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NUCLEAR SAFETY ADVISORY COMMITTEE**Safety Performance Overview of the Major UK Nuclear Licensees:
Annual update - covering the period 2006/07****A Paper by A W Clarke**
(on behalf of Review Group 1)

INTRODUCTION

1. This is the ninth annual report produced by NuSAC examining the relative performance of the major UK Nuclear Licensees in a range of safety related parameters - this is the seventh year that data from the Defence Licensees are also included. Note that the review is based on data provided by the Licensees (circulated as an Annex alongside this paper) together with information included by Licensees on their web sites. NuSAC would like to thank the Licensees for making their data available to NuSAC and, in particular, Jane Climpson for its compilation.
2. Information about the Imperial College Research Reactors is included for the first time this year. All Licensee data are accompanied by a comprehensive set of notes. NuSAC welcomes the clarification that these provide, particularly in relation to recorded events and enforcement actions.
3. Last year, we included tables to demonstrate trends in those data items which have prompted the most comment from NuSAC over the 10 year period for which data have been provided. These tables have been updated to include the latest data. The tables display trends in industrial safety (RIDDOR and Major Injuries) for Employees and Contractors and Individual and Collective Dose, again for Employees and Contractors. Other items are commented upon by exception.

KEY FEATURES**Civil Licensees**

4. The original data supplied by the Licensees was for the period 1997/98 accompanied by a selection of 1990 data to provide historical context. In each

subsequent review NuSAC has observed that, with some caveats, *“there has been a progressive and substantial improvement in all parameters monitored between 1990 and 1997 which is broadly being maintained”*.

5. Tables 1 and 2 indicate the basis of these observations for industrial safety performance. Table 1 (RIDDOR injury rate per 100,000 hours) shows a significant improvement in performance **for employees** between 1990 and 1997 followed by a plateau that has persisted for nearly a decade. Last year, NuSAC commented that *“Individual companies exhibit performance above, and sometimes significantly better than, the plateau, but none have been able to maintain the level of performance year upon year that characterises “best in class”. The OSHA DACR and TRIR data have not been available for as long, but would show a similar pattern”*. The 2006/2007 data for employees exhibit a similar pattern to recent years; importantly, no Licensee data exhibit significant adverse trends.
6. Table 1 also shows data for **Contractor** performance (but note that some of the data for the early years of the table were stated to be of limited accuracy). Last year NuSAC noted that *“Contractor data was not available for 1990, but, since 1997, appear to display a similar plateau to the employee data for each Licensee.----- ----- It is of concern that the contractor injury rate generally remains worse than that for the corresponding Licensee by a factor two to three.”* NuSAC is pleased to note that the 2006/2007 data show improvements compared with previous years for every Nuclear Site Licensee listed. Some of the Contractor injury rates quoted (e.g. Sellafield RIDDOR injuries, Sellafield OSHA TRIR, UKAEA RIDDOR injuries) are about a factor 2 worse than the corresponding employee data, However taken over all Licensees, the improvement is sufficiently marked that contractor injury rates are, for the first time, indistinguishable from the population of employee injury rates. NuSAC will continue to interact with Licensees and NDA to understand what is being done to maintain and further improve performance in this very important area.
7. Last year NuSAC observed that *“Table 2 (RIDDOR reportable major injuries) shows a less satisfactory picture overall. It is not appropriate to compare absolute numbers among Licensees, because the number of people varies. But overall, it is not obvious that there has been any sustained improvement in this statistic since 1990. Unlike the RIDDOR injury rate, there is no obvious difference between Employee and Contractor data.”* NuSAC is pleased to note therefore that for 2006/2007, the number of RIDDOR reportable major injuries (11 cf 19 in the previous year) is the lowest recorded since the data have been collected.
8. Tables 3, 4 and 5 display trends in worker dose for employees and contractors. All Licensees show a substantial reduction in cumulative, average and maximum doses since 1990, reflecting improvements in working practices and the introduction of more modern plant and equipment. Compared with 2005/2006, some sites display increases in cumulative dose and in the number of employees and contractors receiving doses above 5mSv. This is not surprising in the light of the increased focus on hazard removal (or in

British Energy's case, the need for increased internal inspection and repair work). All doses are well within statutory limits, but there is also a legal requirement that they shall be ALARP. The raw data do not provide a basis for making a judgement about that. NuSAC members discuss dose management practices when they visit sites and with NDA and NII. The results of these discussions will form the basis of a separate report in due course.

9. NuSAC is pleased to note that (with one exception noted below) all Licensee (or Parent Company) web-sites contained their most recent health and safety information. This is in a variety of forms. Several Licensees now produce an annual Corporate Social Responsibility Report which gives information about achievement against plans for a range of parameters including health and safety. NuSAC is pleased to note that Licensees continue to participate in recognised safety award schemes (e.g. ROSPA, ISRS) and continue to compete successfully for the top awards in their category.
10. In previous years, Members have commented on the importance of good Occupational Health programmes and NuSAC review groups have received information about these when discussing specific topics with Licensees. Compared with previous years, Licensees appear to include very little, if any, information on occupational health programmes and absence rates on their web sites. However, NuSAC is pleased to note that NDA collects and publishes Licensee absence rates on a site by site basis on their web-site and have discerned no overall trends so far.

Defence Nuclear Licensees

11. Tables 6 and 7 indicate trends in industrial safety performance (cf tables 1 and 2 for the Civil Nuclear Licensees). Last year NuSAC noted that "*Table 6 displays an improving RIDDOR injury trend in recent years with the best sites indistinguishable from the Civil Licensee population. NuSAC encourages the Defence Licensed sites to continue to share best practices and to seek progressive improvement in performance. This comment also applies to RIDDOR major injuries displayed in Table 7. As for the Civil Licensees, no overall trends in this parameter are evident over the period covered by the data.*" This year, it is difficult to make any general comments about injury rates across the Defence Sites as a whole. It is encouraging to note continued improvement at 2 of the sites employing the largest workforces (AWE and Devonport Royal Dockyard Ltd) and that the AWE employee injury rates are comparable with the best of the Civil Licensee Sites. However, this improvement is not evident at some of the other Defence Sites, some of which also employ significant numbers of people. Further comment is given in paragraph 19 below.
12. Performance on dose management remains particularly noteworthy with no employee or contractor receiving a dose of greater than 5mSv). Trends (or lack of them) in this parameter are displayed in table 8. Data for collective and average individual dose are not displayed for the Defence Nuclear

Licensees since they simply show universally low values throughout the period.

INES Events and Regulatory Enforcement

13. This is the seventh year that data on the INES scale has been included for Civil Nuclear Licensees and the sixth report including these data for the Defence Nuclear Licensees. Members are reminded that INES level 1 is "an anomaly beyond the authorised operating regime". INES level 2 is "an incident for example involving (modest) overexposure of a site worker or significant failures of safety provisions". INES level 3 is "a serious incident for example involving a very small public exposure, severe spread of contamination or a near accident with no defensive layers remaining"
14. The number of INES 1 events reported by the former BNFL Companies is 9 compared with 12 last year and 13 the previous year. NuSAC is pleased to note that NDA is also monitoring some lower level nuclear safety indicators provided by their Licensees which may give advance warning of any adverse trends in INES 1 (or higher) rated events
15. The British Energy number of INES 1 events reported (44) is a substantial reduction on the numbers (range 72-82) recorded in the three previous years. As indicated in last year's report, the absolute numbers should not be compared with other Licensee figures.
16. No trends are apparent in the number of events reported at level 1 at the Defence Sites which remain small. However, it is noted that one event classified at level 2 is recorded for Devonport Royal Dockyards Ltd which is said to involve safety culture issues.
17. NuSAC notes that prosecutions were deemed necessary at two Nuclear Licensed Sites during the year. Sellafield Ltd were prosecuted in respect of the leak of product dissolver liquor within Thorp in 2005. NuSAC has subsequently been fully briefed on this event and the remedial actions taken. UKAEA was fined after pleading guilty to four charges brought by SEPA about the unauthorised disposal of radioactive waste at Dounreay between 1963 and 1984.
18. The number of Enforcement Notices at Civil Nuclear Licensee Sites in 2006/2007 was 9 compared to 7 last year and 19 in 2004/05. At the Defence Nuclear Licensed Sites, 2 enforcement notices were issued, both at Devonport.

SOME DETAILED ITEMS

19. The following additional items from the 2006/07 data are drawn to Member's attention:
 - Improvements previously noted in the British Energy statistics have continued. Of particular note are the RIDDOR injury rates and numbers of

RIDDOR major injuries to Contractors' staff, unplanned reactor trip rates and numbers of INES level 1 events;

- Collective and maximum doses accrued by British Energy workers and Contractors' staff are higher than in recent years although well below statutory limits. NuSAC members have been briefed during the year on the inspection work undertaken of the boiler tubes at Hinkley Point B and Hunterston B and the Sizewell B Reactor pressure Vessel Head (and control rod guide tubes) change which have given rise to these increases in dose commitment;
- Last year, NuSAC observed that "*the number of RIDDOR major injuries for UKAEA is the highest recorded by the Company since at least 1997.*" This parameter has recovered in 2006/2007 to historic low values. In addition, the RIDDOR injury rate for Contractors' staff is the lowest recorded;
- Springfields Fuels Ltd recorded no injuries to Contractors' staff for the second year running;
- RIDDOR major injury rates for contractors working at Sellafield are at least a factor 4 worse than for any other Civil Nuclear Licensee and are about 6 times worse than the corresponding employee rate;
- The recovery noted last year in the GE Healthcare industrial safety data has been maintained but the RIDDOR injury rate remains the highest of the Civil Nuclear Licensees and a factor 2 higher than GE Healthcare's own best result achieved in 2002/2003. As noted last year, the Health and Safety performance data on the Parent Company web-site gives very little U.K. specific information;
- It is encouraging to note that the improving trend in RIDDOR injuries (for employees and Contractors' staff) at AWE has been maintained for the third successive year. It is noted, however, that some of the Contractor injury rates given are considerably inferior to the corresponding Contractor rates at any Civil Licence site. It is also noted that information on the company web-site was not up to date as of mid December 2007 (The latest Annual Report was for 2005/2006; the latest monthly assurance report was for April 2007);
- It is encouraging to note that the improving trend in RIDDOR injuries for employees at Devonport Royal Dockyard Ltd has been maintained for the third successive year. NuSAC encourages the Company to continue its efforts to further reduce RIDDOR injury rates and RIDDOR major injuries towards the levels now achieved by AWE and all of the Civil Nuclear Licensees;
- It is noted that injury rates for employees at the Dockyard Sites are, at present, a factor 6-11 inferior to the best of the Defence Sites (AWE)

- In 2004, NuSAC received a report from Rolls Royce Marine Power explaining the steps being taken to recover from the worsening RIDDOR injury rates recorded in 2001/02 and 2002/03. Regrettably, the 2006/2007 RIDDOR injury rate is a factor 3 worse than the performance achieved in the 3 previous years.

CONCLUSIONS

20. The major observations from the most recent set of data for the Civil Nuclear Licensees are:
- All Licensees have maintained their industrial injury rates at, or close to, their best values achieved in recent years. The improvement this year in injury rates to Contractors' staff is particularly noteworthy and encouraging;
 - Doses to employees and contractors remain well within statutory limits at all sites. Increases in collective and maximum doses are apparent at some sites and it is understood that this is due to the increased amount of work required to be undertaken in higher radiation fields.
21. The major observations from the most recent set of data for the Defence Nuclear Licensees are:
- Performance on dose management continues to show good results with no employee or contractor experiencing an individual dose in excess of 5mSv;
 - With the exception of RIDDOR major injuries, the non radiological parameters show a generally improving trend with the best site indistinguishable from the population of Civil Nuclear Licensees. The industrial injury rates for Employees at the Dockyard Sites are a factor 6-11 inferior to the best Defence Site (AWE)

RECOMMENDATIONS

- 1) **NuSAC should continue to seek information from the Defence Nuclear Licensees on the steps they are taking to secure further improvements in industrial safety performance;**
- 2) **NuSAC should continue to seek assurance from Licensees and NDA that accrued worker doses remain ALARP;**

- 3) **NuSAC should undertake a further review of Licensees data next year.**

A W Clarke

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Table 1: Civil Nuclear Licensees - RIDDOR Injury Trends per 100,000 hours

	Urenco (Capenhurst)		BNFL UK(1)		Sellafield Ltd		Magnox Electric Ltd		Springfields Fuels Ltd		UKAEA E C		British Energy Gen		G E Healthcare		Imperial College
	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E		
06/07	0				0.11	0.20	0.08	0.03	0.17	0	0.09	0.19	0.13	0.10	0.25	-	0
05/06	0.15	-			0.08	0.26	0.04	0.08	0.14	0	0.14	0.33	0.09	0.32	0.26	-	
04/05	0.65				0.10	0.16	0.14	0.22	0.03	0.40	0.21	0.29	0.11	0.23	0.58	-	
03/04			0.06	0.22							0.02	0.28	0.23	0.32	0.37	-	
02/03			0.14	-							0.23	0.26	0.19	0.33	0.13	-	
01/02			0.13	-							0.27	0.26	0.25	0.41	0.28	-	
00/01			0.14	-							0.14	0.8	0.22	0.35	0.26	-	
99/00			0.16	0.45							0.12	0.8	0.29	-	0.25	-	
98/99			0.18	0.25			0.32	0.16			0.10	0.6	0.26	-	0.24	-	
97/98			0.20	0.15			0.29	-			0.21	0.9	0.19	-	0.37	-	
1990			1.0	0.59			0.59				0.35	-	0.59	-	0.41	-	

(1) BNFL includes BNG SL and Springfield Fuels up to 2003/04 and Magnox Electric from 2000 to 2003/04

Table 2: Civil Nuclear Licensees - RIDDOR Major Injury Trends

	Urenco (Capenhurst)		BNFL UK(1)		Sellafield Ltd		Magnox Electric Ltd		Springfields Fuels Ltd		UKAEA E C		British Energy Gen		G E Healthcare		Imperial College
	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E
06/07	0	-			2	4	0	0	1	0	1	1	1	1	0	-	0
05/06	1	-			1	3	1	1	0	0	4	2	2	4	0	-	
04/05	0				5	3	4	2	1	0	0	1	1	2	1	-	
03/04			1	4							0	1	4	4	0	-	
02/03			7	-							2	0	3	4	0	-	
01/02			2	-							1	2	2	4	0	-	
00/01			5	-							0	3	4	6	0	-	
99/00			10	6							2	2	5	6	2	-	
98/99			9	4			2	3			1	1	2	3	1	-	
97/98			8	1			1	-			1	2	1	1	3	-	
1990			12	-			2	-			3	-	Inc in Magnox		2	-	

Table 3: Civil Nuclear Licensees - Collective Dose (Sv) Trends

	Urenco (Capenhurst)		BNFL UK(1)		Sellafield Ltd		Magnox Electric Ltd		Springfields Fuels Ltd		UKAEA E C		British Energy Gen		G E Healthcare		Imperial College
	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E
06/07	0.13	0.04			8.3	3.1	0.4	0.9	1.2	0.1	0.2	0.6	0.6	2.0	0.7	-	0.00
05/06	0.07	0.03			6.7	3.7	0.6	0.7	1.2	0.2	0.2	0.6	0.3	0.8	0.7	-	
04/05	0.1				6.0	3.2	0.6	0.5	1.0	0.1	0.2	0.6	0.3	0.1	0.6	-	
03/04			9.4	3.5							0.2	0.6	0.4	1.0	0.7	-	
02/03			10.7	3.4							0.2	0.7	0.5	1.2	0.8	-	
01/02			11.9	4.6							0.2	0.5	0.6	1.2	0.8	-	
00/01			10.4	4.1							0.1	0.5	0.8	1.8	0.9	-	
99/00			11.9	5.0							0.1	-	1.1	1.8	1.1	-	
98/99			11.9	3.7			1.6	1.5			0.2	0.7	0.9	0.6	1.2	-	
97/98			13.5	3.9			1.9	1.4			0.4	0.9	1.0	1.4	1.1	-	
1990			33.8	6.8			8.7	2.5			4.0	0.4	Inc in Magnox		3.3	-	

(1) BNFL includes BNG SL and Springfield Fuels up to 2003/04 and Magnox Electric from 2000 to 2003/04

Table 4: Civil Nuclear Licensees - Average Dose (mSv) Trends

	Urenco (Capenhurst)		BNFL UK(1)		Sellafield Ltd		Magnox Electric Ltd		Springfields Fuels Ltd		UKAEA		British Energy Gen		G E Healthcare		Imperial College
	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E
06/07	0.4	0.4			0.95	1.0	0.1	0.1	0.8	0.4	0.1	0.2	0.1	0.2	0.8	-	0.2
05/06	0.2	0.2			0.8	1.1	0.1	0.1	0.8	0.4	0.1	0.2	0.1	0.1	0.7	-	
04/05	0.3	-			0.7	0.8	0.2	0.1	0.7	0.3	0.1	0.2	0.1	<0.1	0.6	-	
03/04			0.7	0.5							0.1	0.2	0.1	0.1	0.7	-	
02/03			0.8	0.5							0.1	0.2	0.1	0.2	0.7	-	
01/02			0.9	0.5							0.1	0.1	0.2	0.2	0.7	-	
00/01			0.8	0.4							0.1	0.2	0.2	0.2	0.8	-	
99/00			1.0	0.5							0.1	-	0.4	0.3	0.9	-	
98/99			1.3	1.0			0.5	0.2			0.1	0.2	0.2	0.1	1.1	-	
97/98			1.4	1.0			0.6	0.2			0.2	0.3	0.2	0.2	0.9	-	
1990			3.1	1.1			0.6	0.2			1.2	0.3	Inc in Magnox		2.4	-	

(1) BNFL includes BNG SL and Springfield Fuels up to 2003/04 and Magnox Electric from 2000 to 2003/04

Table 5: Civil Nuclear Licensees- Maximum Dose (numbers in excess of 5 mSv) Trends (2)

	Urenco (Capenhurst)		BNFL UK(1)		Sellafield Ltd		Magnox Electric Ltd		Springfields Fuels Ltd		UKAEA		British Energy Gen		G E Healthcare		Imperial College
	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E
06/07	0	0			75	122	0	20	1	0	0	17	23	203	16	-	0
05/06	0	0			97	171	0	0	4	0	0	0	4	45	16	-	
04/05	0	-			75	106	0	3	1	0	0	4	0	0	18	-	
03/04			134	87							1	12	3	29	23	-	
02/03			218	74							0	5	4	58	25	-	
01/02			326	163							0	0	3	110	25	-	
00/01			336	113							0	8	7	85	32	-	
99/00			547	230							0	-	22	41	45	-	
98/99			634	222			19	9			0	10	0	1	72	-	
97/98			654	124			27	36			1	21	8	48	67	-	
1990			2436	175			162	51			154	-	Inc in Magnox		217	-	

(1) BNFL includes BNG SL and Springfield Fuels up to 2003/04 and Magnox Electric from 2000 to 2003/04

(2) No person exceeded the legal maximum (now 20mSv pa.).

Table 6: Defence Nuclear Licensees- RIDDOR Injury Trends per 100,000 hours

	AWE		BAE Systems		Rolls Royce Marine power		Vulcan NRTE		HMNB Clyde		Devonport Royal Dockyard Ltd		HMNB Devonport		Babcock	
	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C
06/07	0.07	0.26	0.51	-	0.46	0	0.21	1.36	0.52	-	0.48	-	0.4	0.15	0.79	0
05/06	0.13	0.35	0.41	-	0.17	-	0.32	-	0.45	-	0.59	-	0.05	-	0.57	-
04/05	0.20	0.52	0.55	-	0.15	-	0	0			0.69	-			1.06	1.42
03/04	0.41	0.79	2	-	0.11	-	0.2	-			0.90	-			1.0	0.7
02/03	0.39	0.42	1.02	-	0.58	-	1	-			0.54	-			0.89	-
01/02	0.16	0.47			0.55	-	0				0.79	-				
00/01	0.36	-			0.12						1.32	-				

Table 7: Defence Nuclear Licensees- RIDDOR Major Injury Trends

	AWE		BAE Systems		Rolls Royce Marine power		Vulcan NRTE		HMNB Clyde		Devonport Royal Dockyard Ltd		HMNB Devonport		Babcock	
	E	C	E	C	E	C	E	C	E	C	E	C	E	C	E	C
06/07	2	0	1	-	2	0	0	0	3	-	10	-	2	0	0	0
05/06	3	0	2	0	2	-	0	0	2	-	14	-	0	0	1	1
04/05	3	2	4	-	0	-	0	0			8	-			8	3
03/04	4	8	1	-	0	-	0	-			15	-			3	2
02/03	3	1	2	-	0	-	0	-			8	-			0	0
01/02	2	1			0	-	0	-			6	-				
00/01	5	2			1	-					6					

Table 8: Defence Nuclear Licensees- Maximum Dose (Numbers above 5 mSv) Trends

	AWE		BAE Systems		Rolls Royce Marine power		Vulcan NRTE		HMNB Clyde		Devonport Royal Dockyard Ltd		HMNB Devonport		Babcock	
	E	C	E	C	E	C	E	C	E	C	E	C	E	C		
06/07	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	
05/06	0	0	0	0	0	0	0	0	0	0	0	0	-	0	0	
04/05	0	0	0	0	0	0	0	0			0	0		0	0	
03/04	0	0	0	-	0	-	0	-			1	0		0	0	
02/03	0	0	1	-	0	-	0	-			0	0		0	0	
01/02	0	0	0	-	0	-	0	-			0	0		10	17	
00/01	0	0	0	-	0	-	0	-			0	0		20	-	