

SERCO

PROJECT SUMMARY

Introduction

The Ministry of Defence wishes to seek a solution to deal with a number of redundant submarines which have been through the initial decommissioning phase that comprises the process of de-fuel, de-equip and lay-up and preparation (DDLp). There are presently 11 submarines which have been prepared for afloat storage and these are stored on the Nuclear Licensed Sites of Rosyth (7 submarines) and Devonport (4 submarines). In addition there are 16 submarines in service and a further 3 vessels on order, with options for further purchases that will be subjected to DDLp. Project ISOLUS has therefore been established in order to “define, develop and procure a safe and publicly acceptable method for interim storage of radioactive material arising from decontaminated nuclear submarines”. This proposal considers options for providing interim storage of the radioactive material arising from current and future laid-up submarines at a land based site and conversion of the waste to a form suitable for consignment to national disposal facilities.

Options

Two options have been proposed by the Consortium as providing an acceptable technical solution which we believe meet the full requirements of Project ISOLUS. Both options consider the transport of the complete submarine from its afloat storage location to a site where the submarine Reactor Compartment is removed. It is anticipated that one submarine per year will be processed in this way. After removal from the submarine, the Reactor Compartment will be transported by sea (e.g. sea going barge or ship) and road to an interim land storage facility. The siting of the interim storage facility will be such that road transport will be minimised, possibly only within the boundary of the licensed site. An outline summary of the two options is presented below.

Our Option 1 is equivalent to the MoD’s “baseline” scheme for land based interim storage of the complete Reactor Compartment after its removal from the remainder of the hull. This option is applicable for all current submarines and has flexibility to accommodate future arisings. Phase 1 of this option will be the provision of the interim storage facility and associated support facilities. Phase 2 would include a size reduction facility built at a later date to dismantle the RC’s and hence reduce Intermediate Level Waste (ILW) volumes.

Option 2 considers early size reduction of the Reactor Compartment by dismantling the Reactor Compartments in a dedicated shielded facility. This is our recommended solution as it involves a more comprehensive waste minimisation and segregation strategy in accordance with industry best practice, and makes use of the knowledge and experience of personnel familiar with reactor decommissioning that may not be available in the future. In this option, long-lived ILW, i.e. waste where the radioactivity levels will not decay significantly with time and remain above the relevant criterion, will be encapsulated in approved containers (e.g. an industry standard 3 m³ box), overpacked and placed into a store on site or, more likely, transported to BNFL Sellafield for future storage. Remaining waste will be processed and stored in a new Waste Store. This waste can then be resorted and recategorised at the appropriate time for either continued storage or dispatch to the national waste repository if it is operational at that point. This procedure is consistent with that already carried out within

the civil nuclear industry for waste management and therefore the technology and equipment required to perform such tasks is currently available.

Siting

The interim storage of Reactor Compartments from submarines, either complete or size reduced, will require the identification of a suitable site(s) that preferably satisfy certain basic requirements or desirable attributes for the construction of the Interim Storage Facility, Size Reduction/Waste Processing Facility and Waste Store Building. These requirements and attributes are essentially:

- Nuclear licensed (existing) or authorised by Naval Nuclear Regulator,
- Ease of access for receipt of Reactor Compartments, e.g. coastal,
- Road and rail transport links,
- Existing marine infrastructure (e.g. jetty, slipways, cranes etc.),
- Existing security arrangements.

These requirements / attributes are desirable for either of the options considered within this proposal.

Clearly, to identify the most appropriate site will require further detailed discussions and the requirements assessed in depth.

An important fundamental issue in selecting the site will be the potential licensing/authorisation issues and the impact on the project programme in general. If use is made of an existing licensed site it is believed that the significance of any changes to the site Safety Case will be relatively minor. If a green field site or an existing facility that is not licensed is to be the location of the Interim Storage Facility then clear justifications will have to be made, an option study and Environmental Impact Assessment (EIA) will need to be carried out and an application made for the issue of a 'nuclear site licence', all of which could have a significant impact on the ISOLUS Project programme. This has been substantiated through informal discussions with the regulators who have indicated that to make the case for storing radioactive waste on anything other than a licensed site could prove difficult. It is acknowledged that an EIA will be required regardless of which site is selected.

If the optimum waste minimisation and segregation strategy is adopted i.e. the proposed Option 2 outlined above, preference would be given to identifying existing waste storage facilities for the long lived ILW. This would most likely result in this waste being stored at BNFL Sellafield, as this is a licensed site and already stores MoD nuclear waste. The use of BNFL Sellafield as a storage location under Option 2 will result in there being a requirement for a smaller storage facility at the proposed Interim Store site although it is acknowledged that a size reduction/encapsulation facility would be required earlier in the decommissioning programme. It is envisaged that storing smaller quantities of waste over long periods of time within the boundary of the new facility would be more acceptable to the local community and general public. Early size reduction and encapsulation process would also provide local employment.

The concept of storing Reactor Compartments as complete units i.e. Option 1 of the proposal would require the identification of a site that is suitable for storing such volumes of waste. Initial indications from BNFL are that storing the Reactor Compartments as units at Sellafield would not be a viable option. It is anticipated that potential future waste storage locations will be discussed with the National Decommissioning Authority (NDA) (currently being formed) to make optimum use of currently available or planned waste storage facilities

irrespective of the submarine decommissioning option that is selected for further development.

A potential benefit of selecting Option 2, and taking advantage of existing ILW storage facilities at BNFL Sellafield is that the transport of the size reduced waste from the Reactor Compartments from the location of the new size reduction site to Sellafield will be in accordance with nuclear industry transport practices using road, rail and sea links that are already used for transporting standard radwaste packages.

In summary, the preferred site will depend on the option that the MoD decides to take forward to public consultation and the siting will wherever possible take account of the following ways of minimising public concern:

- A publicly acceptable distance from centres of population,
- On existing nuclear sites,
- Near centres of nuclear expertise,
- Not in areas of outstanding beauty, scientific interest or other high (non-market) value,
- Equitable distribution of risks.

Safety

It is acknowledged that the organisation undertaking Project ISOLUS must comply with a wide range of safety, health and environmental legislation. Legislation requires that the organisation undertaking Project ISOLUS shall ensure, so far as is reasonably practicable, the health, safety and welfare of all employees, and other persons who may be affected by its operations, including contractors, tenants and visitors. At the same time, it will be necessary to obtain the confidence of the general public that a commercial consortium will ensure all work is carried out to the highest safety standards. Therefore, within the framework of the overall project strategy to define, develop and procure a safe and publicly acceptable method for the interim storage of radioactive material arising from decommissioned submarines it is necessary to have a safety strategy that demonstrates commitment to safety by highlighting the safety policies applicable to this Project. Much of the work proposed in developing the Project will be carried out by private companies in a partnership / consortium.

Within our proposed Consortium there is over 40 years of safety experience in ensuring the safety of submarines. This experience will provide valuable input to developing the safety strategy and safety management system most appropriate to the ISOLUS Project.

The safety management system and details of how the safety justification for the Project will be progressed is summarised below. The safety strategy for the Project will be as close as possible to that required to satisfy civil licensing procedures even if the preferred location for the Interim Storage Facility is on an MoD site.

Safety Management System

The safety management arrangements that will be in place will be in full consideration of the requirements of The Management of Health & Safety at Work Regulations 1999.

The safety management system together with the physical safeguards in place are to prevent accidents and restrict radiation exposure from normal operations to the public and employees.

The responsibility for safety, which is incumbent of the Director of Safety, will be discharged by:

- The safety management system which includes the provision of safety documentation, safety committees, safety monitoring and review activities;
- The appointment of Duly Authorised Persons (DAPs) to supervise and control operations and activities with implications for safety;
- Ensuring that only Suitably Qualified and Experienced Persons (SQEPs) are appointed to any posts which have implications for safety.

A Project Director/Manager will oversee all aspects of the Project, supported by staff from within our proposed Consortium appointed to undertake specific functions in relation to the interim storage of the radioactive material from laid-up submarines.

Safety Activities and Documents

The Safety and Environmental teams will have an input to all project activities and will have the joint objectives of:

- Assisting the design teams to produce the most efficient design to meet the required performance and safety levels; and
- Performing the assessment and preparing the documentation required to justify the safety of the design and the future operation of the facility i.e. the Safety Cases. The Safety Cases, which will meet the civil regulators requirements, are very stringent. Before each operation can be carried out i.e. from construction, commissioning, facility operations and subsequent decommissioning, a safety case has to be submitted to the regulatory authorities for approval before the work can commence. The degree of scrutiny and the regulatory requirements are discussed in further detail below.

Interfacing with other Partners

Development of the project designs will be an iterative process in which the Safety and Environmental Consultant must be fully integrated. The principle interfaces with the design partners will occur during the hazard identification exercises, development of safety functional requirements, the hazard analysis exercise and while assisting with the design substantiation.

To enable these activities to be carried out efficiently, it will be essential that links are set up with the other Consortium partners which will ensure the proper flow of, firstly, up to date design information, and secondly, timely information on the results of the safety assessments to the other partners.

It will be the intention that in the early days of the proposed interim store concept stage to hold a workshops with the Consortium partners to develop a common understanding of key safety and environmental considerations and to identify how they can best be carried forward into the Project. The top themes would be published to all members in the Consortium, to ensure that safety and environmental aspects are prominent to all team members.

Scrutiny

Regulation

The degree of scrutiny and those regulatory bodies that will be involved depends largely on the siting of the facility and the particular activity within the overall Project programme that is being carried out. A summary of the regulatory bodies with which there will be an involvement through each major stage of the Project strategy is discussed below.

Removal of Reactor Compartment (Reactor Compartment)

If use is made of an existing licensed nuclear site (e.g. Devonport or Rosyth), regulation would be conducted by the Health and Safety Executive, Nuclear Installations Inspectorate (HSE/NII) against the existing license. It would only be necessary to modify the existing safety cases to justify safe removal of the Reactor Compartment. It is believed that the significance of any changes to the safety case will be relatively minor. Although the NII would take primacy with respect to the regulation of the licensed site, the MoD regulator i.e. the Chairman of the Naval Nuclear Regulatory Panel (CNNRP) does have responsibilities with respect to DDLP submarines. Also he would maintain a watching brief with respect to the activities being undertaken on the licensed site.

Any waste material that is generated under this task will be quarantined and appropriate waste disposal arrangements implemented in accordance with the requirements of the Environmental Agency/Scottish Environmental Protection Agency (EA/SEPA) to comply with the Radioactive Substances Act 1993 (RSA93).

Transfer to Interim Storage

Transfer of all radioactive material within the scope of this project will be subject to national regulations including The Road Transport Act 1991, Transfrontier Shipment of Radioactive Waste Regulations 1993, Transport of Radioactive Substances Regulations 1996, Transport of Radioactive Materials by Rail Regulations. Consideration will also be given to the National Radiation Protection Board (NRPB) document 'UK Guidance on Radiation Protection Programmes for the Transport of Radioactive Material.

Consideration will be given to the International Maritime Dangerous Goods (IMDG) Code to confirm the need or otherwise for licensing of transport.

Interim Storage

If the interim storage facility is located on an MoD Site, primacy for the regulation of the site will fall to CNNRP using the requirements presented in the Joint Services Publication JSP518. It would be expected that a full suite of safety case documentation would be required, i.e. Safety Justification Plan/Safety Principles Paper (SJP/SPP), Preliminary Safety

Report (PSR), Pre-Construction Safety Case and Pre-Operational Safety Case. The location of the storage facility would also comply with the Ionising Radiation Regulations 1999 (IRR's) and RSA93.

The Radiation (Emergency Preparedness and Public Information) Regulations 2001 (REPPIR) will also have to be adhered to which will require the production of a HIRE (Hazard Identification and Risk Identification) Report for the Local Authority to enable them to produce an Emergency Plan.

Final Cut Up

Final decommissioning operations in a dedicated Size Reduction Facility, including decontamination, size reduction, waste segregation and packaging will be fully compliant with the requirements of RSA93, REPPIR and IRR's or their successors.

Transfer to Final Repositories

The appropriate transport regulations that have been outlined in 'Transfer to Interim Storage' discussed above will be applied.

Safety Approvals, Categorisation and Licensing

The regulator will see all Safety Cases as the Project develops, and once approved the operator will be required to comply with them. Any changes to the Safety Case must, in most cases, be approved by the regulator before they can come into effect. An approval route will be established for all Safety Cases and any such modifications (which will be approved by the regulator), the main elements of which will be:

- i) a Categorisation procedure that defines the appropriate approval route according to the safety importance
- ii) an independent review of the safety documentation (Peer Review)
- iii) submission of safety justification documents to NII or the CNNRP where appropriate.

With regard to licensing/authorisation issues and the potential impact for the safety case and the Project programme in general, this will be dependent of the proposed site of the interim store/size reduction facility. If use is made of an existing licensed site it is believed that the significance of any changes to the safety case will be relatively minor. If a green field site or an existing facility that is not licensed is to be the location of the Interim Storage Facility then the award of a licence will be necessary which could have an impact on the programme.

Openness

A fundamental aspect of the ISOLUS Project since its inception has been that the public should participate and be consulted in the relevant social and environmental issues. The benefits of this consultation include "more responsive decision making and service provision, wider acceptance of decisions, the development of more constructive relationships and better understanding, and amore comprehensive knowledge base."

There is no doubt that public consultation and stakeholder engagement is of primary importance in order to overcome the apparent public concerns/perception of the problems associated with radioactive waste material and to ensure that the proposal links in with the emerging national strategy.

The consultation paper ‘Managing Radioactive Waste Safely’ was published by DEFRA in September 2001, launching an initial process of consultation which ended in March 2002. This paper demonstrates the wish of the government to involve the general public in the wider debate including radioactive wastes generated by the MoD. Paragraphs 2.27 and 2.28 of this paper set out the MoD’s position:

“Where legislation does not apply to the Ministry of Defence it is Ministry of Defence policy to ensure where practical standards are at least as good as those required by legislation. It is also MoD policy at regular intervals to invite the Government’s independent advisors, the RWMAC, publicly to review radioactive waste management practices at Ministry of Defence sites and those of its contractors.”

“The Ministry of Defence has made considerable progress in adopting civil regulation for defence sites e.g. through the privatisation of dockyards and the management of the Atomic Weapons Establishment. In the light of these advances, the Government agrees in principle that, in order to increase public confidence, Ministry of Defence radioactive wastes should be disposed under the civilian regulatory regime, provided that issues of national security, the operational effectiveness of the armed services and cost can be resolved.”

Openness, transparency, full stakeholder engagement and public participation are key to ensuring the delivery of a planning permission(s) within a realistic timescale. Similarly, such engagement is crucial to avoid criticisms of prematurity in advance of the finalisation of a national strategy for the management of all radioactive waste.

Clearly the industry as a whole has become more transparent in recent times in its engagement with the general public and interested parties. There have been a number of recent consultation exercises and procedures to ascertain and identify the extent of public/stakeholder perception towards radioactive waste.

Much of the research received suggests that the public is suspicious and distrustful of the nuclear industry in general (and now the MoD with respect to military applications of nuclear technology) and wary of its communications. Discussions of the industry tend to lead to a demand for more information, much of it to do with the management of radioactive waste – the volumes and locations of storage in the UK and elsewhere, the radioactive life of the waste. These sorts of questions surface more readily than any concerned with the benefits of the technology.

It is nevertheless clear at the outset that this issue will be a key consideration throughout the planning process. In this context, full consultation will be fundamental in the pre-application submission phase of the process. It will be a fundamental component of the EIA process. Any assessment would be deemed to be flawed if there is insufficient public/stakeholder participation. Open discussion on the environmental and social effects of the proposal can help to allay fears and promote increased acceptance to the Project in general.

In taking this Project forward, there will need to be a full appreciation and realisation of the importance of building upon and linking with the previous extensive consultation processes, some of which are still ongoing. The task of this project is to extend this consultation still further to most effective advantage.

To accommodate these attributes, it is intended that full and complete dialogue will be maintained via an open consultation process at all stages as the Project progresses. Every opportunity for public consultation, either as a legal requirement or from a Consortium commitment to conduct the Project in as open a manner as possible will be taken.

Transport

There are a number of transportation issues that will need to be addressed relating to the importation and export of material to and from each of the sites; associated construction traffic in the development of any buildings/structures; increased traffic generated by the workforce; and support facilities and associated maintenance. The need to identify an integrated transportation strategy will be important to demonstrate key transport modes/linkages by road/rail/sea. There may be a need for localised off-site highway improvements and additional rail/sea collection and delivery facilities. Increased traffic is always an emotive issue. Increased traffic involving the transportation of radioactive material will be even more emotive. In assessing the suitability of alternative sites, due consideration will need to be had to minimising the length of the journey and the Interim Storage Facility to minimise public concerns with associated health and safety risks.

The proposed options for decommissioning and eventual disposal of the submarine fleet will require the movement of substantial items namely:

1. Transfer by sea of the seven decommissioned submarines from Rosyth to either DML or other facility where the Reactor Compartment's can be removed.

Some discussion has taken place on the advantage of using a semi-submersible ship or a towing barge. As a result of these discussions, our current opinion is that the use of a semi-submersible ship to bring the seven submarines individually down from Rosyth to Devonport for Reactor Compartment removal is the preferred option on safety and cost grounds.

A semi-submersible ship is less dependent on the weather reducing the programme risk. Indicative costs have been obtained for the use of suitable ships to carry the submarines, whole or cut up sections, for processing at sites. This method is considered the safest and was used before for transferring HMS Nottingham from Australia back to Portsmouth by "Dockwise" – Holland.

2. Transfer of residual hulls from site of Reactor Compartment cut out to final dismantling yard

This could also be accomplished by transfer on a semi-submersible ship or purpose built tow barge depending on the relative locations of Reactor Compartment cut out and final residual submarine sections dismantling facilities.

3. Transfer of Reactor Compartment by sea from Reactor Compartment cut out site to road access point for transfer by road to storage/ waste processing site

It is envisaged that the cut out Reactor Compartment slice would be slid sideways and secured onto a purpose built barge docked alongside the submarine. The barge could then be towed to a suitable point for unloading the Reactor Compartment either direct to the Interim Storage Facility if this is close to unloading point or to some means of road transport. This will be a significant transport operation in terms of size of load,

but experience in heavy transport with low impact techniques exists commercially. Such methods were used for the transport of the Naval reactor to Dounreay for the Vulcan shore test prototype and allow the move to be undertaken even, in remote areas of natural beauty, with little temporary and no permanent impact. There would only be approximately one such move per year over the period of decommissioning.

4. Transfer by road of cut out Reactor Compartments to storage/ waste processing site

Given the size and weight of the Reactor Compartment section, land transport of this item to the Storage/ Waste Processing facility will be difficult but should not pose insurmountable problems. It is most likely that this transport will be via wheeled transport utilising appropriate lifting equipment for load/unload at either end of the route.

5. Transfer of Low Level Waste (LLW) to Drigg

Any waste removed from the Reactor Compartment that can be categorised as LLW will be transported to the national LLW repository at Drigg, Cumbria in standard "ISO" containers. These containers meet requirements stipulated in the Transport Regulations relevant to the movement of radioactive waste. The most appropriate means for transport of these containers, i.e. road, rail, sea or a combination of these, depending on the location and access chosen for the site of the Reactor Compartment cut up facility will be used. It is anticipated that 50 m³ of LLW will be generated per Reactor Compartment. This corresponds to less than 4 container lorry trips per year and this should not prove a significant impact in itself

6. Transfer of ILW to site of national ILW repository

From the information obtained it is assumed that the reactor pressure vessel, core barrel and thermal shield will remain as Intermediate Level Waste for over 100,000 years and therefore could be consigned in its final waste form as soon as possible. The intention would be to place this waste after size reduction into 3 m³ boxes, which would be encapsulated to the required waste form specification. The waste box could then be placed in an overpack to obtain sufficient attenuation of dose rate and placed into store on site – "the Waste Store".

Alternatively the encapsulated waste in the box could be transported in a Type B package and by arrangement with BNFL Sellafield placed in the Miscellaneous Beta Gamma Waste Store (MBGWS) until the national repository was available. Members of the Consortium have designed, built, commissioned and operated a number of waste packaging plants for UKAEA and BNFL Magnox, which utilise the techniques mentioned above. Estimates predict that each Reactor Compartment will require eleven 4m³ waste containers for the ILW. Thus the ILW and LLW total transport requirement will be around fourteen trips per year.

Workforce

A skilled workforce will be required to carry out all aspects of the ISOLUS Project. Familiarity with the technical and structural aspects of submarines, nuclear SQEPness, and radwaste management will be essential attributes. Advantage will also be taken of detailed knowledge and experience contained within MoD and dockyard staff to undertake decommissioning safely and economically. It is envisaged that there will be very close integration and interaction of the teams drawn from the MoD, the Dockyards and the Consortium. The advantage of using our proposed option, i.e. early cut up of the Reactor Compartment is that it utilises decommissioning skills currently available within the Consortium. There is a good chance that these skills will be lost as the civil nuclear industry programme for decommissioning land based reactors intensifies and staff move away or retire.

No matter how well recorded the details of the submarines the hands-on knowledge will not be available if long-term Reactor Compartment storage is adopted. The Consortium work force is experienced in nuclear submarine safety, building of civil structures and the cut-up, encapsulation and storage of radioactive waste. This combined with the advantage of using an existing licensed site is that it already has the correct culture, the appropriate facilities and an informed and trained and experienced workforce to handle the hazards posed by disposing of decommissioned submarines. The intention is to use the local workforce wherever possible, and to provide for local training as well as employment to ensure the continuity of available skilled labour.

Environmental Sustainability

The concept of sustainable development has been around for a number of decades. A widely-used international definition is 'development which meets the needs of the present without compromising the ability of future generations to meet their own needs'.

In May 1999 the Government published its White Paper, *A Better Quality of Life: a strategy for sustainable development for the UK*, which sets out the Governments guiding principles. This brings the environment, social progress and the economy alongside each other, aiming to put sustainable development at the heart of policy making. The broad objectives underlying the strategy are:

- Social progress which recognises the needs of everyone;
- Effective protection of the environment;
- Prudent use of natural resources; and
- Maintenance of high and stable levels of economic growth and employment.

In simpler terms, at the heart of sustainable development is the simple idea of ensuring a better quality of life for everyone, now and for generations to come.

Environmental sustainability issues to address as part of the ISOLUS Project would include climate change; protection of human health and safety; and protection of natural and built environment. These are in fact issues that would have to be addressed as part of the Environmental Impact Assessment (EIA) to be prepared for the Project.

EIA can be described as a procedure that enables the likely effects on the environment of a development to be fully appraised and taken into account before the development proceeds. It also serves to provide information to statutory bodies and other interested parties including the general public about proposed developments and their likely effects on the environment.

Standard methodology for environmental assessment involves a description of the baseline environmental information and the proposed development, followed by the identification and assessment of key impacts, including the incorporation of mitigation measures to reduce the scale or magnitude of potential identified impacts.

The EIA for the ISOLUS Project would be carried out in accordance with the latest Government EIA regulations and good practice guidance, and would cover all sites, decommissioning phases and activities.

Environmental issues to be considered as part of the EIA process for the ISOLUS Project include the following:

- Ecology;
- Air quality and climate;
- Noise and vibration;
- Geology and soils;
- Water resources;
- Landscape and visual;
- Archaeology and cultural heritage;
- Socio-economic issues;
- Transportation;
- Waste management (including minimisation);
- Planning framework;
- Unplanned incidents and contamination;
- Radiation;
- Health and Safety; and
- Sustainable Development.

Consultation plays a key role throughout the EIA process. Consultation is the process by which those organisations or individuals with an interest in the area of the proposed development are identified, and consulted to obtain baseline information and convey their opinions or concerns. Public consultation and participation in EIA is essential and represents best practice. It aims to ensure the quality, comprehensiveness and effectiveness of the EIA,

and that the public's views are adequately taken into consideration in the decision-making process.

It is envisaged that the work to be done as part of the EIA process including the input into the selection of the final option for the Project would provide an appropriate framework to cover environmental sustainability issues during the Project life.

It is important to note that environmental sustainability should be addressed in an integrated manner throughout the whole Project life and should be part of the overall design solution and EIA process. Early and continuous involvement of the environmental team (as well as health and safety and engineering teams) would therefore be of key importance. Through consultation with stakeholders a series of environmental sustainability guidelines could be developed and used to monitor the performance and progress of the Project.

It is important to involve both statutory consultees and the local community from the early stages to make sure that the overall scheme is understood, agreed and accepted/legitimated. Lack of information or misinformation might cause resentment or criticism, which will negatively affect the overall Project.

Development

The options considered as part of this proposal result in a requirement for a facility that is unique in nature for submarine components i.e. an interim storage facility for either complete Reactor Compartments (Option 1) or size reduction facility and new waste store (Option 2). An innovative approach to the design will be considered taking into account current technology and industry best practice wherever possible. There are accepted industry standard designs for waste processing including waste packaging, waste transport and subsequent waste storage routes and it is considered prudent to adopt these schemes in general such that cost and dose penalties are not incurred in developing a new solution or refurbishing an existing active facility. However, there may be limited development work required to facilitate the removal of the Reactor Compartment from the submarine and transport to the Interim Store or Size Reduction Facility although a solution to this is anticipated to be achieved using standard engineering techniques.

Given the proposed programme for the ISOLUS Project as a whole and the length of service of those submarines that will remain operational into the future there is scope for reviewing the decommissioning techniques and methodologies applied as the Project progresses. This will be an ongoing project development task to ensure that the most appropriate technical solution is applied to the Project. The companies who are part of this Consortium are at the forefront of this type of work and are aware of the latest developments in this field of work.

At this stage the scope of this proposal considers the decommissioning of the nuclear submarines and in particular the processing of the Reactor Compartments once they have been removed. However, if the recommended waste minimisation and segregation option is adopted as the preferred solution i.e. Option 2 there is the potential to use the Interim Store/ Size Reduction Facility for processing other plant and materials that require similar treatment that may not necessarily have been generated from the submarine decommissioning project.

Developments outwith the scope of the ISOLUS Project may result in the potential to use the size reduction facility to reduce waste volumes to a size that may be accommodated by decontamination facilities such as the MEDOC (Metal Decontamination by Oxidation with

Cerium) chemical treatment plant. This would provide scope for decontamination of items to a level where they may be considered for free release and as such treated as conventional scrap. This would have the benefit of reducing volumes of waste that require on site storage.

Further development of the basic schemes considered in this proposal may maximise the utilisation of the available plant. Consideration could be given to combining waste flows with civil wastes and locating a larger plant at a site suitable for both, but this would require extensive development with the Nuclear Decommissioning Authority. A more innovative possibility would be to construct the encapsulation plant on a sea worthy platform that may be floated from the site of the Interim Store to any sea- access location where other similar operations may be carried out.

It is our view that such possibilities should be explored but that to ensure the success of ISOLUS we must be fully ready to implement an “MoD” solution soon, without ties to uncertainties in other programmes.