

MAGNOX DECOMMISSIONING DIALOGUE
TIMESCALES WORKING TWG

REVIEW OF THE DOCUMENTS

CLIENT: THE ENVIRONMENT COUNCIL

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REVIEW OF THE TIMESCALES WORKING TWG DOCUMENTS

SUMMARY

This Review examines the documentation that has been submitted to the Timescales Working Group (TWG) to assist its assessment of the factors that could influence policy, strategy and practicable implementation of the UK Magnox decommissioning programme. The Review gives no regard whatsoever to the discussion and information exchange that takes place between the various participants at the meetings, presentations and visits, although it is noted here that this is likely to significantly augment and/or endorse the information and data provided by the documentation.

The Review is brazen inasmuch that it assumes a set of cardinal issues that would determine, in varying degrees of influence, a reasonable decommissioning strategy. It examines how the documentation so far submitted to and considered by the TWG relates to this strategy and it checks these against the dialogue focus categories that have been identified by the TWG.

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SELECTION AND IMPLEMENTATION OF A DECOMMISSIONING STRATEGY

It should be recognised that there are a number of factors that affect the selection of a particular decommissioning strategy. Some of these factors will be design and engineering specific, these might require further research and development to achieve optimised techniques and methods; others factors might relate and/or be dictated by national policy, such as how the process is to be licensed and regulated, and there might be the financial and organisational aspects of the corporate body responsible for decommissioning that were set down years ago when decommissioning was then still a matter for the future; and some factors might indeed surface as the decommissioning strategy is developed, with these possibly relating to technical, radiological, societal and other less well defined concerns.

Setting aside the factors identified by the TWG (dialogue focus categories) and, with an element of fool's bravado, I set the main areas of consideration to be:

- The Historical Perspective
- The Regulatory Framework – National and International

- The Political Expedient and Policy
- Land Reclamation
- Radioactive Waste Management
- Research and Development Considerations and Priorities
- Social Considerations – Public Perception
- Cost and Funding Provisions
- Safety Issues

Now I shall briefly review these areas with relation the documents provided (*italicised thus*) to the TWG and identify other areas and specific documents, papers, etc., that might be of interest to the TWG (*italicised and underlined thus*), rounding up with a tabulation of how these could contribute to the established Dialogue Focus Categories summarised on the tabulation:-

THE HISTORICAL PERSPECTIVE

Some aspects of the historical perspective are sketched out in *Magnox Electric Decommissioning Strategy (T23)*, although this provides the briefest of explanations as to how the then operator (Nuclear Electric plc) first in 1982 and then in 1991 arrived at its strategy of deferred decommissioning (then *Safestore*).

The TWG might consider it worthwhile to explore the original reasoning behind the *Safestore* decision and it could seek out decommissioning reports and papers from about 1982 (for example *CEGB Proof of Evidence on Decommissioning, Sizewell B Public Inquiry, A R Gregory 1982, Decommissioning of Nuclear Facilities, F Passant 1986, Decommissioning Technology in the United Kingdom, Jones J, OECD Paris, 1992, and Decommissioning of Nuclear Electric's Gas Cooled Reactors, Gordellier S, OECD Paris, 1992*) and subsequently how the deferred decommissioning option was consolidated in the *1996 Magnox Electric Quinquennial Review of Decommissioning and Management Waste Strategies of 1996* and that of *2000 (T24)*. The TWG might also wish to examine the approach to decommissioning at the time of the construction and commissioning of the then planning inquiries that provides an intriguing insight into the approach to the design and decommissioning of nuclear power stations (*Public Inquiry – Atomic Power Station at Trawsfynydd, Buchanan C 1958*).

TIMESCALES FOCUS CATEGORY	CROSS LINKAGE	COVERED	COMMENTS
ETHICS/MORALITY/INTERGEN EQUITY		✘	Not essential but could provide a broader depth of understanding

THE REGULATORY FRAMEWORK – NATIONAL AND INTERNATIONAL

The two Nuclear Installations Inspectorate’s papers (*Decommissioning of Nuclear Licensed Sites, 2001 (T7)* and *Management of Radioactive Materials and Radioactive Waste on Nuclear Sites, 2001 (T6)*), together with an explanation of the license conditions (*The Standard Licence Conditions attached to Nuclear Site Licenses, 2000 -T29*) are comprehensive.

BNFL Magnox also provided a useful document, *Management of Licensed Site Records (T26)*, which deals with the record keeping and audit functions of the site licence,

T7 provides a useful listing of the pertinent UK legislation and gives a clear statement of the NII’s regulatory strategy that could be adopted by the TWG as one of the reference baselines for the consultation, the components of the NII’s regulatory strategy are:

- i) **DECOMMISSION AS SOON AS POSSIBLE:** In general, decommissioning should be carried out as soon as it is reasonably practicable, taking account of all regulatory factors
- ii) **PROGRESSIVELY REDUCE THE HAZARDS:** Hazards associate with the plant or site should be reduced in a progressive and systematic manner
- iii) **USE EXISTING ROUTES OF WASTE MANAGEMENT:** Full use should be made of existing routes for the disposal of radioactive waste
- iv) **PASSIVELY STORE SURPLUS WASTES:** Remaining radioactive material and radioactive waste should be put into a passively safe state for interim storage pending future disposal or other long term solution

In addition to these NII papers, including *Consents for Decommissioning (T3)*, the TWG might wish to review some of the more detailed regulations, reports, guidance notes and papers recently published (*Nuclear Reactors (Environmental Impact Assessment for Decommissioning) Regulations 1999, Control and Remediation of*

Radioactively Contaminated Land, Consultation Paper, DETR 1998, Decommissioning on Nuclear Licensed Sites, NII T/AST/026), Regulatory Experience of ALARA and Decommissioning at UK Nuclear Sites, Robinson I F Saclay, 1997)

The NII's useful contributions (T7 and T8) are confined to decommissioning policy and activities in the United Kingdom but in near-future years both international and European regulations may have a greater impact on UK decommissioning technologies and strategy (A Review of the Situation of Decommissioning of Nuclear Installations in Europe, EUR 17622, 1998). Also, it might be worthwhile for the TWG to consider the case where a particular national policy, such as that of Japan, prescribes immediate dismantling after final shut down so that the research and development programmes to achieve this objective might provide a useful offset review of the practicality and cost of the UK approach (Decommissioning of Nuclear Facilities in Japan – the Strategic, Practical and Environmental Considerations, Saeki K, London 1995). Another example is that of Germany where national policy and regulations directly affect the decommissioning and dismantling of nuclear plant in that recycling of radioactive components is required unless otherwise justified for major technical, economic or safety reasons (Treatment of Ferrous and Non-ferrous Waste from Nuclear Power Stations, Sappok M Berlin 1995, see also Recommended Radiological Protection Criteria for the Recycling of Metals, radiation Protection Series No 89, European Commission 1995).

TIMESCALES FOCUS CATEGORY	CROSS LINKAGE	COVERED	COMMENTS
POLICY & REGULATORY FRAMEWORK		✓	Well covered for the United Kingdom but could have more overseas decommissioning input, particularly for the Magnox reactors located in Japan and Italy – NII's Principles should be examined and possibly part-adopted by the TWG as a reference baseline when combined with the EA's Principles (see Political Expedient)

THE POLITICAL EXPEDIENT AND POLICY

The 1995 Government White Paper (Review of Radioactive Waste Management Policy – Cm2919) sets out the requirement that the operator's decommissioning strategy should remain firmly based as the circumstances change and this, in

detailed extent, is set out by Nuclear Electric's *Decommissioning Strategy (T23)* of 1996, which is subsequently endorsed by *T24* (2000). The NII also reflects on Government policy (*T7*) and emphasises the cardinal role that the radioactive waste management policy will have on decommissioning, noting that a review of the radioactive waste policy is due to commence this year.

The Environmental Agency has submitted its statement *Decommissioning of Nuclear Installations: The Environment Agency's Role and Objectives, 2001 (T9)* which is useful inasmuch that it sets out the EA's *Principles for Decommissioning*, namely: -

- 1) **Sustainability:** Should include for account of future generations and the technical means at their disposal, the economic burden and the extent to which they should be given the ability to make decisions.
- 2) **Timing:** To be started and completed as soon as possible, this being the greatest contribution to sustainable development and offers the greatest confidence of environmental protection – any deferral of any stage of decommissioning must be justified.
- 3) **Planning:** Appropriate planning and preparatory work should be carried out for decommissioning.
- 4) **Option Assessment:** Alternatives approaches to radioactive waste management should be identified – secondary waste streams should be minimised.

The Department of Trade and Industry submission *Magnox Reactor Decommissioning: The Government/Regulator Perspective (M3)* and which, perhaps surprisingly, draws and relies upon a number of technical conclusions which may or may not apply to early decommissioning.

The last BNFL Magnox Quinquennial Review (*T24*) provides a useful checklist (*Annex 2*) on how it considers Government policy (Cm 2919) is being satisfied by its present decommissioning strategy and practice, although it notes (*Annex 2*) that "*Sustainable development, as it applies to decommissioning and waste management is not clearly defined or understood*".

TIMESCALES FOCUS CATEGORY	CROSS LINKAGE	COVERED	COMMENTS
POLICY & REGULATORY FRAMEWORK		✓	Adequately covered but the EA's Principles should be considered for adoption by the TWG when

			combined with the NII's Principles and those of BNFL Magnox, see <i>M4</i>
POLICY & REGULATORY FRAMEWORK		✘	Because <i>sustainability</i> is a key EA principle, the TWG might wish to consider further submissions on this from the NII and BNFL Magnox, particularly noting that BNFL admit to some difficulty in defining ' <i>Sustainable Development</i> ' in <i>T24</i> – see also <i>Sustainable Development – the UK Strategy (Cm 2426)</i> and also <i>This Common Inheritance, 1995 (Cm 2822)</i> and <i>T4</i>
ETHICS/MORALITY/INTERGEN EQUITY		✘	Not covered other than by <i>Songline of Risk, Jasanoff S 1999 (T16)</i>
POLICY & REGULATORY FRAMEWORK		✘	Since the DTI is such a persuasive HMG ministry in decommissioning – it effectively holds the purse and policy strings – its input has been surprisingly scant and the Group might wish to seek further policy information in this respect

LAND RECLAMATION

BNFL Magnox (*Developments in Decommissioning Strategy for Magnox Power Stations, Woollam P, undated – M4*) touches upon land reclamation and, particularly, how and when contaminated land within the nuclear power site boundary. The TWG might wish to review past incidents that have resulted in contaminated land at Trawsfynydd (the roadway) and Hinkley Point (the builder's rubbish).

The final clearance of the site is referred to in several documents (*M4, T23, T24*, etc) but no definition is provided on the minimal standards to which the land will be recovered and if it is expected that any limitations of use (ie not unrestricted use) would apply.

TIMESCALES FOCUS CATEGORY	CROSS LINKAGE	COVERED	COMMENTS
RISK		✘	TWG may wish to receive more definition and information as to the state of the land to be released and how this effected by the various timescale options

RADIOACTIVE WASTE MANAGEMENT

Surprisingly, although this dominates the choice of decommissioning strategy, in both method of dismantling and, particularly, timescales, little documentation has been presented to the TWG relating to the eventual development of the UK national radioactive waste strategy.

So far to date, only the BNFL Magnox paper *How will we Manage the Waste from Magnox Decommissioning, Woollam P, undated (M1)* tackles the volumes and types of waste streams arising during decommissioning and usefully sets the balance of natural radioactive decay over time. This points to a worker dose benefit if the dismantling occurs later rather than sooner (see also *M3, T19* and *T13*), although it is not expressed in terms of a direct health detriment (ie the dominant radionuclides). However, the TWG may wish to put into context the timescales of decommissioning, as these relate to *Stage 3*, and the lengthening time delays until the decisions and development of a national radioactive waste repository are undertaken.

Abroad, delays in the implementation of a national radioactive waste disposal strategy have invoked delays in the decommissioning programme (*Decommissioning Activities at Latina NPP, Struvi M, London, 1995*)

TIMESCALES FOCUS CATEGORY	CROSS LINKAGE	COVERED	COMMENTS
WASTE MANAGEMENT – RADIOACTIVE WASTES		✘	Assessment of the generic model of radioactive wastes arisings seems to be satisfactory, although not presented in detail to the TWG, but individual station inventories are available from the NIREX/DETR <i>National Radioactive Waste Inventory, 1998</i> . There is great uncertainty, and little published, about the present state of National radioactive waste strategy, policy and practicable progress to providing a national radioactive waste repository – the TWG might wish for a representative of NIREX to provide a presentation on this.
RADIOLOGICAL INVENTORY AND PROJECTIONS		✓	With the NIREX/DETR national inventory sufficient information is

			available to cover the generic and specific power station cases
WASTE MANAGEMENT - NON-RADIOLOGICAL WASTES		*	Nothing has been made available.

RESEARCH AND DEVELOPMENT CONSIDERATIONS AND PRIORITIES

It is often considered that the driving force behind technological development is its need and applicability to specific industrial projects. New technologies for decommissioning generally improve safety, reduce waste generation and improve the productivity of dismantling. The expectation is that a country with a large stock of similar nuclear power plants might embark upon a large R&D programme and, if the reactor plant was common internationally, that country could benefit from the international pool of decommissioning knowledge (*The European Union's R&D in the field of Decommissioning, Simon R, Luxembourg, 1995*). Because of the uniqueness of the Magnox graphite moderated design, a significant amount of the decommissioning technology will be unique to the United Kingdom (setting aside the two Magnox reactors in Japan and Italy) and the Britain's R&D programme might be out on a limb.

Other than BNFL Magnox's statement (T24) that its "*decommissioning and waste management strategies are based on the application of present day technologies*", nothing has been presented to the TWG to demonstrate that all of the required technology and methodology has been developed, refined and proven and that this could be put in place within the timescale options under consideration.

TIMESCALES FOCUS CATEGORY	CROSS LINKAGE	COVERED	COMMENTS
TECHNICAL (SECTION THEREOF)		*	The TWG may wish to seek further information on the state of development and practicable implementation of the specialised technology required for the Magnox decommissioning programme.

SOCIAL CONSIDERATIONS – PUBLIC PERCEPTION

Social considerations are likely to influence national decommissioning strategies in several ways.

Public perception and concern about the effect of a nuclear power plant on the health and welfare of the local and regional population may be significant and possibly hostile, not just to the presence of the plant but also to any changes

proposed to it. There are also the redundancy issues affecting the extensive workforce once that the plant has ceased generation and, even if decommissioning is immediately undertaken, the workforce may not have the necessary skills to undertake the task.

The Economic Impact of Closure without Replacement of Trawsfynydd Power Station (T37 - see also The Closure of Trawsfynydd Power Station – Effects on Staff and the Local Community and Identifying a Strategy for Decommissioning, Kay, J M, London 1995 and Social Effects of Decommissioning Trawsfynydd Power Station, Jones H M, undated) examines the employment and local economy impacts of decommissioning a single station, although the impact from Trawsfynydd's closure, because of its remoteness, may not be typical of the other Magnox stations. Hugh Richards identified a shortfall in the recruitment of younger staff at Trawsfynydd (*Preserving the Capacity to Manage Eventual Decommissioning*, T17).

TIMESCALES FOCUS CATEGORY	CROSS LINKAGE	COVERED	COMMENTS
GENERIC LOCAL IMPACTS		✘	Most probably adequate for Trawsfynydd but the TWG may wish for further and site-specific information for the other Magnox sites.
AVAILABILITY OF EXPERTISE		✘	Certain grades of employee availability considered but general management and R&D capacity not considered to date – the Group may wish to examine BNFL Magnox's graduate and professional engineers recruitment and training programmes.

COST AND FUNDING PROVISIONS

Funding of decommissioning varies considerably from state to state (*Decommissioning of Nuclear Facilities: An Analysis of the variability of Decommissioning Cost Estimates*, OECD, Paris 1991, *Future Financial Liabilities of Nuclear Activities*, OECD, Paris 1996 and *Funding Schemes in OECD Countries for Future Decommissioning of Nuclear Facilities*, Stevens, G, Avignon 1992).

BNFL Magnox gives the comparison between discounted and undiscounted Magnox site costs, *Magnox Reactor Site Decommissioning Costs*, Holt G (T25), for a range of deferral timing scenarios, there is a worked example of *discounting* (DTI -

T30) and BNFL Magnox stated that 88% of the necessary funding for decommissioning liabilities has already been set aside (*BNFL Funding – T2*).

The cost of decommissioning a nuclear power station is subject to many factors, which are either related to engineering and technical problems, such as radiation dose limitation, radioactive waste management, etc., to financial issues such as inflation and discounting. Certain of these cost determining factors are outside the control of the organisation undertaking the decommissioning – these might include the costs of managing the radioactive wastes, the additional costs of tighter dose control (including environmental discharges), and changing standards required for the eventual clean-up and delicensing of the site. Some of these issues have been presented to the TWG (*Discounting, Funding and Decommissioning Costs, Sadnicki M, 2001, Sussex*).

TIMESCALES FOCUS CATEGORY	CROSS LINKAGE	COVERED	COMMENTS
A) COSTS B) AVAILABILITY OF FUNDING		✘	Further information distinctly related to the TWG's options for the decommissioning deferral periods required

SAFETY ISSUES

There are a number of specific safety issues that can arise during the decommissioning period. The type of hazard(s) present and the risk presented will determine the nature of these safety concerns.

Specific hazards will include the presence of hazardous materials, the generation of secondary wastes, effects of the decommissioning operations on other nearby nuclear facilities, general industrial safety requirements and fire protection.

For Magnox power plants quite specific hazards may be present, for example the handling of large quantities of asbestos based lagging and thermal insulation, and the removal of the graphite moderator cores (*Decommissioning Graphite Cores containing Significant Amounts of Stored Energy, Marsden B, London 1995, Graphite Core Stability during Care and Maintenance and Safe Storage, Wickham A, IAEA-TECDOC-1043, 1998 and Graphite Disposal Options – A Comparison of the Approaches Proposed by UK and Russian Reactor Operators, Marsden B, London 1998*).

A number of documents have been presented to the TWG addressing the longer-term stability of the Magnox power station sites (*T32, T33, T34, T36*) and these should be generally sufficient for the TWG's consideration of seismic and

geological stability, coastal erosion and other potential changes arising from global warming. Claims that there are higher incidences of childhood leukaemia nearby one particular station (*Childhood Leukaemia in Chepstow, opposite Oldbury Nuclear Power Station, Busby, undated M6*), although of interest, do not directly relate to the decommissioning deferral and eventual dismantling stages, although it may be useful for the Group to examine decommissioning discharges for the deferral periods under consideration.

Surprisingly, absent are any documents relating to any of the decommissioning safety analyses that have been prepared for the generic and station-specific cases. The latest versions of these are identified by Hugh Richards (*List of Licensee's Documents Relevant to the Safestore safety Case, T31, 2001*).

TIMESCALES FOCUS CATEGORY	CROSS LINKAGE	COVERED	COMMENTS
A) COMMUNITY SAFETY B) WORKER SAFETY C) RISK		✘	Although there may be confidentiality problems associated with the release of the latest decommissioning safety case, BNFL Magnox should be able to release previous versions or work-ups to the present safety case for the TWG to consider. It should not be considered within the TWG's collective expertise to arrive at its own safety case, particularly the hazard identification and risk assessment aspects.