Defence Board (09)33

01 Jul 09

DEFENCE NUCLEAR PROGRAMME HUMAN RESOURCE STUDY
A PAPER CO-SPONSORED BY 1SL AND CSA

ISSUE

1. **XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX**

RECOMMENDATIONS

2. The Defence Board should **note**:

   a. **Paragraph redacted in full.**

   b. **Paragraph redacted in full.**

   c. That the resurgent civil nuclear power programme poses a major threat to the RN and MoD's nuclear expertise and will do so for the next 10-15 years.

   d. **Paragraph redacted in full.**

3. The Defence Board should **agree:**

   a. **Paragraph redacted in full.**

   b. **Paragraph redacted in full.**

   c. The dialogue across government and with academia developed during the Study should be maintained to ensure our approach remains coherent (CSA).

   d. Four key initiatives to improve HR collaboration across the Defence SM Enterprise[1] should be pursued: nuclear skills mapping (already underway); a more ambitious exchange programme (CDM); the creation of a joint DNP careers 'road show'; **XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX**.

   e. **Paragraph redacted in full.**

   f. Following the Maritime Change Programme (MCP) decision to bring forward the single SM operating base by 6 years, personnel and training infrastructure issues at Faslane must be resolved as a matter of priority (1SL/CDM).

4. These recommendations are tabulated in more detail at Annex A.

[1] MOD, AWE and the Tier 1 SM contractors – BAE Systems, Babcock Marine and Rolls Royce.

TIMING

5. Priority. For discussion at the Defence Board on 9 Jul 09.

BACKGROUND

Context

6. The Government's decision in 2006[2] to maintain an independent nuclear deterrent for the foreseeable future and to build a further generation of SSBNs, committed the UK to a nuclear programme for at least 50 years. This includes the ability to design, build, operate, maintain and decommission nuclear powered submarines (SSNs and SSBNs) and nuclear warheads. It also includes support to the Strategic Weapon System (SWS) currently based on the US Trident D5 ballistic missile. The DNP is the most complex and resource intensive programme delivered by Defence. Given that it provides the UK's nuclear deterrent, it also has the highest strategic and political significance.

7. **Paragraph redacted in full.**

Study Approach

8. **Scope**. The Study covered 5 broad but inter-related areas: engagement across government; MoD Civil Service nuclear expertise; RN SM manning issues; HR collaboration with industry; and consultation with **XXXXXXXXXXXX**. This report provides an overview of these issues, with more detail available at the Annexes and Enclosures.

9. **Independent Evidence**. In order to validate preliminary findings from early stakeholder engagement and to provide independent evidence, the Study commissioned the DITC[3] from DCDS(Pers)'s staff to conduct an attitudinal survey among MoD Civilian staff involved with the DNP and within the RN SM service. Their report is attached at Enclosure 2.

10. **Consultation**. The Study engaged extensively and at high level across Defence, with Other Government Departments (OGDs), Non-Departmental Public Bodies, Academia, the Civil and Defence nuclear related industrial sector and with our **XXXXXXX XXXXXXXXXXXXXXXXXXXXXXXX**. A full list of stakeholder engagement and senior consultation is at Annex B. The Study also routinely sought advice from Sir Keith O'Nions who has formally endorsed the findings of this report at Enclosure 3.

ENGAGEMENT ACROSS GOVERNMENT

11. The Study consulted widely across government to understand the relevant initiatives and to map the architecture of the national nuclear skills and education base. Significant steps have been taken by the Government to facilitate remediation of the situation following two decades of neglect. The Study confirmed that Defence is now properly engaged with the relevant organisations, particularly with the Office of Nuclear Development within the Department of Energy and Climate Change (DECC). Further details are at Annex C.

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[2] CM 6994 (White Paper) Dec 06.

[3] The Directorate of Individual Training Capability (DITC) is an independent tri-Service organisation who are expert in establishing ground truth through carefully constructed face-to-face interviews among a wide cross-section of personnel.

12. **Scale**. The resurgent civil nuclear power programme is burgeoning: it is a huge, global and commercial market that is recruiting aggressively. As international opinion has converged on the need to reduce carbon emissions, increase security of supply and stability of price, so international enthusiasm for nuclear energy has re-ignited. Worldwide, the number of new reactors under construction, on order or proposed has grown by 50% in the last two years and continues to rise[4]. Government proposals[5] for new nuclear power in the UK envisage an initial build of up to 11 new plants between 2014 and 2025 with almost certainly more to follow. New build aside, increased demand for nuclear expertise of equal magnitude arises from the need to decommission the first generation reactors, the reprocessing requirement and deep geological disposal of the huge and as yet unaddressed stockpile of nuclear waste.

13. **Skills Shortage**. The current stock of civil NSQEP is in increasingly short supply nationally and internationally, is largely middle-aged and many are due to retire over the next 10 years. The UK's education base is responding rapidly but it will take over a decade to develop NSQEP in the numbers required due to the time needed to acquire the necessary qualifications and experience. A significant skills shortage is developing across the full spectrum of nuclear-related business and will remain until the market and education base can respond fully. There is already a significant shortage in general engineering skills in the UK, which will become most acute from 2015 – 2025[6]. The problem will affect the power industry as a whole and the nuclear sector in particular. In the longer term, however, as the situation stabilises into steady state, the developments in the education and skills base will be good for Defence. Further analysis on the civil nuclear sector is at Annex D.

14. **Market Forces**. Unlike previous nuclear power builds in the UK, with the exception of regulation and decommissioning, all aspects of the resurgent programme (energy utilities, reactor vendors and operators) have been transferred from state ownership into the commercial sector. This, combined with the global nature of the business, significantly increases Defence's exposure to market forces beyond government control. In the short term, there is little that can be done about the market realities but it is fundamental to recognise there will be intense competition for nuclear expertise while the shortage prevails and we need to act to protect our interests. While the recession has resulted in buoyant recruiting and retention for the Armed Forces generally, the same does not apply with regard to the nuclear skills issue. There is widespread consensus that the resurgent civil nuclear sector is unlikely to be affected by the recession, which presents Defence with two challenges: first, how to recruit sufficient graduates from the education base to sustain our expertise; and second how to retain the expertise we already have.

15. **Recruiting**. Defence is fortunate in that the number of graduates it needs to recruit into the RN and MoD NSQEP pools is relatively small. We also have a competitive and expanding graduate entry programme – the Defence Technical Officer Engineering Entry

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[4] As at Jun 09, 436 nuclear reactors are currently in operation, 45 are under construction, 131 are on order and being planned and firm proposals exist for a further 282 – www.world-nuclear.org/info/reactors.html

[5] BERR (2008) 'Meeting the Energy Challenge: A White Paper on Nuclear Power' p10.

[6] House of Commons Innovation, Universities, Science and Skills Committee Fourth Report of Session 2008-09 dated 18 Mar 09, p14.

Scheme[7] (DTOEES). This successful quad-Service scheme started in 2002 and is forecast to continue growing before reaching a steady state of 590 students by 2011. Nevertheless, in view of the increased competition, we need to be more aggressive about our recruiting. Considerable benefit could be derived from developing a Defence Nuclear Programme careers 'road show' in which the RN, MoD and SM Enterprise partners would collectively advertise in universities the very wide range of exciting career opportunities available. In so doing, we should endeavour to replicate the highly successful US practice of establishing strong relationships with the key department heads in the universities that really matter, encouraging them to talent spot on our behalf. There is universal agreement about this concept, which should be pursued under joint RN/DESG leadership. Further details are at Annex F.

16. **Paragraph redacted in full.**

MoD CIVIL SERVICE NSQEP

17. **Paragraph redacted in full.**

18. **Way Forward**. As a result of the meeting, the Personnel Director (DG HR&CS) authorised a number of actions at Enclosure 4. The key elements were: to treat the NSQEP pool across all TLBs as a single cohort for career and talent management purposes, under DSM's direction; to establish a dedicated career management HR cell; to conduct a review of remuneration, including the requirement for a Market Skills Supplement; and to investigate a margin for exchanges/secondments in order to develop the deep expertise needed for succession planning[8]. This work has now been formalised into a change programme that was initiated in May 09 and will need to be implemented at the earliest opportunity. The new measures will be applied to the NSQEP pool as a pilot but the intention is to extend them to the broader SM SQEP population, following investigation[9]. The SM SQEP skill sets are equally important to delivering the DNP but similarly attractive to the civil power generation industry. Further details are at Enclosure 5.

RN SUBMARINE MANPOWER

19. **Paragraph redacted in full.**

20. **Paragraph redacted in full.**

21. **Paragraph redacted in full.**

22. **Other Issues**. There are two other issues that must also be addressed to ensure that the quality of life for our submariners is improved in the longer term. First, SSBN(F) design considerations must take very careful account of the standards of accommodation and R&R facilities – we must not repeat the retrograde step made with the Astute class SSN, where the sailors will have less mess-deck space than in HMS Valiant built 45 years ago. Second, following the MCP decision to move to a single SM operating base 6 years early (in 2017), personnel and training infrastructure issues need to be addressed

[7] DTOEES comprises Welbeck and the Defence Technical Undergraduate Scheme (DTUS).

[8] About 15 to 20 civil servants (tbc) for HR cell and margin uplift.

[9] Whereas the NSQEP pool is an easily defined cohort, the boundaries of the SM SQEP pool are more diffuse and need to be more accurately defined.

as a matter of priority, particularly given the unpopularity of this move with many of the submariners interviewed in the DITC survey. Further detail on RN issues is at Annex E.

NUCLEAR SAFETY

23. **Paragraph redacted in full.**

COLLABORATION WITH INDUSTRY

24. Whilst commercial sensitivities, security and nationality issues constrain opportunities for cooperation with the globalised commercial sector, significant potential exists to improve HR collaboration within the SM Enterprise. Several work strands have been now been initiated. These include a mechanism to map and review the skills requirement across the Enterprise out to 2025 and developing a more ambitious and better managed secondment and exchange programme. There is also agreement on the need to establish a combined DNP careers ‘road show’ as outlined in paragraph 15. **XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXX**. **XXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXX**. **XXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXX**.

XXXXXXXXXXXXX

25. **Paragraph redacted in full.**

26. **Paragraph redacted in full.**

IMPLEMENTATION

27. Two members of the study team will remain in post until Dec 09 to ensure that the momentum of the initiatives already underway is maintained and to initiate those that have yet to be endorsed; thereafter the DNEB should coordinate implementation. Given the importance of this issue, DOC should audit the progress of this work in July 2010, reporting directly to the Defence Board.

FINANCIAL IMPLICATIONS

28. Inevitably, there are financial implications to implementing the recommendations in this paper and given the very challenging resource position facing the Department, it is recognised that the Defence Board would wish to see these minimised. **XXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX**. The costs are primarily driven by modest uplifts in RN and Civil Service manpower (paragraphs 18 and 21). The costs for a possible **XXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXX** have yet to be determined. Greater HR collaboration with the SM Enterprise partners for a joint graduate recruiting programme **XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX** should

be cost neutral and may even present opportunities for savings. More work will be needed on the future training/personnel infrastructure requirements for Faslane as the single operating base, but a key element of this (nuclear training at HMS SULTAN) is due to move anyway under DTR and should therefore be cost neutral. The financial implications of improved SM shore support will depend on the outcome of the review.

CONCLUSION

29. **Paragraph redacted in full.**

30. The DB is invited to endorse the recommendations of this report.

Annexes:

A. Detailed Recommendations table.
B. Stakeholder Engagement.
C. MOD Engagement with OGDs.
D. Civil Nuclear Power – **XXXXXXXXXXXXXXXXXX**
E. RN SM Manning Issues
F. Opportunities for Collaboration with Industry.
G. **XXXXXXXXXXXXXXXXXXXXXXXXXXX**
H. Glossary.

Enclosures:

1. D/DNP HRS/1-01 dated 30 Oct 08 – Study Terms of Reference.
2. D/DITC 400/404 dated 27 Mar 09 – Attitudinal Survey.
3. Letter of Endorsement from Sir Keith O'Nions dated 25 Jun 09.
4. D/DGHRCS/1/3/11 dated 23 Mar 09.
5. D/DCP/2/1/1 dated 17 Jun 09 – DNP Civilian Human Resources.
6. Delivering Sustainable SM Manning – A Plan for Action dated 5 Jun 09.
7. DNSC Annual Report 2008 – Executive Summary.

ANNEX A TO
DEFENCE BOARD (09)33
DATED 01 JUL 09

DEFENCE NUCLEAR PROGRAMME HR STUDY – DETAILED RECOMMENDATIONS TABLE

Srl	Recommendation		Lead	Date	Remarks
(a)	(b)		(c)	(d)	(e)
1	Implement measures to stabilise, safeguard and develop the MoD's pool of Civil Service NSQEP and SMSQEP:		CDM/ 2PUS		
	1.1	All NSQEP are to be treated as a single cohort for purposes of career and talent management, regardless of the TLB they are employed in, under the single ownership of DSM supported by the DE&S Business Partner, DHR.	DSM	Completed	
	1.2	An HR cell, sufficient to manage up to 1200 staff, is to be established at DE&S to undertake the career and talent management function for the NSQEP pool with particular emphasis on C grade staff.	DHR	Implement by Oct 09	DSM / DHR / industry virtual team in place
	1.3	The boundaries of the SMSQEP pool are to be defined more accurately. Once complete, and if appropriate, SMSQEP are to be career managed in the same way as NSQEP.	DSM/ DHR	Complete by Dec 09	
	1.4	DHR is to write formally to DG HR&CS requesting authority for the delegations currently available to DE&S to be applied to NSQEP in other TLBs.	DHR	Completed	Review annually
	1.5	A paper is to be developed centrally and provided to DE&S, summarising all the levers available within current HR policies that could be used to safeguard the NSQEP pool.	DGCP	Completed	
	1.6	A DNP careers 'road-show' is to be established in collaboration with the SM Enterprise partners, under RN/DESG leadership.	DESG	Implement by Jun 10	Link with 2.1.b (FOSNNI)
	1.7	**XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX**	XXXXXX XXXXXX	XXXXXXXXXX XXXXXXXXXX	XXXXXXXXXXX XXXXXXXXXXX

(a)	(b)		(c)	(d)	(e)
1 cont'd	1.8	A more ambitious secondments and exchange programme is to be developed, building on the provisional assessment completed within the DNP HR Study, in order to facilitate professional development and the acquisition of specialist skills. The work is to include a business case for a margin, to enable the programme to be implemented.	DSM/ DHR	Implement by Jun 10	Review annually
	1.9	The Nuclear Skills mapping work completed within the DNP HR Study is to be developed and reviewed annually in order to: - Maintain the integrity of the nuclear skills requirement over time. - Improve definition of the essential niche skill requirements at sub-contractor level. - Inform forecasting recruiting requirements and secondments/exchanges.	DSM	First iteration completed Jun 09	Review annually
2	Implement the NAVB Personnel Change Programme '*Delivering Sustainable Submarine Manning*':		1SL		
	2.1	Submarine Recruiting, Training & Pipeline Management:			
		a. Enhance recruiting and training effort for submarine Warfare, Marine Engineer, and Weapon Engineer officers in order to achieve full GTS by 2011/12.	FOSNNI	Complete by Apr 10	Review annually CNR
		b. Introduce a Defence Nuclear Programme recruiting road-show in collaboration with the SM Enterprise partners, under RN/DESG leadership.	FOSNNI	Complete by Jun 10	Link with 1.6 CNR
		c. **XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX.**	**XXXXXX**	**XXXXXXX**	**XXXXXXXXXXXX XXXXXX XXXXX**
		d. Investigate feasibility of using non-traditional training facilities to fill any significant training gaps.	FOST	Ongoing	Review Annually ACOS(T)/D(N)
		e. Introduce "Fast Track" Scheme for MESM/WESM Engineer Technicians in order to accelerate pull-through of trainees to Cat C/B/A nuclear watchkeepers and SWS LETs.	NAVSEC	Complete by Apr 10	NPT(E) TL
		f. XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX.	**XXXXXX**	**XXXXXXX**	**XXXXXXXXXXXX XXXXXXXXXX**

(a)	(b)		(c)	(d)	(e)
2 cont'd	2.2	Skills Retention and Future Sustainability:			
		a. Recommend to AFPRB a remuneration scheme for nuclear-skilled engineers (officers and ratings), **XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX**, Engineering Technician Job Realignment, the greater proportion of personnel serving on extended careers, extant FRIs and nuclear related bonuses.	NAVSEC	Complete by Dec 09	NPT(E) TL
		b. Develop revised terms and conditions of service for senior Engineering Technicians and Engineer Officers who are routinely offered extended careers, or whose career management needs a novel or constraining approach.	NAVSEC	Complete by Dec 10	NPT(E) TL
		c. XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	**XXXXXX**	**XXXXXXXXX**	**XXXXXXXXX**
		d. Work across TLB boundaries, and particularly in support of COMFLEET, to address the elements of shore support and onerous routines that make time alongside even more demanding than at sea. In particular:	DSM	Review by Dec 09	Link to 4
		1) Improve flexibility and effectiveness of support alongside.	DSM	Review by Dec 09	NBC(D)/NBC(C)/ Hd ISM
		2) Improve Stores Availability.	DSM/ D Ships	Review by Dec 09	Review Annually PT TLs
		3) Improve telephone and intranet connectivity when alongside.	DSM	Complete by Apr 10	PT TLs
		4) Improve JPA access at sea and alongside.	COS CAP	Complete by Dec 09	DACOS C4/ DACOS Log Ops
		5) Ease alongside watchkeeping routines.	COS CAP	Complete by Jan 10	CSO(E)SM
		6) Subject to tri-Service agreement, mitigate 'harbour hassle' by waiving food and SLA charges for seagoing submariners when alongside in base port to bring them in line with shipboard conditions enjoyed by General Service personnel.	NAVSEC	Complete by Oct 09	DACOS PPA

(a)	(b)		(c)	(d)	(e)
2 cont'd	2.2	e. Investigate cultural factors within the SM Service to improve understanding of how values, behaviours and customs serve to underpin or hamper effectiveness of the SM Service.	RASM	Complete by Dec 09	COS RASM/ SM Service Cdr
		f. Provide visible recognition of the contribution made by submariners to past and future classified operations and the sustained delivery of the National Deterrent.	RASM	Complete by Apr 10	COS RASM
		g. Develop and implement an effective Internal Communications campaign.	RASM/ NAVSEC	Complete by Sep 09	COS RASM/ NPT(E) TL
	2.3	SSBN(F) Manning:			
		a. Agree draft Establishment for SSBN(F) that is structurally sustainable.	ACNS	Complete by Apr 10	NPT(E) TL
		b. Establish feasibility of women serving in SSBN(F).	NAVSEC	Complete by Oct 10	NPT(E) TL
		c. Deliver agreed manpower transition plan to SSBN(F).	NAVSEC	Complete by Oct 10	NPT(E) TL
	2.4	Submarine Warfare Officer Career Structure:	**Endorsed by NAVB Jun 09**		
		a. Improve the knowledge and visibility of a career in the SM Service in order to improve recruiting and support an increased proportion of submarine warfare officer volunteers.	CNR	Complete by Sep 10	CNR
		b. **XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXX**	**XXXXXX**	**XXXXXXXX XXXXXXXXX**	**XXXXXXXXX**
		c. Align Submarine Advance Warfare Course with the PWO General Course and to re-brand as PWO(SM).	NAVSEC	Ongoing Review Jul 10	NPT(X) TL
		d. Improve preparedness for Submarine Command Course by adding a third, broadening tour at AWC level, thus delaying selection for SMCC by 18-24 months.	NAVSEC	Policy in place	Review Annually NPT(X) TL

(a)	(b)		(c)	(d)	(e)
2 cont'd	2.4	e. Implement a career management policy to support second boat commands in order to reduce structural stress on the Submarine Command Course.	NAVSEC	Policy in place	Review Annually NPT(X) T
	2.5	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX.	XXXXXX	XXXXXXXXXX	XXXXXXXXX XXXXXXXXX
3	Address the personnel and training infrastructure implications at Faslane as a matter of priority, in view of the Maritime Change Programme decision to advance the move to a Single SM Operating Base by 6 years to 2017.		1SL/CDM	Develop plan by Dec 09	2SL/COMFLEET/ CE DE
4	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX.		XXX	XXXXXXXXX XXXXXXX	XXXXXXXXXXXX XXXXXXXXXXX
5	**Redacted in full**		1SL/CDM		
	5.1	**Redacted in full**	XXXXXX	XXXXXXXXXX	XXXXXXXXXXXX
	5.2	**Redacted in full**	XXXXXX	XXXXXXXXXX	XXXXXXXXXXXX
6	Maintain the dialogue across Government (particularly with the Office of Nuclear Development) and with Academia established during the Study.		CSA	Continuous	DSM
7	SSBN(F) design considerations should ensure that on-board accommodation standards and quality of life issues are thoroughly addressed in order to avoid the mistakes made with the Astute class.		DCDS (EC)	Continuous	DEC DUWC

(a)	(b)	(c)	(d)	(e)
8	The Defence Nuclear Executive Board (DNEB) is to coordinate implementation of these recommendations from Dec 09.	DNEB	Dec 09	Review each DNEB
9	DOC is to audit implementation, reporting progress to the Defence Board in Jul 10.	VCDS	Jul 10	

ANNEX B TO
DEFENCE BOARD (09)33
DATED 01 JUL 09

STAKEHOLDER ENGAGEMENT AND SENIOR CONSULTATION

MoD	Academia	DE&S Abbey Wood	OGDs / Non-Departmental Public Bodies
PUS – Sir Bill Jeffrey 1SL – Adm Sir Jonathon Band CSA – Prof Mark Welland DCDS(Pers) – VAdm Peter Wilkinson Defence Nuclear Executive Board (DNEB) Strategy Director – Mr Tom McKane Policy Director - Mr Jon Day DG HR&CS – Ms Susan Scholefield S&T Director – Mr Paul Stein ACNS – RAdm Bob Cooling CMPA – RAdm Amjad Hussain Mr Stephen French (former DGE) Min Def Materiel BDS(W) – Mr Patrick Turner DEC DUWC – Dr Paul Hollinshead DG Strat Tech – Mr Nick Bennett Mr Paul Taylor (former DG Strat Tech/ DGE) SP Pol Pay and Manning – Cdre David Steel DPRN – **XXXXXXXXXXXXXXX**	Royal Academy of Engineering (RAE) - **XXXXXXXXXXXXXXXXX** - **XXXXXXXXXXXXXXXXX** Imperial College London: - Sir Keith O'Nions (former CSA) The Dalton Institute, Manchester University: - Director Education – **XXXXXXXXXXX** Defence Academy: - Comdt DCMT/ Hd DESG – **XXXXXXXXX** - Hd Nuc Dept – **XXXXXXXXXXXX** Defence Technical Officer Engineer Entry Scheme Hd DTOEES – **XXXXXXXXXX** DCEME: - Comdt – Cdre Al Rymer RN - RNSME – **XXXXXXXXXXXXXXXXX** National Skills Academy for Nuclear (NSAN) - **XXXXXXXXXXXXXX**	CDM – Gen Sir Kevin O'Donoghue CoM Fleet (outgoing) – VAdm Trevor Soar DGSM – (outgoing) RAdm Andy Mathews D SM – (incoming) RAdm Simon Lister D HR – Mr Jonathon Evans CSSE – RAdm Steve Lloyd D CSSE (outgoing) – Cdre David Jarvis D CSSE (incoming) – Cdre Mark Beverstock Hd HR – Brig Ken Furguson Engineering Skills Director – RAdm Ian Tibbitt Chief Engineer and Safety – Mr Howard Mathers M/NSQEP Head of Profession – Mr Franz Pearson SM/NSQEP Manager – **XXXXXXXXXXXXXXXX** **XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX** FSM IPTL – Mr Andy Mackinder DSW IPTL – Mr Martin Jenkins DNP IPTL – Cdre Steve Dearden Defence Nuclear Safety Regulator – Cdre Andrew McFarlane Military in Acquisition Stream – Maj Gen Macklin DESG Graduate Office, Foxhill HMNB Clyde (Faslane) - COB – Cdre Chris Hockley - Management Board	Cabinet Office – Sy and Pol - Richard Frere Dept of Innovation Universities and Skills (DIUS) Dept for Energy and Climate Change (DECC) Office for Nuclear Development (OND): - CE OND – **XXXXXXXXXXXXXX** - Dir New Nuclear – **XXXXXXXXXXXXXX** - Nuclear Strategy – **XXXXXXXXXXXXXXXX** Defence Nuclear Safety Committee (DNSC): - Chairman – **XXXXXXXXXXXXXXXXXX** - **XXXXXXXXXXXXXXXXXXXXX** COGENT Sector Skills Council: - CEO – **XXXXXXXXXXXXXXX** - Dir Nuc Research – **XXXXXXXXXXXXXXX** - Dir Nuc Skills Development – **XXXXXXXXXX** Nuclear Decommissioning Agency (NDA): - Dir Graduate Recruiting – **XXXXXXXXXXX** HSE Nuclear Directorate (formerly NII): - Deputy Chief Inspector – **XXXXXXXXXX**
AWE Aldermaston	**Civil Sector and Industry**	**XXXXXXXXXXXXX**	**Navy Command**
Managing Director – **XXXXXXXXXXXX** Chief Scientist – **XXXXXXXXXXXXX** Director Research – **XXXXXXXXXXXX** Dir Corporate Svcs & HR –**XXXXXXX** Hd of Plasma Physics – **XXXXXXXX** Director Assurance – **XXXXXXXXXXX** Director Recruiting – **XXXXXXXXXXX** Director HR – **XXXXXXXXXXXXX**	IMES – **XXXXXXXXXXXXXXX** SM Enterprise Tier 1 Contractors: - BAE Systems - Rolls Royce - Babcock Marine Lockheed Martin Strategic Systems British Energy – **XXXXXXXXXXXXX**– New Build HR Director AREVA UK Director – **XXXXXXXXXXXXX** BMT Defence Services – **XXXXXXXXXXXXX** Atkins Power – **XXXXXXXXXXXXXX** AMEC: - Chief Engineer – **XXXXXXXXXXX** - Director Defence - **XXXXXXXXXXXXXX**	**Redacted in full**	CinC Fleet - Adm Sir Mark Stanhope 2SL – VAdm Alan Massey DCinC Fleet – VAdm Richard Ibbotson RASM – RAdm Mark Anderson FOSNNI – RAdm Martin Alabaster NAVSEC – RAdm Charles Montgomery DNPS – Cdre Simon Williams NPT(E) – **XXXXXXXXXXXXXXXXXX** SM manpower planners DNR – **XXXXXXXXXXXXXXXXXXXX**

ANNEX C TO
DEFENCE BOARD (09)33
DATED 01 JUL 09

ENGAGEMENT WITH OTHER GOVERNMENT DEPARTMENTS

Background

1. This Annex summarises the findings from the Study's consultation across Government, with the relevant Non-Departmental Public Bodies and with Academia. The purpose of the consultation was to understand the relevant Government initiatives and to map the architecture of recent developments in the nuclear education and skills base. It was also to ensure that the MoD was properly connected into this architecture. A full list of those with whom the Study engaged is at Annex B.

2. Two decades of relative inactivity and neglect in the UK's civil nuclear sector have had a seriously detrimental effect on the associated skills and education base. Support for nuclear power in most Western countries was undermined by public concern over nuclear safety (following the accidents at 3 Mile Island in the US and at Chernobyl), by significant nuclear power plant construction cost overruns in the 1970-80s and by the relatively low cost of alternative fuels, mainly oil and gas. Partly as a consequence of this lack of public support for nuclear power in the UK, and in common with the Government's general policy of privatisation, most of the industry has since been transferred into the commercial sector, with the exception of the regulatory and decommissioning bodies. With the withdrawal of almost all government funding for nuclear research and the break up of British Nuclear Fuels Limited, there was a significant risk of a complete collapse in the UK's nuclear skills base.

Government Initiatives

3. **Policy**. The Government's commitment to reduce carbon emissions by 80% by 2050 means that nuclear power and its small carbon footprint, will play a major role in the UK's future energy mix. Accordingly, over the last 5 years, a number of steps have been taken by government to facilitate remediation of the nuclear education and skills base. The main elements are set out below.

4. **Office of Nuclear Development (OND)**. Until Sep 08, policy responsibility for civil nuclear power lay with the Department for Business, Enterprise and Regulatory Reform (BERR). A departmental reorganisation at that point resulted in the nuclear portfolio being transferred to the newly created Nuclear Directorate within the Department for Energy and Climate Change (DECC). The Nuclear Directorate is established with four branches leading on New Nuclear, Nuclear Strategy, Nuclear Policy and Non-Proliferation Policy, the first two of which form the OND. The OND's main role is to ensure that any problems in the development of new nuclear power stations are resolved. Further detail of their responsibilities is set out on the organogram at Appendix 1.

5. **Science, Technology, Engineering and Mathematics (STEM) Agenda**. In Oct 06, implementation of the recommendations of the STEM Programme Report 06 built on the Government's strategies for developing a stronger supply of scientists, engineers, technologists and mathematicians. Critically, this is dependent on improving the uptake of STEM subjects among pupils at school, which directly determines the number of students who can subsequently undertake degrees in these subjects.

6. **Sector Skills Councils**. Sector skills councils were established as a means for employers to secure influence in shaping the supply of training and skills to meet their current and future needs. Created out of dismantling the previous system of around 70 National Training Organisations in 2002, sector skills councils have since been developed to cover over 90% of the UK's workforce. The councils are independent, employer-led, nationwide bodies which represent the interests and skills requirements of employers. The network now comprises 25 councils which are mainly funded by the Government. Responsibility for establishing the network, licensing the councils, promoting their development and monitoring performance, originally lay with the Sector Skills Development Agency but this body has recently been superseded by the UK Commission on Employment and Skills. The Commission – a non-Governmental Departmental Body overseen by the Department for Innovation, University and Skills (DIUS) – is currently re-licensing all sector skills councils.

7. **Cogent**. *Cogent* is the sector skills council that represents the Chemicals and Pharmaceuticals, Oil and Gas, Petroleum, Polymers and Nuclear industries and was established in 2004. These industries share similar cultures that derive from hazardous technologies, the tightly regulated nature of elements of their work and common skills issues. The latter includes a requirement for highly skilled managers, researchers, engineers and technicians as well as process operators. *Cogent* covers a workforce of around 800,000 and a contribution to GDP in the region of 6%. Driven by the sector industries themselves in response to tangible skills gaps and shortages, *Cogent* has grown steadily in both stature and influence. It now presents a clear and powerful voice, enabling sector employers to influence Government policy development and to shape the outputs of training and education providers. Key roles are to develop Labour Market Intelligence and the provision of appropriate qualifications and National Occupational Standards. The Study team engaged closely with *Cogent* throughout its work and the SM Enterprise skills mapping exercise (see Annex F) was conducted using *Cogent*'s skills categories. This approach was adopted in order that the final product could be incorporated easily into their national nuclear skills assessment that is due to be published in Oct 09. The Study confirmed that strong linkages exist at the appropriate levels between the MoD (DE&S) and the Council.

8. **National Skills Academies**. First announced in a 2005 White Paper, National Skills Academies are sector-based, employer-led centres of excellence for skills training and development. They are intended to raise standards by fostering innovation, spreading good practice, shaping the curriculum and improving the professional development of teachers, lecturers and trainers. Funding is currently provided by the Government through the Learning and Skills Council (LSC); once fully operational, the academies are expected to be self-sufficient. There is no fixed model but most academies work with leading training providers and agencies through collaborative networks and virtual partnerships to provide skills solutions for sector employers.

9. **National Skills Academy for Nuclear (NSAN)**. NSAN was established in Jan 08 at the request of nuclear employers to address the key skills and training challenges facing the nuclear industry. It is a wholly owned subsidiary of *Cogent* although it operates as a Private Limited by Guarantee Company. As a virtual academy, NSAN is structured around the main areas of nuclear activity across the UK and has 5 Regional training clusters[1]. A hub exists within each cluster to support the regional manager with the development and delivery of quality training by NSAN-assured providers. Where possible, the academy builds on existing good provision in the region and works with existing providers to improve standards and to ensure they are responsive to employer

[1] Northwest/Northeast, Southeast/East, Southwest, Scotland and Wales.

demand. NSAN's work is primarily focused at foundation degree level and below, and it aims to play a transformational role for the nuclear sector whose changing skills mix demands greater flexibility and mobility. As the transition from operating, to decommissioning through to new build takes place, a flow of matching skills will be required which is NSAN's responsibility to facilitate. As an Associate Member of NSAN, the MoD has a seat on the Board of Directors and has access to the services and products being developed. As an example, NSAN has recently completed an exercise to identify suitable training providers in the various locations where DE&S requires Advanced Modern Apprenticeships[2]. The Nuclear Department[3], Defence College of Management and Technology (DCMT), was recently audited by NSAN and accepted as a quality assured training provider. Selected commercial courses run by the Department are now in the process of being quality assured by the Academy.

10. **Nuclear Decommissioning Authority (NDA)**. The NDA is a Non-Departmental Public Body, which was established under the Energy Act 2004. The NDA is responsible for decommissioning and cleaning up the UK's civil public sector nuclear sites. The Authority is sponsored by DECC, although for some aspects of their functions in Scotland they are responsible to Scottish Ministers. Since their formation, the NDA have established an ambitious graduate recruiting and placement scheme called '*nucleargraduates*'. The MoD have firm links with the programme and aside from being a member of the stakeholder group, we provide and organise visits and placements to MoD establishments for those on the scheme.

Other Relevant Initiatives and Organisations

11. **Nuclear Institute**. The Nuclear Institute was announced in Apr 08 and formally came into being on 1 Jan 09 with the merger of the Institution of Nuclear Engineers and the British Nuclear Energy Society. The Nuclear Institute is a charity and is formed of a professional institute and a learned society. This enables it to deal with a diverse range of external stakeholders. Following the merger, the future role of the Nuclear Institute with respect to training and education has still to be defined although the MoD is represented on the Institute's new Education and Training committee.

12. **Dalton Nuclear Institute**. Following the break-up of BNFL, concern among former senior employees about the implications for preserving even a modest skills base resulted in the creation of Dalton Nuclear Institute within Manchester University in 2005. Significant funds for research were granted by BNFL to the Institute at its creation but the research budget has since been developed to around £100M per annum. A key initiative has been their creation of the Nuclear Technology and Education Consortium (NTEC) whose management board is currently chaired by the Head of the Nuclear Department at HMS Sultan.

13. **NTEC**. NTEC comprises 11 universities[4] which provide a comprehensive nuclear-related MSc programme, the first courses of which came on stream in Sep 08. The breadth and format of NTEC's programme was designed to meet the UK's projected nuclear skills requirements in decommissioning and waste disposal, reactor technology, fusion and nuclear medicine. Collectively, the consortium represents over 90% of the

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[2] Devonport, Clyde, Portsmouth and Wyton/Waddington.

[3] Currently based at HMS Sultan, but due to co-locate with DCMT at Shrivenham when HMS Sultan closes as part of the Defence Training Review.

[4] The Universities of Birmingham, Lancaster, Leeds, Liverpool, Manchester and Sheffield, City University, London, the Nuclear Department DCMT, Imperial College London, UHI Millennium Institute & Westlakes Research Institute.

nuclear postgraduate teaching expertise residing in the UK's universities and research institutes. As such, NTEC provides a single focus for postgraduate training in nuclear science and technology which is unparalleled in the UK. The structure and content of the programme was designed specifically with the needs of the nuclear sector in mind and was established following extensive consultation with the nuclear sector, including industry, regulators, the MoD, the Nuclear Decommissioning Authority, Government Departments and with *Cogent*. The programme offers a very broad portfolio of subjects, the subject matter being presented by leading specialists in their field. Each topic is presented in modular, short course format making it ideal for employees within the industry. The format confers considerable flexibility, allowing students to undertake an MSc either one year full-time or part-time over 3 years. All modules are delivered by direct teaching but some are being converted into distance learning format in order to provide students with greater flexibility. The programme is coordinated by the Dalton Nuclear Institute and has been approved by the Institute of Mechanical Engineers.

14. **Nuclear Skills Architecture**. The developments described above are all positive initiatives that are indicative of the response by the Government and the UK's academic base to the growing demand for skills from the resurgent civil nuclear sector. The Study confirmed that Defence is properly engaged with the relevant organisations. A diagram of the nuclear skills pyramid, which illustrates the relationship between the skills and education providers, is at Appendix 2. The overall architecture of the education and skills base, showing the principle lines of funding and interaction between the relevant organisations is illustrated at Appendix 3; the MoD's lines of engagement are highlighted in bold simply for purposes of clarity.

Key Issues

15. Against the background described above, there are 2 key issues for Defence:

    a. First is to recognise that Defence should not be concerned about shaping this developing skills and education base, which is essentially demand driven by market forces, but to remain fully engaged with the relevant bodies to ensure that our approach is consistent and coherent.

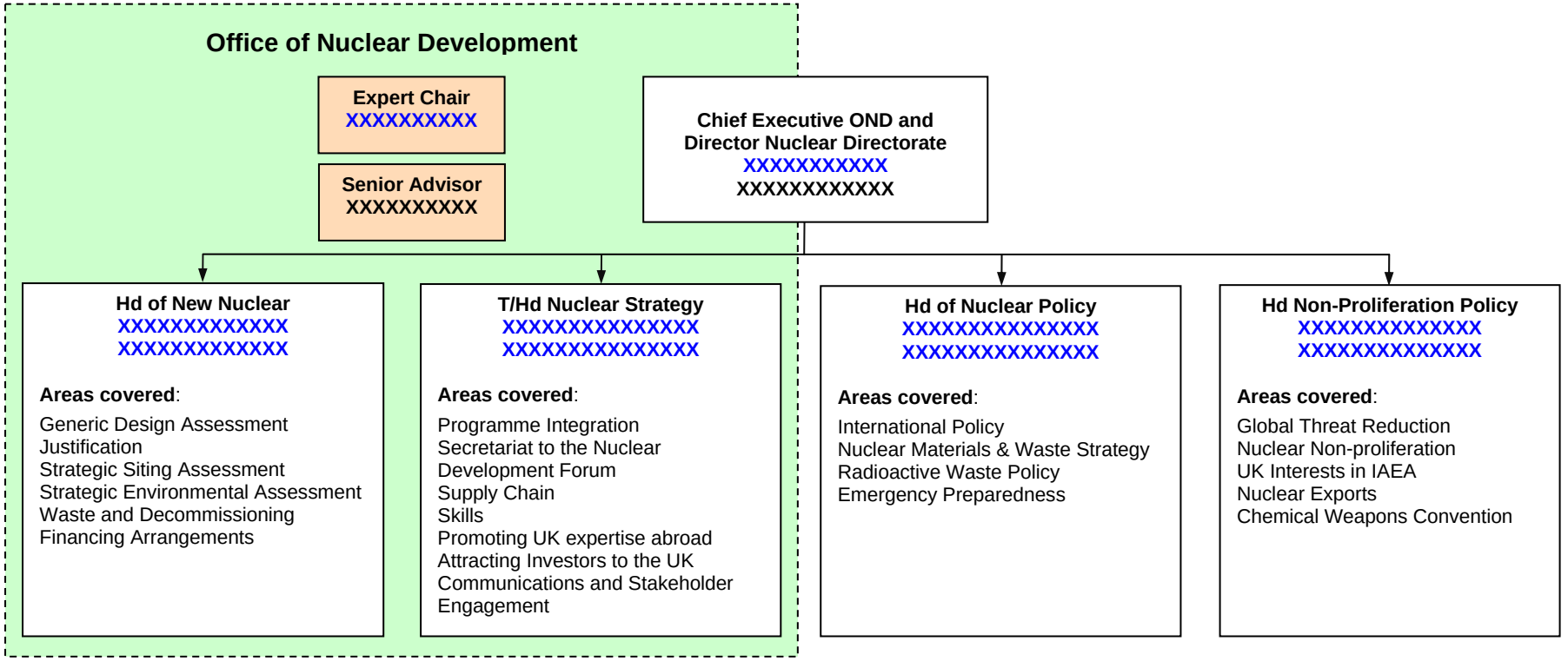
    b. Second, that we need to recruit graduates much more actively and aggressively from within the education base and to remain competitive against an increasingly skills-hungry civil sector.

Appendices:

1. OND Organogram.
2. Nuclear Skills Pyramid.
3. UK National Education and Skills Architecture.

APPENDIX 1 TO
ANNEX C TO
DEFENCE BOARD (09)33
DATED 01 JUL 09

DEPARTMENT OF ENERGY AND CLIMATE CHANGE – NUCLEAR DIRECTORATE



APPENDIX 2 TO
ANNEX C TO
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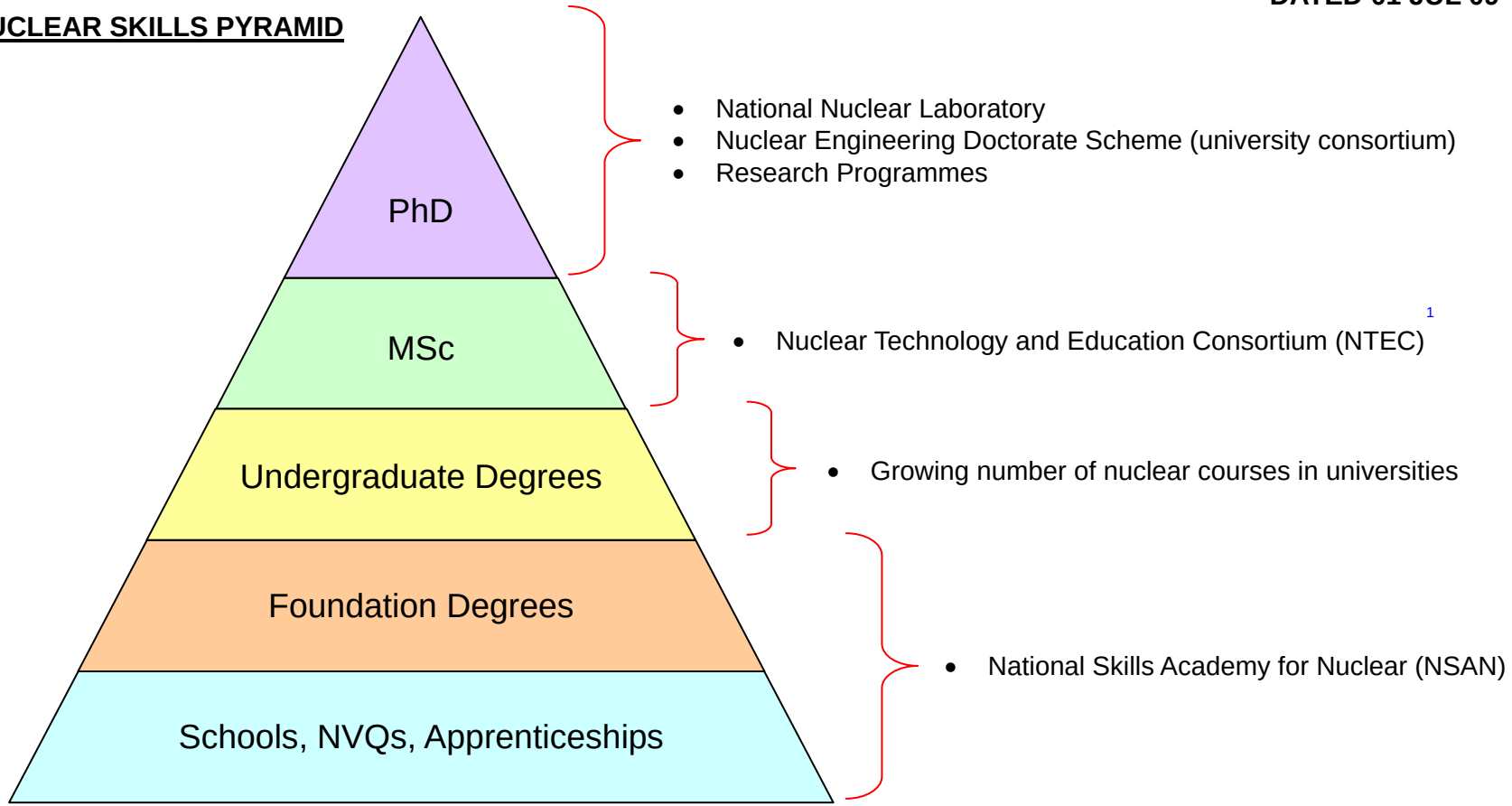
THE NUCLEAR SKILLS PYRAMID



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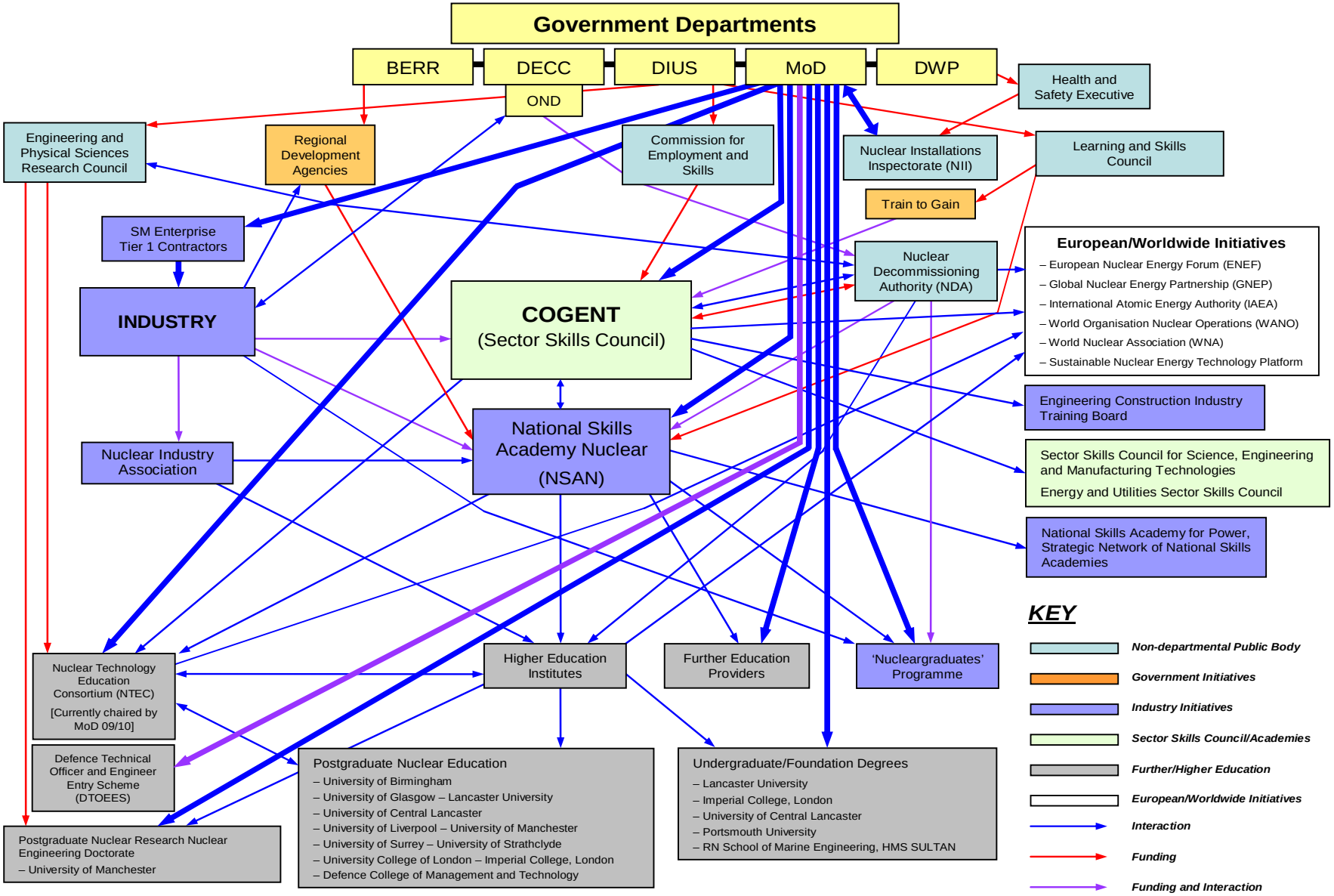
[1] In addition to its involvement with NTEC, the Nuclear Department DCMT provides its own full time residential MSc in Nuclear Reactor Technology (The Nuclear Advance Course), which is accredited by Cranfield University.

UK NUCLEAR SKILLS & EDUCATION ARCHITECTURE



ANNEX D TO
DEFENCE BOARD (09)33
DATED 01 JUL 09

CIVIL NUCLEAR POWER – XXXXXXXXXXXXXXXXXXX

1. **Scale**. The resurgent civil nuclear power programme is burgeoning: it is a huge, global and commercial market that is already starting to recruit aggressively. As international opinion has converged on the need to reduce carbon emissions, increase security of supply and stability of price, so international enthusiasm for nuclear energy has re-ignited. As at Jun 09, 436 nuclear reactors were in operation, 45 were under construction, 131 were on order and being planned and firm proposals existed for a further 282; these figures have grown by over 50% in each area since May 07[1] and continue to rise. Government proposals[2] for new nuclear power in the UK envisage an initial build of up to 11 new plants between 2014-2025 with almost certainly more to follow. New build aside, increased demand for nuclear expertise of equal magnitude arises from the need to decommission the first generation reactors, the reprocessing requirement and deep geological disposal of the huge and as yet unaddressed stockpile of nuclear waste. This assessment is based on an analysis of the renaissance in civil nuclear power by the Study's external consultants, Deloitte, which is at Appendix 1.

2. **Skills Shortage**. From all those consulted during the Study and from all the authoritative literature, it is abundantly clear that a significant skills shortage is developing across the full spectrum of nuclear-related business and will remain until the market and education base can respond fully. The shortage is principally caused by three factors:

a. First, there are insufficient engineers and technicians in the UK generally and the number currently continues to decline[3]. What is actually needed is a 12% growth in the number of graduates with Science, Technology, Engineering and Mathematics (STEM) degrees. Without such growth the UK will be unable to match the predicted and substantial growth in jobs requiring these qualifications.

b. Second, the current stock of NSQEP is in very short supply globally, caused by relative inactivity in the nuclear sector over the last two decades. This has resulted in an ageing profile among the NSQEP population internationally, with large numbers due to retire within 5-10 years.

c. Finally, in addition to gaining qualifications (3-5 years), the time it takes to acquire the experience element of SQEP (a further 10 +/- years) corresponds to a significant lag between identifying the need and market forces satisfying the requirement. The UK is already experiencing a serious and increasing shortage in general engineering skills, which will become most acute from 2015 – 2025[4]. The problem will affect the power industry as a whole and the nuclear sector in

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[1] www.world-nuclear.org/info/reactors.html

[2] BERR (2008) 'Meeting the Energy Challenge: A White Paper on Nuclear Power' p10.

[3] Registered engineers and technicians fell by 8% (from 263,999 to 242,530) between 1997 and 2006 - Engineering UK 2007, p60; chartered engineers in all age groups under 55 declined by 22%, incorporated engineers declined by 66% and engineering technicians declined by 50% – Engineer UK 2007, p63.

[4] House of Commons Innovation, Universities, Science and Skills Committee Fourth Report of Session 2008-09 dated 18 Mar 09, p14.

particular. In the longer term, however, as the situation stabilises into steady state, the developments in the education base will be good for the UK and for Defence.

3. **Market Forces**. Another important consideration is that unlike previous nuclear power builds in the UK, with the exception of regulation and decommissioning, all aspects of the resurgent programme (energy utilities, reactor vendors and operators) have been transferred from state ownership into the commercial sector. This, combined with the global nature of the business, significantly increases Defence's exposure to market forces beyond the Government's control. In the short term, there is little that can be done about the market realities but it is fundamental to recognise there will be intense competition for nuclear skills while the shortage prevails and the MoD needs to act to protect its interests. There is also wide consensus that the resurgent nuclear civil sector will not be significantly affected by the recession. This presents Defence with two issues: first, how to recruit sufficient numbers to sustain our expertise from the education base; and second how to retain the expertise we already have.

4. **Recruiting**. Defence is fortunate in that the number of graduates it needs to recruit into the RN and MoD NSQEP pools is relatively small. We also have a competitive and expanding graduate entry programme – the Defence Technical Officer Engineering Entry Scheme[5] (DTOEES). This successful quad-Service scheme started in 2002 and is forecast to continue growing before reaching a steady state of 590 students by Sep 11. Nevertheless, in view of the increased competition, we need to be more aggressive about our recruiting. Considerable benefit could be derived from developing a Defence Nuclear Programme careers 'road show' in which the RN, MoD and SM Enterprise partners would collectively advertise in universities the very wide range of exciting career opportunities available. In so doing, we should endeavour to replicate the highly successful US practice of establishing strong relationships with the key department heads in the universities that really matter, encouraging them to talent spot on our behalf. There is universal agreement about this concept, which should be pursued under joint RN/DESG leadership.

5. **Retention**. **XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX**. In one respect Defence is fortunate in that in quantitative terms the amount of nuclear expertise needed is relatively small compared to the civil sector but this is also an intrinsic weakness when major market forces are at play. **XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX**

Appendix:

1. The Renaissance in Nuclear Power.

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[5] DTOEES comprises Welbeck and the Defence Technical Undergraduate Scheme (DTUS).

APPENDIX 1 TO
ANNEX D TO
DEFENCE BOARD (09)33
DATED 01 JUL 09

THE RENAISSANCE IN CIVIL NUCLEAR POWER

Introduction

1. Nuclear energy is back on the policy agenda of many countries, with projections for new build reactor plants similar to or exceeding those of the early years of nuclear power. This signals a revival in support for nuclear power in the West that was diminished by the accidents at Three Mile Island and Chernobyl and by nuclear power plant construction cost overruns in the 1970s and 1980s, combined with low oil and gas prices and limited concern for the environment. In the Far East, the drive for nuclear energy is predominantly aimed at meeting population energy demands and the requirement for industrial expansion.

Drivers for the Nuclear Renaissance

2. The first generation of nuclear plants were justified by the need to alleviate urban smog caused by coal-fired power plants. In addition, the post war technology boom meant that Nuclear Power was also seen as an economic source of base-load electricity which reduced dependence on overseas imports of fossil fuels – the phrase 'too cheap to meter' was conceived during this period. Nuclear Power has been through a substantial decline since then and the drivers for nuclear build today have evolved. The key arguments are outlined below.

3. **Increasing Energy Demand**. Global population growth combined with industrial development will lead to a doubling of electricity consumption between 2006 and 2030. Besides this incremental growth, there will be a need to renew current power plants in the USA and the EU over the same period. An increasing shortage of fresh water calls for energy-intensive desalination plants in arid parts of the world, and in the longer term alternative means of energy in the post oil economies, such as hydrogen production or electric powered vehicles for transport purposes, will need significant quantise of reliable and economical energy.

4. **Climate Change**. Increased awareness of the dangers and effects of global warming and climate change has, over the last decade, led decision makers, media and the public to realise that the use of fossil fuels must be reduced and replaced by low-emission sources of energy. Nuclear power remains the only readily available large-scale alternative to fossil fuels for the production of a continuous, reliable supply of electricity.

5. **Economics**. Rising and increasingly volatile fossil fuel prices have substantially improved the economics of nuclear power. Although the current recession has seen oil and gas prices fall dramatically, predictions for oil prices over the next 2-3 decades are generally well above the $100 per barrel mark. Several studies have now shown that nuclear energy is a very cost-effective method of providing base-load energy against the backdrop of higher oil prices. In addition, as carbon emission reductions are encouraged through various forms of government incentives and trading schemes, the economic benefits of nuclear power will increase further.

6. **Stability of Wholesale Energy Prices**. A longer term advantage of uranium over fossil fuels is the low impact that increased fuel prices will have on the final electricity

production costs, since a large proportion of those costs is in the capital cost of the plant. This insensitivity to fuel price fluctuations offers a way to stabilise power prices in deregulated markets.

7. **Security of Supply**. A re-emerging topic on many political agendas is security of supply, as countries feel increasingly vulnerable to interrupted supplies of oil and gas, as recently witnessed by the dispute between Russia and Ukraine which affected gas supplies in many parts of Europe. The abundance of naturally occurring uranium, much of it in more stable areas of the world, makes nuclear power attractive from an energy security standpoint. As the nuclear industry is moving away from small national programmes towards global cooperative schemes, serial production of new plants will drive construction costs down and further increase the competitiveness of nuclear energy.

The Potential for Rapid Expansion in Nuclear Power

8. Most reactors today can be built in around five to seven years. Several years are also required for preliminary approvals before construction. In the 1980s, 218 power reactors were commissioned, an average of one every 17 days. These included 47 in USA, 42 in France and 18 in Japan so it is conceivable that a similar number could be commissioned in the decade 2015 - 2025. However, with the expansion of China and India and a world energy demand double the 1980 level in 2015, it is possible that, worldwide, one 1000 MWe unit could be commissioned every 5 days The latest estimates from the World Nuclear Association is that the minimum increase in the electricity generated by nuclear power during this century is 5 times current levels with a maximum likely of a 30 fold increase[1]. The reality is more likely to be in between, but an expansion of an order of magnitude during the 21st Century is credible – Not only would each operating plant have to be decommissioned, but replacement plants would need to be designed and constructed as well as the new plants representing the increase. This is a substantial increase in the economic activity of the civil nuclear programmes worldwide.

Increasing Public Acceptance of Nuclear Power

9. **Potential for Rapid Expansion in Nuclear Power**. During the early years of nuclear power, there was a greater tendency amongst the public to respect the decisions of authorities licensing the plants, but this changed for a variety of reasons. No revival of nuclear power is possible in modern democracies without the acceptance of communities living next to facilities and the public at large, as well as the politicians they elect. Firstly, there is a growing understanding that alternatives to fossil fuels are limited and that renewable sources will only provide a portion of that alternative and that some of these may be unreliable when dependant on weather conditions. There has been a reluctant acceptance that nuclear power does provide a sensible alternative. There is also a growing acceptance amongst many that this technology has been mastered over the last 50 years, despite some significant setbacks.

10. **The Legacy of Chernobyl**. The Chernobyl disaster marked the nadir of public support for nuclear power. Whereas this tragedy underscored the reason for high standards of design and construction required in the West, the plant in question could never have been licensed outside the Soviet Union. Incompetent plant operators exacerbated the problem, and partly through Cold War isolation, there was no identifiable safety culture. The modern global cooperation in sharing operating experience and best

[1] World Nuclear Association, Nuclear Century Outlook, Dec 08.

practices (often through WANO – World Association of Nuclear Operators) in safety culture as a result of the accident has been of benefit worldwide. The nuclear industry's safety record over the last 20 years is unrivalled and has helped restore public faith in nuclear power. Over this period, operating experience has tripled, from about 4000 reactor-years to more than 12,500. Another factor in public reassurance is the much smaller than anticipated public health effects of the Chernobyl accident. At the time many scientists predicted that tens of thousands would die as a result of the dispersal of radioactive material. In fact, according to the UN's Chernobyl Forum report, as of mid 2005, fewer than 60 deaths had been directly attributed to radiation from the disaster, and further deaths from cancer are uncertain. The ecology of the surrounding area has also recovered much more rapidly than predicted.

11. **Community Acceptance**. One of the criticisms often levelled against nuclear power is the alleged lack of strategy and provision for its long-lived wastes. It is argued that local communities would never be prepared to host a repository for such waste. However, experience has shown in more remote communities, such as Sweden and Finland, that with proper consultation and compensation mostly in the form of long-term job prospects, communities are quite prepared to host repositories. Indeed in Sweden, two communities are currently competing to be selected for the siting of the final repository.

The Global Nuclear Power Market Today

12. **Global Overview**. Today there are some 436 nuclear power reactors operating in 31 countries with a combined capacity of over 370 GWe. In 2006 these provided 2658 billion kWh, about 16% of the world's electricity. About 45 power reactors are currently being constructed in 12 countries, notably China, India, France, Finland, South Korea, Japan and Russia[2].

13. **Global Ambitions**. The International Atomic Energy Agency[3] has significantly increased its projection of world nuclear generating capacity. It now anticipates at least 60 new plants in the next 15 years, 16% more than actually operating in 2006. The change is based on specific plans and actions in a number of countries, coupled with the changed outlook due to the Kyoto Protocol. This would give nuclear power a 17% share in electricity production in 2020. The fastest growth is in Asia.

14. **UK Perspective**. The UK Government has intentions for up to 11 new reactors to be build over the next 15–20 years with 6 already planned. Of these, EDF in partnership with Areva[4] will build 2 reactors at Hinckley Point in Somerset and 2 at Sizewell in Suffolk. A further 2-4 reactors are to be constructed by RWE/Eon[5] at Wylfa in Anglesey and Oldbury on the Severn estuary with the balance of sites being identified in the next couple of years. The Department for Energy and Climate Change and the HSE Nuclear Directorate (formerly the NII) are engaged in facilitating this expansion by ensuring the regulatory process is swift and free from unnecessary obstacles. This is essential to provide the confidence to private sector investors that power stations will operate when planned to start obtaining a return on their considerable investment.

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[2] World Nuclear Association, plans for new reactors Worldwide Information Paper, Dec 08.

[3] Director General IAEA speech, 7Jul 06.

[4] EDF/British Energy Press Release 9 Jan 09; Independent 24 Sep 08.

[5] Eon/RWE Press Release 14 Jan 09.

15. **A Recession-Proof Industry**. Although the current worldwide recession may well have an impact, it is likely that these predictions will not be dramatically changed due to the geo strategic factors such as energy security, energy demand, climate change and the fact that these plants are regarded as long term blue chip strategic investments with healthy cash flows.

16. **Decommissioning**. In addition to the new industries for new civil nuclear power, the decommissioning market in the UK is a £2Bn per annum business focussed on Sellafield, Dounreay, Harwell, Winfrith and the already (or soon to be) decommissioned Magnox power stations. This remains an internationally competitive market with US companies (such as CM2H Hill and Washington Power) now active in the UK. It is estimated that the total nuclear liabilities in the UK are in the region of £70-£100Bn to be drawn down over the next 35 years.

UK Major Industrial Players

17. There are several groups of principal industrial players who are engaged in the Civil Nuclear Market:

a. **The Utilities**. Principally ED*F* (who now own British Energy) and Eon who plan to fund the construction of the power stations and will take the profit/loss risk on the investment.

b. **The Plant Designers and Manufacturers**. These are dominated by French company *Areva* (who are in strategic partnership with EDF), Westinghouse, Toshiba/Westinghouse, GE/Hitachi and Atomic Energy of Canada (AECL). Of these, the first 2 are extremely likely to build plants in the UK.

c. **UK General Engineering & Consultancy**. This ranges from Rolls Royce and AMEC who have announced civil nuclear ambitions through to BAe Systems and Babcock who have less well publicised or defined plans, through to the consultancies such as Fraser Nash, Atkins and Jacobs.

d. **Decommissioning Specialists**. Such as UKAEA, CM2H Hill. In addition, the Regulators, the Nuclear Directorate of the Health and Safety Executive, are small but key players who are desperately in need of SQEP to facilitate the licensing process. Substantial pay rises of circa 15% have already been agreed and it is likely this will increase as this has yet to allow them reach a market price for these skills. That said, [4] qualified and experienced regulators from the Defence sector left for the NII last year.

18. There are also a myriad of smaller companies, but what they all have in common is a requirement for nuclear qualified personnel and they are all now recruiting, some more aggressively than others.

ANNEX E TO
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Redacted in full

ANNEX F TO
DEFENCE BOARD (09)33
DATED 01 JUL 09

OPPORTUNITIES FOR COLLABORATION WITH INDUSTRY

THE COMMERCIAL SECTOR

1. **Paragraph redacted in full.**

2. **Paragraph redacted in full.**

THE DEFENCE SECTOR

3. In contrast to the commercial sector, considerable potential was evident to the Study for improving HR collaboration across the SM Enterprise partners (i.e. MoD, RN, the Atomic Weapons Establishment (AWE) and the Tier 1 contractors – BAe Systems, Rolls Royce and Babcock Marine). In pursuing such an approach, a principal benefit would be to instil a much greater sense of collective ownership of the programme. Four main initiatives were identified: jointly mapping the nuclear skills requirements with the Tier 1 contractors out to 2025; re-invigorating and developing a more ambitious exchange and secondments programme; exploiting the potential of a collective Defence Nuclear Programme (DNP) careers road-show; **XXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXX** Each initiative is described in outline below.

Mapping the Skills Requirement

4. As a discrete element of the Study, a MoD-led skills mapping exercise was undertaken by all the SM Enterprise partners, exploiting AWE's recent experience of conducting their own skills assessment. The work was facilitated by expertise from the Study's external consultants, Deloitte. The aim was to produce an overall picture of the skills needed to deliver the DNP out to 2025. All participants agreed to fund the work and to provide workforce data, predictions and assumptions and to populate a spreadsheet which was then entered into the NSQEP skills model. In order to protect commercial sensitivities, the data was compartmentalised and analysis with the partners was conducted strictly on a bilateral basis. Visibility of the overall picture that emerged was only available to the MoD.

5. It was decided to employ *Cogent*'s skills and experience/expertise categories in order that the data could also be easily incorporated into their National Skills mapping exercise, which is due to report in Oct 09. The main advantage of this approach was economy of effort but doing so constrained the level of detail to a broad order top-level picture. Further work will be necessary in subsequent iterations to develop the model and provide a more comprehensive assessment.

6. **Initial Findings**. The initial findings from the first iteration of the work provides broad assurance that the SM Enterprise has a clear understanding of the skills required over the next 15 years of the programme. The level of definition enables the main deficiencies to be identified in specific areas, however, there are two areas of relative weakness in the model at present:

a. **Niche Capabilities**. It was not possible to map the skills requirements among the sub-contractors where the Tier 1 contractors are heavily reliant for certain essential niche capabilities. This work needs to be carried out in subsequent iterations, as the model is developed, to provide assurance that the niche capabilities are retained in the UK.

b. **Assumptions**. The second weakness is that the model assumes that recruitment targets will be met and that retirements and premature outflow rates will remain at an average of 3.5%.

7. The numbers of skilled people needed to support the DNP fluctuates year by year, the average being around 9,500, although the figure reduces over the last 5 years from 2020-25. **XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXX**

8. As a direct result of the skills mapping work, general awareness has been increased among the SM Enterprise partners about the HR challenges faced over the next decade, specifically about the national skills shortage to support the civil power programme. The model allows projections to be made relatively easily where premature retirements are increased by ‘pull’ from the civil sector; it also identifies shortages and surpluses in specific areas of business and skill levels. **XXXXXXXXXXXXXXXXXXXXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX**

9. Because the skills requirement will change over time, the skills map will need to be reviewed regularly in order to maintain its integrity. The framework to do this has now been established. The model and data will be held and managed by the new NSQEP HR cell within DSM’s organisation, once it is established. The map should be used to inform recruiting forecasts and priorities, and to indicate where secondments and exchanges between the partners are necessary and would be most productive, as described in the next section.

Secondments and Exchange Programme

10. Secondments and exchanges are important to broadening experience and to acquire and develop the deep and specialist expertise needed within the SM Enterprise. The current secondment and exchange programme is ad-hoc and has, thus far, suffered from poor management and from being insufficiently ambitious. Furthermore, none of the partners have had adequate manning margins to enable the opportunities to be exploited fully. The partners agreed unanimously that a re-invigorated programme was required and a preliminary assessment of suitable posts across the SM Enterprise was developed and is attached at Appendix 2. It should be emphasised that this assessment will need to be developed as the programme proceeds and new skills requirements become apparent.

11. During engagement with the SM Enterprise partners it became apparent that the lack of manning margins meant that exchanges were preferred to secondments, as they entailed no net loss of workforce. Nevertheless, it was recognised that there would be occasions where exchanges would not be possible, either for reasons of security clearance, commercial sensitivity or because of the small number of people with certain niche skills. In these circumstances, the use of secondments would be unavoidable. While the programme of exchanges and secondments will be managed by the new

NSQEP HR cell, a case needs to be made to establish a modest uplift in the margin within DSM's staff for the programme to be undertaken.

Collaborative DNP Careers Road-Show

12. Over the course of the Study, it became clear that considerable benefit could be derived from developing a Defence Nuclear Programme careers 'road show'. The concept envisaged is one where SM Enterprise partners would pool their resources to advertise collectively the breadth and diverse range of exciting employment opportunities available across the programme. Currently each of the SM Enterprise partners presents and recruits independently, often in the same recruiting pool and at the same careers fairs, thus the benefits of a collaborative approach are obvious. In so doing, it should be possible to replicate the highly successful US practice of establishing strong relationships with the key department heads in the universities and education establishments that really matter, encouraging them to talent spot on our behalf. There is universal agreement about this concept, which by common consent would be best pursued under joint RN/DESG leadership. Although some additional resource would be needed to implement this idea, once up and running the current recruiting teams should be able to target a much larger audience.

XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX

13. **Paragraph redacted in full.**

14. **Paragraph redacted in full.**

15. **Paragraph redacted in full.**

16. **Paragraph redacted in full.**

17. **Paragraph redacted in full.**

Appendices:

1. **XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX**
2. Potential Pan-SM Enterprise Secondments and Exchanges.

APPENDIX 1 TO
ANNEX F TO
DEFENCE BOARD (09)33
DATED 01 JUL 09

Redacted in full.

APPENDIX 2 TO
ANNEX F TO
DEFENCE BOARD (09)33
DATED 01 JUL 09

POTENTIAL PAN-SM ENTERPRISE SECONDMENTS AND EXCHANGES

Company	Company	Potential Area for Exchange
BAE Systems	MoD	NRPA Submarine Projects Submarine
BAE Systems	Rolls-Royce	Systems Design Pressure Vessels Safety Case Management
BAE Systems	Babcock Marine	Facilities Management Core Load / PRTs In-Service Support / Maintenance Weapons Handling
AWE	BAE Systems	Propulsion / Nuclear / Platform Project Management
AWE	Rolls-Royce	Propulsion / Nuclear / Platform Project Management
AWE	Babcock Marine	Project Management DA Position Programme Management
DSM	BAE, Rolls-Royce, BM	Project Management Safety and Security Maintenance operations Design, development, Commissioning, Decommissioning and construction
CSSE	AWE	Project Management/Design Maintenance safety and security Design and Construction
DE&S	BM	Project Management Safety, process and maintenance operations
DESG	Rolls-Royce, BAE, BM and AWE	Graduate Placements to develop Project Management, design, construction, commissioning, process operations and maintenance operations

ANNEX G TO
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ANNEX H TO
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GLOSSARY

1SL	First Sea Lord - Chief of Naval Staff
AWE	Atomic Weapons Establishment
ACDS(Ops)	Assistant Chief of the Defence Staff (Operations)
BERR	Business Enterprise and Regulatory Reform
BNFL	British Nuclear Fuels Limited
CASD	Continuous at Sea Deterrence
CDM	Chief of Defence Materiel
CSA	Chief Scientific Advisor
DB	Defence Board
DCDS(Pers)	Deputy Chief of the Defence Staff (Personnel)
DECC	Department for Energy and Climate Change
DE&S	Defence Equipment and Support
DESG	Defence Engineering and Science Group
DITC	Directorate of Individual Training Capability
DNEB	Defence Nuclear Executive Board
DNP	Defence Nuclear Programme
DNSC	Defence Nuclear Safety Committee
DOC	Department of Operational Capability
DSM	Director Submarines
DTOEES	Defence Technical Officer Engineering Entry Scheme
DTR	Defence Training Review
GTS	Gain to the Trained Strength
HR	Human Resource
LSC	Learning Skills Council
Lt Cdr	Lieutenant Commander
MCP	Maritime Change Programme
MESM	Marine Engineer Submariner
MoD	Ministry of Defence
NAVB	Navy Board
NDA	Nuclear Decommissioning Authority
NTEC	Nuclear Technology Education Consortium
NSAN	National Skills Academy for Nuclear
NSQEP	Nuclear Suitably Qualified and Experienced Personnel
OGDs	Other Government Departments
OND	Office of Nuclear Development
PCP	Personal Change Programme
PUS	Permanent Under Secretary for Defence
R&R	Rest and Recreation
RN	Royal Navy
SM	Submarine
SofS	Secretary of State for Defence
SQEP	Suitably Qualified and Experienced Personnel
SSBN	Ship Submersible Ballistic Nuclear
SSBN(F)	Ship Submersible Ballistic Nuclear (Future)
SSN	Ship Submersible Nuclear
STEM	Science, Technology, Engineering and Mathematics
SWS	Strategic Weapon System
TLB	Top Level Budget Holders

TMC	Trident Management Committee
US	United States
VCDS	Vice Chief of the Defence Staff
WO2	Warrant Officer second class