any of the Requesting Parties related to the assessment of new designs of reactors intended for building in the UK. Details of the licensees' programmes are provided either in the Nuclear Research Schedule (NRS) prepared annually by BE or in the Technical Baseline and underlying Research and Development needs (TBUrd) documents prepared by Magnox Electric, Sellafield and the UKAEA. These documents ensure that the programmes that the licensees intend to commission are made transparent to HSE. Each reactor licensee also declares a programme of non-NRI related research, the content of which depends on the operational needs of the licensees.

3. HSE's objective is to be proportionate and consistent in its approach to the oversight of the nuclear safety research programmes undertaken by all of its Licensees, in exactly the same way as it exercises proportionality and consistency in its regulatory oversight. As part of its strategy to achieve this research objective, HSE is in discussions with the NDA and its existing site licensee companies (SLCs) in order to evolve the current generic arrangements for managing research. Any new SLC that is contracted by the NDA would adopt these arrangements, once agreed.

THE 2007/2008 PROGRAMME

4. The final outcome of the programme will be reported to NuSAC RG6 in the autumn, through evaluation of both the reactor and the NDA SLCs' programmes.

However, HSE reports here that there have been no issues with the HSE levy, BE, Magnox Sellafield and UKAEA programmes which warrant HSE raising them with RG 6.

5. HSE's Assessment Inspectors with responsibilities for the Research Programme have participated in technical exchanges with counterparts in BE, Sellafield and Magnox throughout the year. For UKAEA, the main medium for non-regulatory technical exchanges was through the Nuclear Waste Research Forum (NWRF). The NWRF has also provided an opportunity for research technical exchanges with AWE and MoD on waste and decommissioning research. In parallel with these technical exchanges, ND's research unit interacted regularly with the licensees' programme managers. These exchanges enable HSE to monitor the Licensees' progress with commissioning activities declared in the Nuclear Research Schedules. The outcome of the 2007/08 Programme will be reported to RG 6 in the autumn. However, the current indications are that adequate and balanced outcomes will result from these programmes.

THE 2008/2009 PROGRAMME

Programme Arrangements

6. Table 1 presents the 2008/09 HSE-commissioned component of the HSE Nuclear Safety Research programme by technical area. In a departure from previous years, the scope of the HSE part of the programme will be broadened to cover NDA Decommissioning SLCs (Sellafield, UKAEA and Magnox South) and new build requesting parties as well as generating reactor licensees (British Energy and Magnox North). The costs of programmes applicable only to British Energy and Magnox North will be recovered from the Levy arrangements, the costs of programmes applicable to new build requesting parties will be recovered under the HSE Fees Regulations 2008. The mechanism for cost recovery from NDA SLCs is likely to be through a University Support Programme funded by the NDA.

7. The table shows how HSE will use the planned expenditure of £754K to support sources of independent advice to HSE, international collaboration and where necessary, a unilateral action by HSE to top-up funding for work that the licensees

decline to commission. During 2008-09, HSE plans to develop Independent Technical Capability (ITC) for ND Division 2 by commissioning research into Graphite Waste Characterisation, Dewatering ILW mixed sludges and Encapsulation of Mixed ILW Wastes. HSE will also provide limited funding to support selected UK organisations in establishing partnerships and submitting applications for EU 7th Framework second call funding.

8. In addition to project expenditure HSE expects to spend £90k on management charges for the HSE-Commissioned part of the NSR programme, which will be recovered from the reactor licensees, NDA and New Build Requesting Parties.

9. Table 1 shows that, excluding the funding for EU FP7 participation, 4 of the proposed projects are relevant to New Build only, 4 other projects are relevant to both New Build and BE. One Project is relevant to Magnox North only and 3 to both BE and Magnox North. Costs of participation in the NEA Databank, under the Nuclear Science technical area, will be recovered from Licensees and commercial users on a voluntary basis. This distribution of projects, between licensees and new build requesting parties, is a reflection of the high LWR fault studies content of international activities. International activities represent 66% of the planned programme expenditure and support and development of ITC the remaining 34%. There is currently no expectation that Levy arrangements will be needed to fund any other research not covered in the licensee programmes.

Generating Reactors Research Programme

10. Table 2 summarises the reactor licensees' programmes of activities that address NRI issues. For purposes of compiling this Table, the Magnox Electric research programme was compiled against the 'ND Research Strategy Statement for Decommissioning', which may be found in Section 13 of the 2007 edition of the NRI. The Magnox Electric programme, in common with those of other NDA SLCs, was taken to be non-NRI research for purposes of compiling Table 2. BE's proposed programme has been assessed completely this year, by ND assessors and agents working for ND.

11. As reported last year, a much-improved consensus in Human Factors research needs was achieved. Revision of the NRI to reflect this consensus is now complete.

12. HSE has examined the proposed 2008/09 British Energy programme and has come to the judgement that this programme should deliver a balanced and adequate programme of research that addresses all high priority NRI issues, provides support to the Licensee's Essential Research Capability and includes participation in appropriate international activities.

NDA SLCs Programmes

13. The late arrival of the Magnox Electric, Sellafield and UKAEA TBUrDs means that we have not been able to examine all of the technical areas in these documents in sufficient detail to satisfy ourselves that they are adequate. However, from the sample of issues that our assessors have been able to examine and from research technical exchanges with the licensees, we can extrapolate that on the basis of this limited assessment, each Licensee's programme should be adequate and balanced. Assessment of the Magnox North and South, Sellafield and UKAEA TBUrDs will continue until HSE is able to draw conclusions on the adequacy and balance of each programme.

14. ND Division 2 is also in the process of developing its research management arrangements to identify a clear audit trail from the W&D Research Strategy Statement, through the technical exchanges with Sellafield and UKAEA to the development of each Licensee's TBUrD. These arrangements are expected to facilitate the assessment process for the NDA SLC research programmes.

Observations on the Evolution of the HSE Nuclear Safety Research Programme

15. Table 3 compares the planned Levy and reactor licensees' programmes for 2007/08 with the planned programmes for 2008/09. There is a substantial increase in the size of the programme. This increase reflects not only the increase in the HSE commissioned programme but also a very substantial increase in investment in

nuclear safety research by BE, following the company's intention to take a longer term strategic view of research. Table 4 shows the evolution of the total reactor programme funding level since responsibility was transferred to HSE. It can be seen that, until 2007-08, there was a managed reduction, in line with an agreed strategy that was based upon HSE's acceptance that for British Energy's operating reactors, the technology is mature and therefore in many technical areas research needs could be expected to decline.

16. HSE notes that Magnox reactor research has shifted from plant operation to plant decommissioning. The need for research in this area may need to be reviewed if plans to decommission Magnox plants are delayed.

17. In the course of the year, ND has attended the NDA Research Board, and NDA has attended the regular working level research coordination meetings between ND, BE, ME, BNGSL and UKAEA. ND also has informal nuclear safety research technical exchange arrangements with MoD and defence licensees. Defence licensees are not part of the HSE coordinated programme, although they do share research information with ND and the civil licensees and contribute to technical exchange groups such as the Nuclear Waste Research Forum and the Control and Instrumentation Nuclear Industry Forum.

18. An initiative by the NDA has required their Licensees to produce Technology Baseline and R&D needs (TBURD) documents since 2007/08. These documents are intended to meet both NDA and HSE's requirements in setting out each Licensee's research programme. For Magnox Electric and UKAEA, HSE produced a 'ND Research Strategy Statement for Decommissioning' (Section 13 of the NRI). ND's Research Strategy Statement is essentially an abstract from the Waste and Decommissioning Sections of the 2005 NRI and the Sellafield NCPRA, together with current issues from other sections of these documents that are relevant to making safely cases for waste management and decommissioning operations, such as Human Factors, Control and Instrumentation, Process Technology, PSA & fault studies and radiological protection. Each SLC is required to take account of this information when drawing together research needs in its TBURD document.

19. TBURD documents require more effort on the part of the Licensee than writing Nuclear Research Schedules because the TBURD is intended to identify all of the technology available to a licensee and its degree of readiness for application to waste management and decommissioning activities as well as what R&D the Licensee needs to undertake in order to meet its Lifecycle Baseline. A UK-wide comparison of all the Licensees available technologies and needs may enable a smaller but more focussed R&D programme to be identified; Licensees would not have to invest time and money into developing technologies that other Licensees already have access to. HSE supports this strategy because it means that hazard reduction operations on decommissioning sites may not have to be delayed by the need to develop appropriate technology. As the TBURD process becomes more mature, the effort required from the NDA SLCs in successive years to maintain them should become less.

CONCLUSIONS

20 HSE has monitored the commissioning and progress of research procured by the licensees during the year. As a result of this, HSE satisfied itself that the programme complied with their commitments in their Nuclear Research Schedules and 2007-08 TBuRDs.

21 HSE has examined the proposed 2008/09 British Energy programme and concluded that it is balanced and adequate.

22. The research programmes of Magnox Electric, Sellafield and UKAEA for 2008-09 have been presented in TBURD documents produced for the NDA. Based upon a limited assessment of these documents and technical exchanges with Magnox Electric, BNGSL and UKAEA, HSE concludes that the programmes are likely to be balanced and adequate. However the assessment continues.

23. The HSE commissioned part of the programme will complement the licensees' parts of the programme by supporting participation in international activities and supporting ITC.

24. Good cooperation between British Energy and Magnox Electric on nuclear safety research related to generating stations continued during 2007/08. However, with the closure date of all Magnox stations approaching, HSE continues to work closely with the NDA, through the Nuclear Waste Research Forum (NWRF), to maintain effective collaboration on research between NDA licensees.

ACTION REQUIRED

25. The sub-committee is invited to note and comment on the paper and use it as information on which to base its advice to HSE on the proposed 2008/09 Programme.

TABLE 1 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	27	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			n/k				
Programme Total	255	498	0	445	28	62	219	754	4	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.

TABLE 2 2008/2009 PLANNED REACTOR LICENSEES' PROGRAMMES OF RESEARCH (£k)
(Excluding project management and HSE Levy charges)

Technical area	BE NRI	ME NRI	BE non NRI	ME Non-NRI	Total NRI
Chemical Processes	1110	0	289	0	1110
Graphite	1926	0	2765	0	1926
Fuel & Core	177	0	732	0	177
Plant Modelling					
Nuclear Science					
Radiological Safety					
Waste & Decommissioning	101	0	760	1170	101
Human Factors	265	0	110	50	265
Probabilistic Safety Assessment					
Control & Instrumentation	417	0	82	0	417
Nuclear Systems & Equipment (Fuel handling)	0	0	181	0	0
Plant Life Management - Civil Eng	190	0	55	0	190
Hazards (external & internal)					
Plant Life Management - Steel	2308	0	1872	0	2308
Generic		0	795	0	0
Programme Total	6494	0	7641	1220	6494

TABLE 3 SUMMARY OF PLANNED NRI RELATED 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	26	177	274	628
Plant Modelling	91	174				
Nuclear Science	0	247				
Radiological Safety	0	0				
Waste & Decommissioning	0	62	217	101	217	163
Human Factors	0	0	170	265	263	293
Probabilistic Safety Assessment	93	28				
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	3744	7248
Management Charges	109	90		150	109	240
TOTALS	581	844	3212	6644	3793	7488

Table 4 HSE Co-ordinated Programme of Nuclear Reactor Safety Research 1990 - 2008

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	0.4
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	3.6
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	11.3

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.

TABLE 5 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	?	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	New Contract	Graphite Waste Characterisation	NDA	ITC
	New Contract	Dewatering ILW Sludges	NDA	ITC
	New Contract	Encapsulation of Mixed ILW Wastes	NDA	ITC
Various	New Contracts	Funding for Euratom FP 7 bids	BE/ME	INTL

¹ Income from external users is used to offset the levy