DML - Project Summary

Options

The proposal is based on reactor compartment separation from the submarine pressure hull followed by storage of the compartments intact. The scheme will also enable disassembly and volume reduction of the reactor compartments prior to the completion of an initial thirty year storage period if planning, regulatory, environmental or other factors make this desirable.

The initial public consultation exercise identified extended on-land storage of intact reactor compartments as the preferred solution. Hence the proposal reflects this approach. However, there are some reasons why "cutting up and packaging" earlier than envisaged by the PQQ might subsequently be proposed and, in due course, adopted:

- *the main planning, technical and regulatory issues associated with the final reactor disassembly and packaging operation will have to be addressed as part of the initial interim storage facility consents; hence the key requirements to enable this work to go ahead will be in place when the storage facility begins operation;*
- *decay timescales for dominant isotopes are such that time periods in the order of 200 years are needed to significantly influence dismantling techniques;*
- *the operation of the interim storage facility and the positive employment benefits associated with an earlier, fully regulated and controlled disassembly campaign may assist in obtaining planning approvals and public acceptance;*
- *the available capacity and capability of specialised personnel already based at any proposed storage site may create the opportunity for an accelerated disassembly and volume reduction programme;*
- *the management of the waste streams may need to be tailored to suit wider considerations associated with any potential storage site.*

This proposal will take account of both national and wider international experience covering lessons learnt in formulating and implementing solutions to sensitive legacy environmental issues. Based, in part, on international precedents it will seek to maintain the essential balance between meeting legitimate public concerns and delivering a scheme that complies with technical and environmental best practice.

The determination of best possible practice in resolving the interim storage of intermediate level waste associated with the UK's defuelled and de-equipped nuclear-powered submarines should take into account a wide range of factors such as:

- *the provision of adequate storage space that meets the needs of the overall programme;*
- *public, workforce and environmental safety;*
- *issues associated with public perception, concern and trust;*
- *the real need to begin progress towards a long term solution that meets all extant legislation, that stands best possible chance of meeting future legislative regimes and that retains future flexibility where discretionary choices might be available (eg, technologies, timing, physical locations).*

This proposal, when developed, is intended to address all of the above factors where absolute requirements are defined (eg, waste authorisation limits) and to provide an optimum solution against more subjective criteria (eg, communication, openness).

The proposed approach of reactor compartment separation on a licensed site(s) in compliance with independently approved safety cases, followed by on-land storage is inherently resilient in ALARP terms. The option to proceed with earlier disassembly and packaging some years into the future, but prior to the thirty year point could, if sought, only be implemented if it met ALARP criteria within the context of formal safety case submissions.

The options are robust to changes of the type outlined in the PQQ. The lack of future national repositories for low or, in the longer term, intermediate level waste might delay the planned timing of reactor compartment disassembly and volume reduction. Alternatively, an issue like this could lead to the requirement for alternative interim storage of packaged waste, pending resolution of the national problem. Changes to Government policy regarding radioactive waste management definitely have the capacity to influence options adopted and their implementation timescale under this proposal. Whilst the reactor compartments are in initial on-land storage, maximum possible downstream flexibility is retained.

Siting

Two sites are proposed.

The proposal identifies Devonport Royal Dockyard as the primary facility for reactor compartment separation, with this work being carried out on the existing licensed site. This recognises Devonport's long term role as the only UK site able to handle irradiated submarine fuel, meaning that all submarines will, in future, have to be de-fuelled at Devonport. Devonport has all of the required skills to successfully justify, manage and execute the required work.

A second potential site on the Cromarty Firth is also proposed for separating the reactor compartments of some or all of the seven Rosyth hulks, subject to schedule requirements. This recognises the current population of defuelled hulks which will increase further over the next few years. The use of a second site could reduce potential delays compared to Devonport being the only separation site for all decommissioned submarines. Specialist input could be provided from either Devonport or any proposed storage site. The Cromarty Firth site is not currently a licensed site, although it has previously received planning permission for use as a decommissioning facility for offshore oil and gas-related installations.

A third site will be required for storage of RCs. It has not yet been confirmed. The new development is anticipated to be a licensed site.

Devonport Royal Dockyard is adjacent to residential areas. The other two sites are/are anticipated to be relatively remote from residential and commercial areas.

Geological stability and climate-related changes are not anticipated to present significant long-term issues at any of the sites. Considerations such as this will be addressed in planning and regulatory submissions. Likewise, the full range of potential external hazards for activities at all sites will be compiled in a risk register and, based on probability/impact assessments, appropriate mitigation measures will be included in order to satisfy fully the relevant independent regulatory bodies.

The use of Devonport for the separation of reactor compartments from the majority of current and future submarines to be taken out of service minimises the requirement for the movement of intact hulks from their defuelling location. Thereafter, all reactor compartments will be moved to the single storage site by sea in accordance with the applicable transport regulations, the exact arrangements being the subject of full independent regulatory submissions and approvals. It is planned to carry out final disassembly and volume reduction of the reactor plants at the same interim storage location, with the only subsequent movement of radioactive wastes being the transport to the national long term waste repositories. In the absence of definite locations for these repositories it is not possible to comment on the distances involved in these final movements.

The financial arrangements supporting this proposal have still to be developed. The companies involved in the submission have/are anticipated to have, between them, extensive experience in all types of arrangement that might potentially be used.

Safety

The national arrangements for independent scrutiny of the design, construction, commissioning, operation and decommissioning of nuclear facilities is the central method of ensuring that safety is not compromised by cost, profit or any other financial drivers. Future regulatory requirements will progressively tighten controls. Experience suggests that these will cause cost escalation at rates that exceed normal industrial inflation indices. In order to ensure that these pressures do not undermine the financial viability of the project to the detriment of safety or environmental protection, appropriate commercial arrangements with the MoD will be sought.

The reactor compartment separation task and the disassembly of the front and rear sections of the submarine contain no significant health and safety risks for experienced management and workforce teams operating to fully developed procedures for all activities – from heavy lifts to the segregation and disposal of hazardous wastes. The preparation for transportation and movement by sea of the reactor compartments is well within established criteria for operations of this type. However, whilst it is very strong, the compartment has not been designed to withstand the forces generated in dropped load scenarios – hence all handling will involve skidding or trailer transportation rather than lifting operations where possible.

Workforce radiation doses will be monitored during separation of the compartments via personal dosimetry equipment supplemented by contamination checks at exit points from controlled areas. This follows established practice. Waste streams will be checked for full compliance with any discharge consents and formal scrap characterisation and separation procedures based on current practices will be applied. These will be used for both active and toxic/hazardous inactive substances. Monitoring of the inert compartments during storage is likely to be via a combination of permanent radiation sensors on or in the compartments themselves, supplemented separate checks using portable equipment where appropriate. Any other building or related environmental monitoring arrangements will be determined during the design and justification processes. Workforce doses, environmental discharges and scrap/waste management during final nuclear plant

disassembly will be monitored and controlled using similar techniques to those applied during the initial compartment separation and submarine dismantling phases.

All data relating to individual and collective workforce doses will be recorded, reviewed and assessed in accordance with existing processes that meet the applicable legislation. Public doses will be assessed against the limits defined within operational criteria and discharge consents. With approved consents in place, company and regulator checks at both regular and random intervals will be used to confirm actual discharges and resultant exposures will be generated from established models to provide the necessary assurances regarding public doses. All consents and limits are likely to be the subject of regular review, re-justification and amendment as time passes.

All company-generated monitoring results will be submitted to the regulatory authorities for assessment and summary results will be made available to the public at regular intervals. No other arrangements for independent peer review have been developed at this stage.

Policy regarding the free release of any slightly contaminated material has not yet been determined, but any such policy will follow established national or international policies and best practice.

The proposed storage facility has not yet been designed and any requirement for it to be capable of being sealed and act as a containment structure will be determined during its hazard and operability analysis and the resultant safety case justification. At this stage sealing and containment requirements are not known, nor has the need for multiple barriers or internal building segregation been confirmed.

Unauthorised access to the facility will be prevented by a combination of security fencing, perimeter and building monitoring devices and physical guards. Security requirements arise primarily from either the classified nature of the reactor plant design or the radiation hazard that the primary plant presents (but only once inside the compartment). Independent auditing of the design and operation of the security arrangements is likely to be the responsibility of the MoD and the regulatory authorities.

The reactor compartments and the storage facility will be physically checked internally and externally at regular intervals in addition to full scrutiny and review of the output from any permanently installed instrumentation. The independent regulators will be granted full access for their own surveys and inspections. Any degradation that occurs to the items being stored, the building or its systems will be rectified so as to ensure full ongoing compliance with the applicable safety case(s) and site licence conditions.

Scrutiny

The primary approach for delivering independent assurance regarding management and security procedures will be via the regulatory bodies. The results of their reports are made available on the public register. Regular community/licensee liaison meetings will be used to provide information on these and related matters and it is envisaged that a programme of physical site visits for community representatives will be established. The optimum balance between openness and the maintenance of security at all sites will be sought over the period of the entire programme.

Routes for internal whistle blowing without fear of retribution are an existing feature of participating company operations. National employment guidelines in the treatment of whistle blowers are strictly observed.

Openness

A structured communications programme will be designed and implemented at the outset of the project. This will continue throughout the duration of the interim storage period and the eventual disassembly and packaging phase. Public input into the communications programme will be sought and used to ensure that legitimate concerns and information needs are met. Communications routes will involve a combination of presentations and discussion forums, printed material, internet-based web sites and electronic newsletters, supplemented by the use of broadcast and newspaper channels as appropriate.

Local communities will be able to access full versions of all regulatory submissions and documentation at libraries and local authority offices as well as via the internet. Summary brochures and booklets will be produced and made available for distribution. These will address key aspects of the programme as it develops. They will contain information such as risk assessments, options analyses, risk mitigation reports and simplified safety case summaries. Radiation monitoring reports incorporating worker doses, radioactive waste streams and resultant public doses will be available via the same channels, published at least annually, but more frequently when appropriate. The processing and disposal of inactive toxic and hazardous wastes will also be covered in these reports.

Transport

The transport requirements for radioactive materials associated with this proposal are:

- *up to seven intact hulks from Rosyth to a separation and disassembly site on the Cromarty Firth, with any residual submarines from Rosyth to Devonport;*
- *up to seven reactor compartments from the Cromarty Firth site to the storage site, with all other reactor compartments from Devonport to the same site over the life of the submarine programme;*
- *ancillary low level waste from the separation site(s) to Drigg or its successor site as the separation work proceeds;*
- *very low level waste to available disposal sites as the separation work proceeds;*
- *transport of packaged intermediate, low and very low level waste from the disassembly site to national repositories or disposal locations as the final disassembly process is undertaken;*
- *the frequency of transport will be derived from the full disposal programme which is not yet available.*

No transport through centres of population is envisaged, other than that involving the movement of low and very low level waste as indicated. Waste generation during compartment separation will be minimised by careful procedural design and this will reduce associated transport requirements.

Workforce

Skills and related knowledge required over the entire programme are associated with the following areas:

- *the submarine classes, their configuration and the materials used in their structure, outfit and operational systems;*
- *the nuclear steam raising plant itself;*
- *legislation covering workforce and public protection from risks associated with ionising radiation, the design and operation of nuclear facilities, the packaging, transport, storage and disposal of radioactive and hazardous materials and the protection of the environment;*
- *communication and consultation with members of the public and other interest groups.*

These will be maintained by drawing on the skill-base that is directly associated with providing ongoing support to the operational submarine force and other relevant parts of the UK's nuclear industrial base.

It is too early in the programme to assess the detailed employment aspects of this proposal at the sites concerned. However, a positive effect is anticipated at all locations.

Environment & Sustainability

The proposal seeks to strike a balance between meeting ALARP principles and reducing the legacy nuclear problem for future generations. It proposes the preferred option of storage of intact compartments on land as identified during the previous consultation process, whilst catering for the possibility of earlier disassembly than currently envisaged – if this is deemed, via analysis and further consultation, to be desirable for whatever reason.

The sites are/are likely to be near areas of scientific and amenity value and the detailed proposals will take this fact into account.

Development

The flexibility to expand the store to support waste from additional submarines can be accommodated into the design. It is proposed to design it for a maximum useful life of sixty years. Given the envisaged nature of the facility, it is expected that a life extension programme at some time in the future would be possible.