SDP TECHNICAL OPTIONS STUDY

Options Report

FNC 35114/35042R Issue 2

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Issue	Date	Comment
1	Dec 2008	Frazer-Nash authored report incorporating comments from workshop attendees
2	Jul 2010	MoD update incorporating comments from Advisory Group members

SUMMARY

The Interim Storage of Laid-Up Submarines (ISOLUS) project (now the Submarine Dismantling Project (SDP)) has been tasked with the development and implementation of a safe, environmentally responsible, secure and cost-effective solution for the dismantling and eventual disposal of the UK's nuclear powered submarines in a manner that inspires public confidence.

The objective of the Technical Options Study is to compare the technical aspects of the three options under consideration for the interim storage of intermediate level waste from the dismantling of nuclear submarines. These options are:

- **Option 1:** Reactor Compartment Storage
  Storage of intact reactor compartments cropped from the submarine;

- **Option 2:** Reactor Pressure Vessel Storage
  Storage of the reactor pressure vessel together with other large items; and

- **Option 3:** Packaged Waste Storage
  Storage of separated and packaged Intermediate Level Waste.

The focus of the Technical Options Study was to identify features of the three options that would impact on their implementation with a view to reducing the number of variables that will have to be addressed in the ongoing procurement strategy. In order to consider the wide range of issues associated with the three options it was appropriate to seek inputs from significant stakeholders. To facilitate this approach the methodology was structured around two stakeholder workshops. The workshops provided the opportunity for a cross section of stakeholders including the MoD, subject matter experts and representatives from across the ISOLUS Advisory Group (IAG) to contribute to the study.

The second stakeholder workshop was held at the Frazer-Nash offices in Dorking on 9th and 10th October 2008. The objective of this workshop was to determine how each of the three options performs against each of the attributes and to understand the relative importance of the attributes by completing a weighting exercise. This document presents a structured commentary of that workshop, and draws together the outcomes; it is supported by the Attributes Report [Ref. 2] and Data Report [Ref. 3]. The methodology for the Technical Options Study is detailed in the Methodology Report [Ref. 1].

The stakeholder workshop did not identify a clear preference for any of the three options, based on the currently available information. However, Reactor Pressure Vessel Storage was the least preferred option and indeed it was not the preferred option under any of the attributes considered. Overall, stakeholders saw little merit in this option, and the focus of the majority of the discussion was on the options of Reactor Compartment storage and Packaged Waste storage.

It was noted that some stakeholders found it difficult to make a judgement on their preferred option on some attributes, given the level of detail with which information can

be generated at the current stage of development. These stakeholders are likely to be more comfortable in expressing their preferences when greater clarity in the definition of the ISOLUS processes is available. Furthermore, some stakeholders did not view some of the information presented in the data report [Ref. 3] as credible, particularly that relating to deliberate or accidental radiological discharges, and the radioactive waste inventory arising from each of the processes.

A number of recommendations arise from this work, principally:

- Further public consultation should be undertaken, providing the best available information to the public and inviting them to express their opinions in the light of this, since the detail of the options and the information available has advanced significantly since the Consultation on Outline Proposals (CIOP) was conducted in 2003.
- Work should be undertaken, to identify the radioactive inventory, as well as the radioactive discharges and doses arising from each of the options. The effects of any differences in dose, discharges, or inventory should then be explored to identify whether these aspects differentiate between the options. This work must be credible to all stakeholders, and it was suggested in the workshop that "co-production" of such information between the MoD and other experts, trusted by non-technical stakeholders, should be considered to address this issue.
- Further work should be undertaken to examine the effectiveness of the Reactor Compartment both as a transport and as a storage container, in comparison to a Nirex box.

CONTENTS

1. INTRODUCTION

1.1 BACKGROUND

The Intermediate Storage of Laid-Up Submarines (ISOLUS) project has been tasked with the development and implementation of a safe, environmentally responsible, secure and cost-effective solution for the dismantling and eventual disposal of the UK's nuclear powered submarines in a manner that inspires public confidence.

During a previous phase of the ISOLUS project a range of interim storage options were investigated. At this stage, the options of storage of intact submarines, either afloat or on land, were rejected, as was the option of afloat storage of cropped submarines. Three land storage options merited further consideration. These are:

- **Option 1:**
  Storage of intact reactor compartments cropped from the submarine;
- **Option 2:**
  Storage of the reactor pressure vessel together with other large items; and
- **Option 3:**
  Storage of separated and packaged Intermediate Level Waste.

Ministerial approval was given to investigate these options in more detail. The MoD is undertaking a number of activities to complete this investigation. One element of this work is the Technical Options Study. MoD has contracted Frazer-Nash Consultancy Ltd to carry out the Technical Options Study on its behalf. This report describes the outcome of the assessments carried out by Frazer-Nash during the study.

1.2 TECHNICAL OPTIONS STUDY

The objective of the Technical Options Study is to compare the technical aspects of the three options for the interim storage of intermediate level waste from the dismantling of nuclear submarines. The focus of the work was to identify features of the three options that would impact on their implementation with a view to reducing the number of variables that will have to be addressed in the ongoing procurement strategy.

The methodology employed for the Technical Options Study is described in detail within a Methodology Report issued in June 2008 [Ref 1]. An overview of the methodology is shown in Figure 1-1.

In order to consider the wide range of issues associated with the three options it was appropriate to seek inputs from significant stakeholders. To facilitate this approach the methodology was structured around two stakeholder workshops. The workshops provided the opportunity for a cross section of stakeholders including the MoD, subject matter experts and representatives from across the ISOLUS Advisory Group (IAG) to contribute to the study.

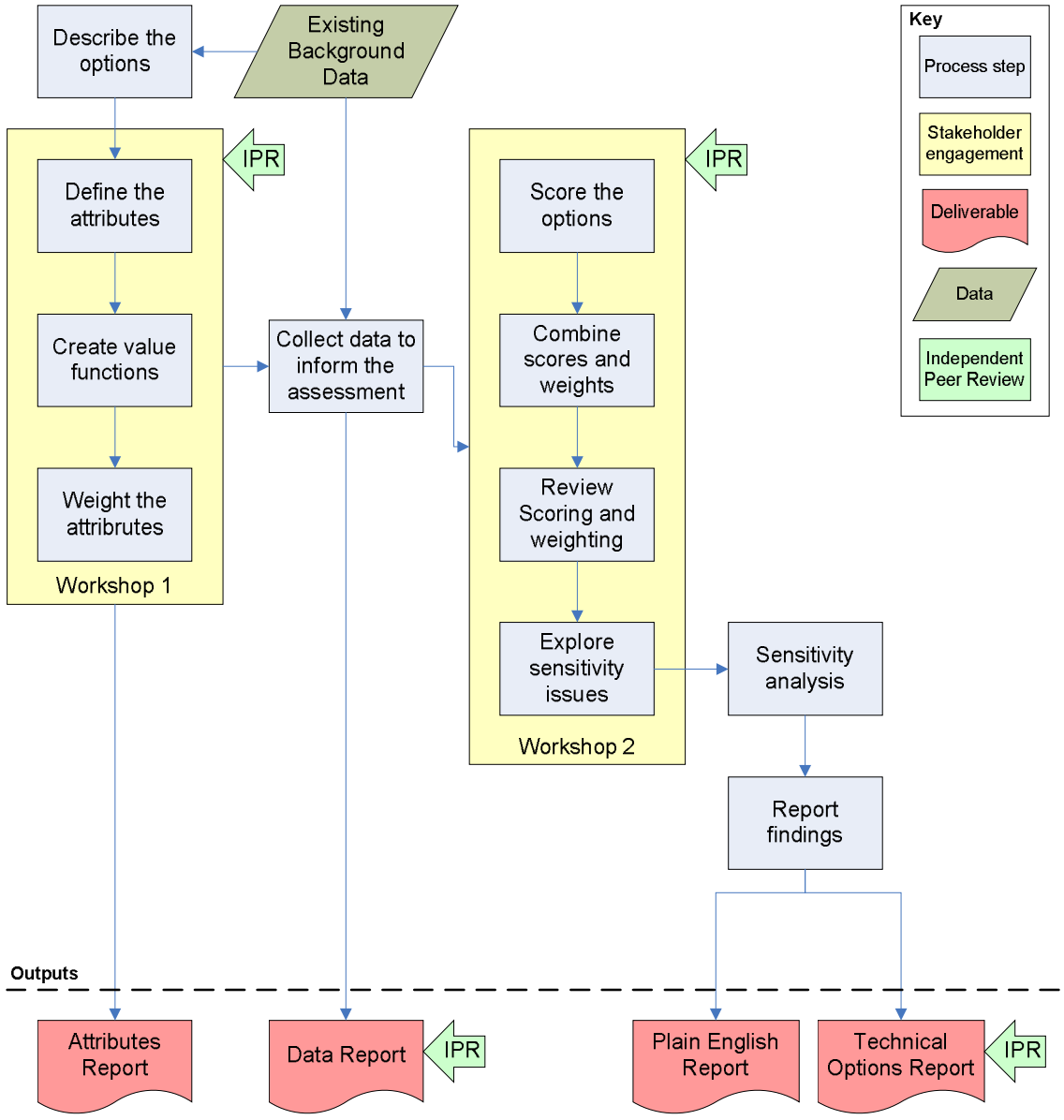


Figure 1-1: ISOLUS Technical Options Study Methodology

The attributes workshop (Workshop 1 in Figure 1-1 above) was held on Thursday 17th July 2008, at the Frazer-Nash offices in Dorking. The objective of this workshop was to identify and agree a set of attributes to aid in discriminating between the three options. A draft report detailing the activities and outcome of the workshop and describing the attributes was issued on the 5th August 2008 [Ref 2].

Following the issue of the Attributes Report, Frazer-Nash collated the background data that was made available and identified how this data could be used to inform stakeholders' assessment of the options under each of the attributes. This information was described in the Data Report [Ref 3] which was issued to stakeholders in advance of the second workshop. Stakeholders were asked to provide any additional data that they felt could contribute to the assessment of the options. A CD-ROM containing

copies of the background data was sent to stakeholders by the MoD in advance of the second workshop.

1.3 SUBJECT OF THIS REPORT

The second stakeholder workshop (Workshop 2 in Figure 1-1 above) was held at the Frazer-Nash offices in Dorking on 9th and 10th October 2008. The objective of this workshop was to determine how each of the three options performs against each of the attributes and to understand the relative importance of the attributes by completing a weighting exercise. This document presents the outcome of that workshop:

- Section 2 of this document discusses the conduct of the workshop, including the attendees and the adaptations to the methodology;
- Section 3 provides a structured commentary on the scoring of each of the options;
- Section 4 discusses the weighting of the attributes;
- Section 5 reviews the outcome of the workshop;
- Section 6 explores factors that could affect judgements made during the workshop;
- Section 7 draws conclusions from the work; and
- Section 8 presents recommendations arising from the work.

2. WORKSHOP NOTES

The second stakeholder workshop (Workshop 2 in Figure 1-1 above) was held at the Frazer-Nash offices in Dorking, commencing at 11:45hrs on 9th October 2008, and concluding at 13:45hrs on 10th October 2008. Stakeholders were provided with a briefing pack [Ref 4] one week before the workshop. The briefing pack described the aims of the workshop and outlined the process to followed.

2.1 ATTENDEES

Stakeholders	
Bill Thompson	Lancaster University
Peter Lanyon	Interpreting the public view
Ian Avent	CANSAR
Max Wallis	Cardiff University
Jane Tallents	The Nuclear Submarine Forum
Cynthia Chia	Environmental Specialist (Frazer-Nash)
Alan Pryce	Health & Safety Specialist (Frazer-Nash)
Paul Naylor	Environment Agency
Les Netherton	IAG Chairman
Chris Hargraves	MoD ISOLUS
Phil Ahmet	MoD Health Physicist
David Wells	Nuvia Ltd.
Steve Woodley	MoD ISOLUS
Duncan Lyne	Defence Nuclear Safety Regulator
Dave Wilcox	MoD Defence Estates
Shelly Mobbs	Health Protection Agency
Peer Reviewers	
Prof. Malcolm Joyce	Lancaster University (Peer Reviewer)
David Collier	IAG (Peer Review Observer)
Paul Dorfman	IAG (Peer Review Observer)
Frazer-Nash	
Peter Entwistle	Facilitator
Ian Watson	Project Manager
Tim Andrews	Frazer-Nash ISOLUS project team
Edd Goddard	Frazer-Nash ISOLUS project team

All of the organisations invited in the briefing pack [Ref 4] attended the workshop, apart from the NDA who, unfortunately, were not able to support the workshop dates. All workshop attendees were present from the beginning of the workshop; Three stakeholders left during the last hour of the workshop to make transport connections as the workshop overran its intended finishing time.

During the introductions at the start of the workshop the Environmental Agency (EA) explained that there may be instances during the discussions where they could have a conflict of interest as they were both a stakeholder and the regulator.

Peter Lanyon explained his reliance on historic data to represent public opinion, and made the workshop aware of the difficulties of relying on historical information in this

context. In response some stakeholders said Peter should contribute as usefully as he could from his wider background, others admitted that the public view was likely to be un-representable, and that there was not much that could be done about this.

2.2 WORKSHOP APPROACH

Frazer-Nash explained that the purpose of the two workshop days was to achieve a structured commentary on the three options. It was made clear that the aim was not to 'select' a single option. Rather than being the end of a process, it was stressed that this is the beginning of a process in which there will be future opportunity for scrutiny of aspects of the options and changing points of view.

Stakeholders were reminded that discussion over the two days should be focussed on the three defined options, not on alternatives to these options, and that stakeholders should concentrate on the highlighting issues that revealed differences between the options.

Frazer-Nash also explained that they had modified the original approach for the workshop based on stakeholder concerns and feedback from the attributes workshop. Numerical analysis would not be pursued, rather the approach would be based around a structured commentary on the options, exploring and highlighting the key issues that underpin this commentary. For each attribute, stakeholders would be asked to select the "most attractive" and "least attractive" option, and to discuss the performance of the third option relative to the most and least preferred. It was stressed that it was not necessary to achieve consensus on each attribute; where multiple views were put forwards, the range of views would be recorded. During the workshop one stakeholder expressed that they were not necessarily happy with the 'most attractive option' and 'least attractive option' terminology and would probably prefer a scale ranging from 'worst' to 'least worst'.

The stakeholders sought clarification on how the technical options study fits in to the overall ISOLUS project. The MoD responded by confirming that the technical options study was to be one of a small number of papers aimed at helping the MoD with discussions on ISOLUS issues. MoD estimated that a preferred way ahead would be issued within 18 months.

2.3 FEEDBACK FROM THE STAKEHOLDERS ON THE PROCESS TO DATE

The adequacy and accuracy of information within the Data Report [Ref 3] was questioned by one stakeholder, in particular the presentation of the options. Two stakeholders expressed the view that a fortnight was insufficient time to go through the data report of forty-nine references and that they felt that the process was being undertaken in an unnecessarily short time period. One stakeholder reinforced this point and commented that they had not received their CD-ROM of the references as yet.

In reply the MoD acknowledged that they did not appreciate that the stakeholders would wish to review all the supporting references in detail before the workshop, and hence all CD-ROMs had been posted in time to arrive before the workshop. The concerns were noted by the MoD and facilitator. Stakeholders were given the option to postpone or continue with the workshop. Stakeholders agreed that the workshop should proceed but that these comments would appear in the final report.

One stakeholder raised the 'Interim Storage Optioneering Report' which was not reviewed in the compilation of the data report, but was released by the MoD on the CD-ROM of supporting references. The stakeholder expressed concern that a closed MoD workshop had taken place (in April 2007), the output of which showed a definite leaning towards one option. They highlighted that public acceptability was not included in this MoD workshop, and that the technical options study stakeholders had not been informed of its existence until the Monday before this workshop. The stakeholder was particularly concerned that public acceptability had been neglected by the MoD and that this information had been intentionally kept from the IAG.

One stakeholder asked whether or not there would be further opportunities for public consultation after the technical options study. MoD confirmed that there would be further public consultation within the ISOLUS programme.

In response to the request to stakeholders to provide additional data to complement that referenced in the Data Report, two additional documents were supplied in advance of the workshop. These were:

- The Application by Devonport Royal Dockyard Limited to Dispose of Radioactive Wastes from Devonport Royal Dockyard Plymouth – Response by South & West Devon and Cornwall & Isles of Scilly Health Authorities, Ref BI 5442, Dated May 2001; and
- Minutes from a meeting of the Edinburgh City Council Environmental Quality Security Panel 07/12/2000.

Copies of these documents were provided for each stakeholder at the workshop.

An untitled document on relevant dates for the ISOLUS submarines was brought to the workshop by a stakeholder, and was copied and distributed to the workshop attendees.

Two other documents were tabled by stakeholders during the workshop:

- Edinburgh City Council criticism of the proposed Renown Cut-up (May 2000).
- A newspaper cutting from the Sunday Herald, 6th May 2001 under the headline Plan to Dismantle Nuclear Sub at Rosyth is 'Half-Baked'.

2.4 FILTERING OF THE ATTRIBUTES

Concern was expressed that the attributes had been filtered in the time between the first and second workshops, and that stakeholders had not been engaged in this process. Frazer-Nash explained that, in accordance with the IAG process for the technical options study, the attributes report [Ref 2] had been available for comment by stakeholders for eight weeks and expressed surprise therefore that no comments had been received from stakeholders in the intervening period.

Stakeholders were asked to explain which issues gave rise to concern. These were identified as:

- Availability of sites
- National repository
- Containment
- Transport

- Facilities

Frazer-Nash explained that each of these issues were characteristics of options and not attributes that differentiate between the options. The example was given that the amount and type of transport associated with an option is a fundamental characteristic of the option. It is not helpful to simply assess the amount of transport associated with an option; it is more instructive to asses the effects of transport, such as public safety, nuisance, public acceptability etc. Each of these issues are captured as separate attributes.

There was much discussion around this subject, with particular emphasis on transport. Several stakeholders from a variety of affiliations stated a preference for transport to be a stand alone attribute. Frazer-Nash stressed again that transport is a characteristic of the options and the impact of transport is assessed through its effect on a number of attributes. If transport were included as an attribute it would be difficult to avoid double counting between the attributes and hence distorting the outcome of the assessment. Following discussion, stakeholders were content that transport aspects could be addressed within the existing attributes but requested that a separate commentary on transport issues should be provided in the Options Report.

The issue of “Extensibility”, raised during the first workshop, was highlighted again. It was confirmed by the MoD that the technical options study shall consider the scope of the ISOLUS programme to be limited to the 27 submarines currently stored afloat and in-service. It was noted that this modifies the assumption made in the attributes workshop and hence the MoD took an action to confirm this issue.

The “Intergenerational Endowment” attribute was discussed. Concern was raised that longer term issues, such as collective dose to future generations, were not being captured. Concern was expressed that only those factors which were likely to change within the timescales of the ISOLUS programme were being considered. Factors such as institutional breakdown were highlighted as an example of an attribute which was not being considered. However the MoD health physicist clarified the position, explaining that since all options left the waste in the same form at the end of the ISOLUS programme (in Nirex boxes) the collective dose over say 1000 years will be the same for all options and hence that time dependence need not be considered in this study as it would not reveal any differences between the options.

Some stakeholders were clearly uneasy that all three options under discussion concluded with the waste packaged in Nirex boxes. The root of this concern appeared to lie in the assumption that the National Repository would be available to accept such packages. Some stakeholders requested that the MoD should provide information on the National Strategy for radioactive waste (such as that the MoD accounts for only 4% of total UK radioactive waste) to set these discussions in context.

At the conclusion of these discussion Stakeholders were content to proceed with the attributes as presented in the Attributes Report [Ref 2] on the basis that their concerns had been noted and would be reported.

3. SCORING THE OPTIONS

3.1 SCORING PROCESS

Each attribute was considered by the stakeholders in turn. In order to generate discussion, one stakeholder was asked to introduce each attribute, summarising the relevant information and present on initial view on the attractiveness of the options. Stakeholders were then invited to discuss and challenge this interpretation of the information.

After stakeholders had been given the opportunity to explore and discuss the issues they felt were pertinent to the attribute, they were asked to identify the most attractive option, the least attractive option, and the relative performance of the third option on that attribute. These views were recorded, displayed and agreed by stakeholders using a standard template, the position of the slider indicating the relative performance of the third option. The three options are indicated as follows on the template:

- Option 1 "RC Storage"
- Option 2 "RPV Storage"
- Option 3 "Package Storage"

In some instances stakeholders' views were that there was no material difference between the options, in which case the template records "All Same". In other cases the view was that there was currently insufficient data available to form a view on the performance of the options against the attribute, and the template shows "Insufficient Data".

The completed templates for each attribute are reproduced in the discussions below.

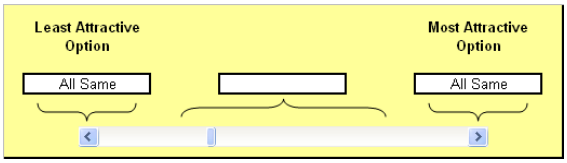
On some attributes a consensus was not reached and for these attributes the conflicting points of view were both recorded. The information recorded, and the supporting discussions, are presented in the sections below.

3.2 COST - TOTAL COST

The difference in total costs between the options.

3.2.1 Option Ranking

A consensus view was recorded:



3.2.2 Supporting Discussion

The overall cost data in the data report was presented and the MoD explained that, although there is significant scope for change in the absolute figures for total cost, there is unlikely to be any change in the relative costs between options. The MoD

clarified that discounting was not applied to provide the total cost figures; rather each cost figure is based upon current money values.

However concern was expressed that these three figures were provided in an e-mail that has not been seen by all the stakeholders and that they were not persuaded that this data can be relied upon.

Several stakeholders felt that there was insufficient data, and hence uncertainty within that data, to make a judgement on the performance of each option on this attribute. However, a consensus was reached that if the data provided could be relied upon, then there was in effect no significant difference in the total cost of the three options.

During the discussions, the MoD accepted that there are site implications for total cost, particularly as certain sites may be able to accommodate more process steps than others. However, as the site to be used is not known then the worst case had been assumed in calculating the cost estimates i.e. there is no single site that can host all of the necessary operations. If one site could host all operations in the process, then the costs are likely to be less.

One stakeholder asked whether the cost data is based on Devonport operations today. The stakeholder expressed concern that, if this is true, it could appear that there is a plan to undertake ISOLUS activities at Devonport and the Technical Options Study is a fabrication. In reply the MoD stated categorically that the cost estimates presented are not based on Devonport.

3.2.3 Most Attractive Option

Based on the data presented in the data report, stakeholders could see no real difference in the total cost of the three options.

3.2.4 Least Attractive Option

Based on the data presented in the data report, stakeholders could see no real difference in the total cost of the three options.

3.2.5 Third Option

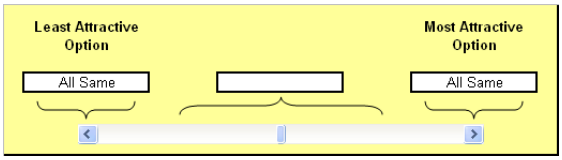
Based on the data presented in the data report, stakeholders could see no real difference in the total cost of the three options.

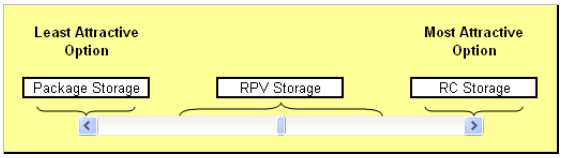
3.3 COST - COST PROFILE

The differences in year on year cost of the option

3.3.1 Option Ranking

Two points of view were recorded:





3.3.2 Supporting Discussion

The MoD presented the cost profiles in the data report for discussion. One stakeholder expressed surprise at the similarity between options, noting that they had been expecting more variation in the results. MoD explained that the cost profiles were dominated by the construction and dismantling/disposal of the facilities rather than processing the submarines.

Concern was voiced that a contractor may have a preference for an option as increased upfront cost would generate more profit as compared options with reduced up front cost. Therefore the industrial contractor should not be able to influence option selection.

One stakeholder expressed their confusion about the fifty five year time period in the charts. This was explained as a 30-year nominal 'afloat' storage period followed by 25 years in the ISOLUS programme, based on the date when the national repository is expected to become available. If the national repository is not available at this time, then the time period would be extended.

Two separate views formed from the discussions, and are discussed in the sections below.

3.3.3 Most Attractive Option

One view was that there is insufficient difference between the cost profiles presented to effectively differentiate between the options. Hence all options are equally attractive.

An alternative view wished to take account of the present value of the options. RC storage has a greater cost incurred towards the end of its life as compared to each of the other options and therefore has the lowest present value when a discounting scheme is applied.

3.3.4 Least Attractive Option

One view was that there is insufficient difference between the cost profiles presented to effectively differentiate between the cost profiles of the options. Hence all options are equally attractive.

The alternative view, considering the present value of each option, suggested that packaged waste storage has the least cost incurred towards the end of its life, compared to the other options. Hence it has the highest present value and is least preferred.

3.3.5 Third Option

One view was that there is insufficient difference between the cost profiles presented to effectively differentiate between the cost profiles of the options. Hence all options are equally attractive.

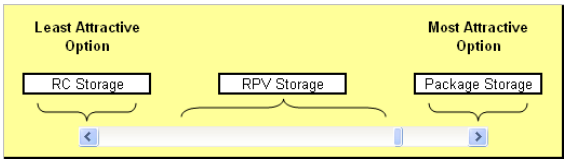
The alternative view considered that RPV storage incurs a greater amount of cost towards the end of the time period as compared to packaged waste storage. Hence it has a lower present value that packaged waste storage, but a higher present value than RC storage.

3.4 FACILITIES & SKILLS - FLEXIBILITY

The number of potential sites available for most site restricted part of the process.

3.4.1 Option Ranking

A consensus view was recorded:



3.4.2 Supporting Discussion

Defence Estates introduced this attribute, stating that site evaluation for the ISOLUS facilities is yet to be completed, but that assessment will include both hard and soft issues. There are many sites available and suitable sites exist for each option, though there are few sites with deep water access. There is also a preference for the use of an existing nuclear-licensed site, since regulators will demand justification for the licensing of additional sites if existing sites have the capacity to host the facilities.

It was noted that more sites are accessible if the material can be transported on the national road network, which imposes width, height and weight limitations as well as the condition of the material. The MoD confirmed that a broad approach will be taken to the assessment of transport options, including assessment of road, rail, land, sea and air. It was noted however that the RC will not be included in an assessment of air transport for reasons of practicality!

3.4.3 Most Attractive Option

Packaged waste storage was considered most flexible. There is existing experience of transporting packaged waste by road and rail, and the size of the package does not unduly restrict the choice of routes, giving the greatest flexibility in the siting of the interim storage facility.

3.4.4 Least Attractive Option

RC storage is least attractive as it is the most difficult option to transport on land, requiring specialist equipment and prepared routes, and is too large for rail transport. In addition the RC option would require close access to the sea for dismantling; limiting the number of sites that may be used.

3.4.5 Third Option

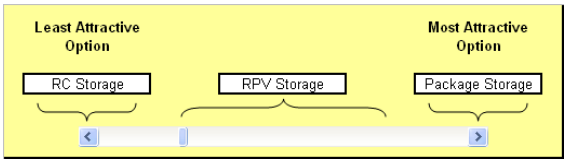
RPV storage was considered closer to packaged storage than RC storage in terms of flexibility, as the RPV could be transported by road, hence providing access to a variety of sites.

3.5 FACILITIES & SKILLS - SKILL SET

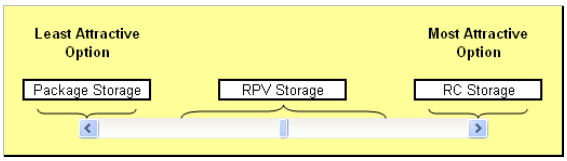
The availability of the skills needed to undertake the work.

3.5.1 Option Ranking

Two views were recorded.



View 1



View 2

3.5.2 Supporting Discussion

Frazer-Nash introduced this attribute, putting forwards the view that the available skills to complete the work could be lost if the dismantling of reactor compartments was delayed.

One stakeholder expressed the view from their personal experience that the dismantling skills required are generic skills that can be applied to any vehicle, ship or submarine, and specialist knowledge of the submarines is not necessarily required.

Another stakeholder explained their experience of dismantling Russian submarines, where although documentation is provided at each stage of dismantling, it is very difficult to do anything if the original designer is not available to provide advice.

The MoD explained a recent case where they had to supply information under the Freedom of Information act. This was achieved by speaking to a gentleman who worked on the Dreadnought class of submarine in 1960. The MoD pointed out that this level of understanding will be lost when those who worked on the submarines die.

Corporate knowledge was identified as unique and particularly valuable as knowledge that has been gained in a particular context and can't be retrieved through reading of documentation. Indeed, one stakeholder related the experience in another industry sector of hosting "tea parties" with retired staff when decommissioning lab equipment, in order to determine which potentially hazardous activities had been conducted in which laboratories.

One stakeholder identified a report published by the (then) Department of Trade and Industry concluding that more jobs will be required in the nuclear sector in 30 years time than can be filled. It was suggested that this gap will hit project ISOLUS, individuals with the skills are likely to "go where the money is" in the civil sector. One stakeholder requested the MoD quantify their requirements for Suitably Qualified and Experienced Personnel (SQEP) within the scope of the ISOLUS project. (Recommendation 1).

The view was put forwards that if the future requirements for SQEP are known, then workers can be trained now so that we have the skills required for the future. However it was pointed out that training is dependant on the people who are doing the job today to train individuals for the future.

A point of view was put forwards that delaying dismantling and cut-up activities gives the opportunity for future advances in technology (particularly robotics) to provide a better way of doing the work. This was noted here, however this issue should be addressed under the "future: flexibility" attribute.

Most members of the discussion group were in agreement and formed "view one" identified below. Four members of the discussion group disagreed and expressed "view two." Two stakeholders wished it to be recorded that they fundamentally disagreed with "view 2". One stakeholder expressed difficulty in understanding the data provided here, as they did not know enough about the skills and technologies needed to complete the processes.

3.5.3 Most Attractive Option

View one: Packaged waste storage is the most attractive option because it takes advantage of SQEP that are available today, particularly those with practical knowledge gained from operating and conducting engineering work on the submarines to be decommissioned.

View two: RC storage is the most attractive as it delays work for completion compared to the other options, making it possible to take advantage of any future skills and expertise advances (including robotics design) in 30 years time.

3.5.4 Least Attractive Option

View one: RC storage is the least attractive option as SQEP will not be available to undertake the final cut-up RC.

View two: Package waste storage is the least attractive option as it requires more work to be done earlier than any other option. This denies the opportunity to take advantage of any advances in skills and expertise made in the future.

3.5.5 Third Option

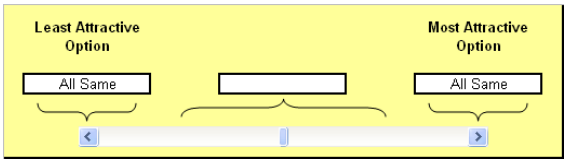
RPV storage was viewed as the intermediate option by all stakeholders, however view one saw it as closer to RC storage than packaged waste storage, since the cut-up of the components would be conducted in a timeframe when the SQEP with experience of the submarines are no longer available.

3.6 FACILITIES & SKILLS - ACHIEVABILITY

The technical maturity of the process.

3.6.1 Option Ranking

A consensus view was recorded:



3.6.2 Supporting Discussion

Frazer-Nash attempted to guide the stakeholders through a technology readiness level assessment of the options to determine their level of achievability. This exercise was not completed, and several stakeholders expressed difficulty in understanding the TRL concept for evaluating achievability, and had difficulty in making the assessments of technical readiness of each technology on the information available. However, the process generated a significant amount of useful discussion which is captured below.

Overall it was accepted that if each of the options is achievable then there is nothing to distinguish between the options. However there were additional comments.

Additional investment in research and development programmes may be required to ensure it is technically possible to achieve each of the options.

The MoD stated that they had cut into an RPV at one of their facilities, but due to MoD security restrictions the details of this cannot be disclosed. A view was expressed that

there is a fundamental difference between doing “bits of a thing” and doing “a whole thing.” It was accepted that some further work would be required to develop the process to cut-up reactor plant items in the ISOLUS program.

The MoD were asked why they had not performed a complete cut up of an RC, they replied that no permission had been sought to do this.

A view was put forwards that one cannot assume that a technology that is available today will still be available in the future, and that this idea should be applied to each of the options. The example of steam locomotive engineering was cited. This view was countered by another stakeholder who believed that overall there will be better technology available in the future.

3.6.3 Most Attractive Option

All options are equally attractive.

3.6.4 Least Attractive Option

All options are equally attractive.

3.6.5 Third Option

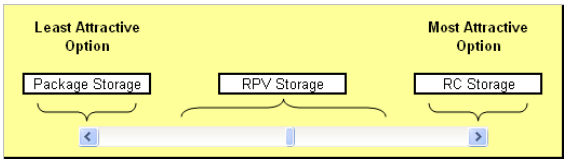
All options are equally attractive.

3.7 SAFETY - PUBLIC - RADIOACTIVE DISCHARGE

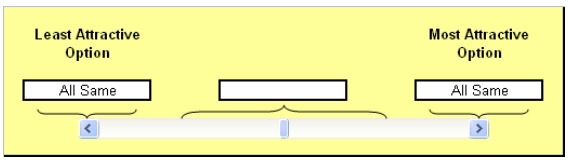
The radioactive discharge in routine operations.

3.7.1 Option Ranking

Two views were recorded:



View 1



View 2

3.7.2 Supporting Discussion

In introducing the “Safety” group of attributes, Frazer-Nash sought to explain the difference between the “Safety” category of attributes and the “Environmental” category. It was suggested that as a rule of thumb “Safety” attributes are those having an impact directly on humans, whilst “Environmental” considers the impact on all other environmental receptors. One stakeholder accepted that this was one way of differentiating between the options, but raised the view that such an approach is somewhat Cartesian in its approach, and seems to put humans “on a pedestal.” As such he fundamentally disagreed with this division.

The MoD introduced the radioactive discharge (routine operations) attribute, stating that the decontamination processes used on nuclear submarines have been in place for years, and that the ISOLUS programme will not drive up these discharges.

One stakeholder expressed concern that discussions centred on “managing discharges to regulatory limits.” It was suggested that there is a distinction between the regulatory

understanding of risk and the scientific understanding of risk (which is continually reviewed in the light of new evidence). This was countered by another stakeholder who commented that any risk from discharge is regulated and the regulations are informed by the best science of the day.

One of the stakeholders provided a verbal summary of findings from a study into the occurrences of Cancer and Leukaemia in a row of terrace houses close to HMNB Devonport, in Plymouth, and reported a 19.2 % increase relative to the rest of the population. The stakeholder further suggested that any course of action other than RC storage would lead to greater levels of discharges, although this view was not accepted by all of the stakeholders.

It was clear from the level of discussion on this attribute that the absolute levels of discharges arising from the ISOLUS process is of great concern to a number of the stakeholders. However, much of the discussion focussed on appropriate levels of regulatory control, rather than on the technical differences between the options.

In the course of the discussions on this attribute, a clarifying assumption for the study was made:

The starting point for all options is when the submarines have been laid up, de-fuelled, for thirty years.

3.7.3 Most Attractive Option

View one: RC storage is the most attractive option as this delays the time to cut up, providing additional time to exploit increased knowledge of discharges to better inform the decision. In addition the deferred time to cut up increases the radioactive decay.

View two: All options are equally attractive as any one option would not be allowed to have a higher discharge than any other option due to regulatory requirements.

3.7.4 Least Attractive Option

View one: Package storage is the least attractive option as this reduces the time available to exploit any increase in knowledge on the impact of discharge to better inform the decision.

View two: All options are equally attractive as any one option would not be allowed to have a higher discharge than any other option due to regulatory requirements.

3.7.5 Third Option

View one: RPV storage sits between the other two options in terms of additional time available.

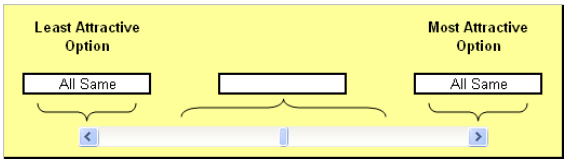
View two: All options are equally attractive as, any one option would not be allowed to have a higher discharge than any other option due to regulatory requirements.

3.8 SAFETY – PUBLIC - ACCIDENT (RADIOLOGICAL)

The risk and consequence to the public of the worst case radiological accident.

3.8.1 Option Ranking

A consensus view was recorded:



3.8.2 Supporting Discussion

It was accepted that, at present, the processes to be employed in each of the options are not defined in detail. Hence on the level of information available, it was felt that all options were considered to carry the same risk of radiological accident.

This argument considered risk as the combination of two factors; the probability that an event will occur and the consequence of the event. In this case, if one option has significant consequence then you would take measures to reduce the probability of its occurrence. Conversely if there is a high probability of occurrence, then steps may be taken to reduce the consequence of the event occurring. Therefore for all three option the risks of a radiological accident would be actively managed down to similar levels.

Road transport operations were considered as an exemplar. It was suggested that if one of the options was more likely to have a greater accident risk than the other options additional packaging would be used to reduce the risk and hence the risk would be the same for all three options.

Fire during operations was also considered. If there was a fire during plant operations stakeholders felt that any consequence to the public would be contained, and hence would present extremely low risk to the public. Fire therefore is not seen as a discriminator between the options.

One stakeholder stated that regulators now require rising sea levels to be taken into account when locating a facility.

3.8.3 Most Attractive Option

Overall, it was felt that all options are equally attractive, as safety is so important that any unacceptable risks would be managed in ISOLUS processes for any option.

3.8.4 Least Attractive Option

Overall, it was felt that all options are equally attractive, as safety is so important that any unacceptable risks would be managed in ISOLUS processes for any option.

3.8.5 Third Option

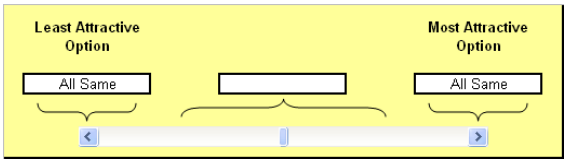
Overall, it was felt that all options are equally attractive, as safety is so important that any unacceptable risks would be managed in ISOLUS processes for any option.

3.9 SAFETY – WORKERS - ACCIDENT (RADIOLOGICAL)

The risk and consequence to the workers of the worst case radiological accident.

3.9.1 Option Ranking

A consensus view was recorded:



3.9.2 Supporting Discussion

As with the attribute Safety – Public - Accident (Radiological), it was felt that the risks to workers would balance out across the three options therefore there is nothing to distinguish one option from any other options.

One stakeholder suggested that the natural process of ageing may increase the risk to workers as they are likely to deal with corroded equipment requiring additional force which may be more likely to cause an accident. However it was unclear how this would discriminate between the three options.

One stakeholder expressed confusion over the thirty year time period, this was explained as the nominal time that the submarine is laid up following withdrawal from operations, before any ISOLUS activity begins.

One stakeholder expressed that view that improved technology may exist in 30 years, reducing risk during cut –up. This view is accounted for under the "Future – Flexibility" attribute.

3.9.3 Most Attractive Option

All options are equally attractive.

3.9.4 Least Attractive Option

All options are equally attractive.

3.9.5 Third Option

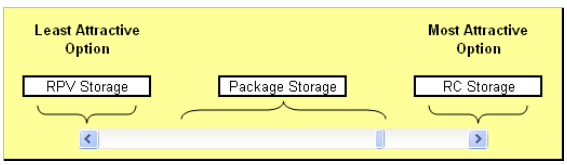
All options are equally attractive.

3.10 SAFETY – WORKERS - WORKER DOSE

The worst-case radiation dose expected in routine operations.

3.10.1 Option Ranking

A consensus view was recorded:



3.10.2 Supporting Discussion

The MoD opened discussions on this attribute, explaining that in de-fuelled naval reactor plant dose arises from the activation products (beta and gamma emitters) only. In contrast with civil nuclear reactors, alpha emissions do not arise in the decommissioning of naval reactor plant. A request was made for information regarding the activation products for each option. MoD responded that until site design and

process details were finalised for the options no additional data (other than that in data report) can be provided.

One stakeholder described the relationship between radiological and non-radiological worker safety. Mitigation strategies for radiation exposure may have a negative impact on worker safety. As an illustrative example, increased lead shielding may increase radiological safety but the handling of large heavy items may increase the likelihood of a non-radiological accident.

During the discussions it emerged that processes for dealing with Carbon-14 are yet to be defined by a national strategy. Carbon-14 emission will not impact on worker dose rates as any activity that could conceivably lead to ingestion of radioactive material would be done remotely or otherwise mitigated such that worker dose is not an issue.

Stakeholders requested the MoD provide a decay curve for the emissions outside of the reactor, to represent worker exposure during cut up. The MoD responded that they will now look to see what data can be made available to better inform stakeholders. It was explained that it would not be possible to provide a detailed analysis until the detail of the process for each option was known. However, when the processes are designed, they will be designed to minimise worker exposure to radiation. For example, in designing a process one may consider two possible procedures. If both were conducted in the same way, then one may lead to a higher dose than the other. However in practise the processes will be adapted and protective measures put in place to address the dose rate to workers. The outcome is that the dose rates will be the same for both processes.

3.10.3 Most Attractive Option

RC storage allows for an additional period of radioactive decay before any intrusive work in the reactor compartment is conducted. Although many stakeholders felt that this additional decay was small in comparison to the decay during the 30-year period of afloat storage, there will nonetheless be some additional decay. Hence if the same processes are involved to dismantle and cut-up the reactor compartment, worker exposure to radiation could be slightly lower than in the other options.

3.10.4 Least Attractive Option

RPV storage is the least attractive option as it requires two separate intrusive activities in the reactor plant. Firstly, to dismantle and package the primary plant components before the period of interim storage and then subsequently to unpack and cut-up and package the primary plant components.

3.10.5 Third Option

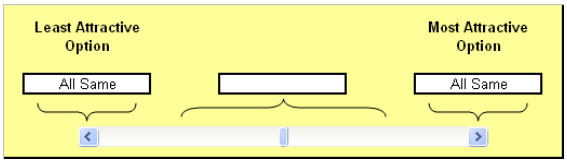
Packaged waste storage was viewed to be almost as attractive as RC storage, compared to RPV storage which was viewed as significantly worse. However packaged waste storage was viewed as less attractive than RC storage, since the latter allows for an additional period of radioactive decay before intrusive activities are conducted in the reactor compartment.

3.11 SAFETY – WORKERS - ACCIDENT (NON-RADIOLOGICAL)

The risk and consequence to the workers of the worst case non-radiological accident.

3.11.1 Option Ranking

A consensus view was recorded:



3.11.2 Supporting Discussion

Frazer-Nash introduced this attribute, explaining that the nuclear industry has very stringent health and safety standards. If there is any change to these standards in the future then the change is unlikely to make the standards less stringent.

It was considered that there was a higher risk that an accident would occur in the construction and decommissioning phases of a site rather than during the operation phase of a site, since accident rates in construction are significantly higher than those in the operation of nuclear licensed facilities. This could be viewed to discriminate against RPV storage which includes more construction activity, however this was not felt to be a strong discriminator.

Furthermore, the Health and Safety Executive has a strong focus on improving safety in the construction industry, so it is possible that construction activities conducted in the future may be done more safely than construction activities conducted today. This argument is accounted for under the “future – flexibility” attribute.

3.11.3 Most Attractive Option

Overall, stakeholders felt that all options are equally attractive on this attribute, any differences in performance being very small.

3.11.4 Least Attractive Option

Overall, stakeholders felt that all options are equally attractive on this attribute, any differences in performance being very small.

3.11.5 Third Option

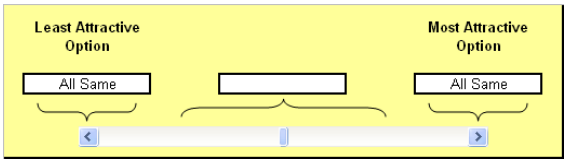
Overall, stakeholders felt that all options are equally attractive on this attribute, any differences in performance being very small.

3.12 WASTE MANAGEMENT - RADIOACTIVE WASTE

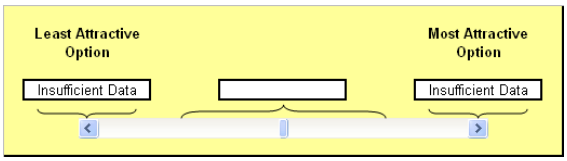
The total amount of ILW and LLW produced by each option.

3.12.1 Option Ranking

Two views were recorded:



View 1



View 2

3.12.2 Supporting Discussion

The MoD introduced this attribute, highlighting the decay cures, and the radioactivity distribution in the reactor pressure vessel, from the data report. It was explained that, taken together, these charts indicate that there will not be any significant decay of ILW to LLW during the ISOLUS timescales (i.e. after the period of afloat storage). It was also explained that the MoD expects to issue a contract to Rolls-Royce to revisit the waste management assumptions; this will be made available to stakeholders in a declassified form when the work is complete.

It was noted that the packaging for RPV storage could form a secondary waste stream that would have to be managed, and also that RC storage requires some degree of maintenance whilst in storage which may generate an additional waste stream.

One stakeholder expressed the opinion that the data presented leads to a different conclusion than that held by the public; i.e. the public perception is that RC storage allows more time for the material to decay and so results in less ILW. Hence it was requested that data be made available to better inform the public, in particular data supporting the bell shaped curve of distribution of radioactivity in the RPV. The MoD responded that they will attempt to declassify the data for public release, but added that there is a limit to the amount of data that can be made available. (Recommendation 2)

One stakeholder suggested that as new data is produced and generates new assumptions, previous assumptions should be reviewed and revisited. There was general agreement with this point.

Following this discussion, two points of view were recorded. One group saw no differentiation between the options, whilst the other felt that they did not fully understand the data presented and could not verify its credibility. Hence they felt that there was insufficient data to evaluate this attribute.

A request was made that those stakeholders who felt that there was insufficient data should consider what additional data was required to make an informed decision on this attribute and make a request for that data to be provided.

3.12.3 Most Attractive Option

View one: All options are equally attractive as the same amount of waste would be generated for each option. The nature of the radioactive decay over the thirty year storage period would not change the quantity of ILW and LLW in the reactor compartment. Therefore the same amount of waste will be generated for all three options.

View two: Insufficient data has been made available to make an informed decision on the most attractive option.

3.12.4 Least Attractive Option

View one: All options are equally attractive as the same amount of waste would be generated for each option. The nature of the radioactive decay over the thirty year storage period would not change the quantity of ILW and LLW in the reactor compartment. Therefore the same amount of waste will be generated for all three options.

View two: Insufficient data has been made available to make an informed decision on the most attractive option.

3.12.5 Third Option

View one: All options are equally attractive as the same amount of waste would be generated for each option. The nature of the radioactive decay over the thirty year storage period would not change the quantity of ILW and LLW in the reactor compartment. Therefore the same amount of waste will be generated for all three options.

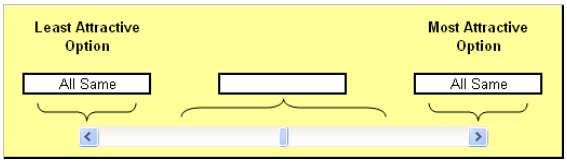
View two: Insufficient data has been made available to make an informed decision on the most attractive option.

3.13 WASTE MANAGEMENT - NON-RADIOACTIVE WASTE

The amount and nature of non-radioactive waste produced by each option.

3.13.1 Option Ranking

A consensus view was recorded:



3.13.2 Supporting Discussion

Frazer-Nash introduced this attribute, stating that their consideration of the options had identified no additional non-radioactive waste streams which would arise from any particular option. Stakeholders were asked if they could propose any additional waste streams for discussion that could be used to distinguish between options.

It was noted that packaged waste requires a single facility and a smaller interim store, and hence the amount of construction and demolition waste may be less for this option, though this was not felt to be a significant discriminator.

It was noted that the standards in handling of toxic waste streams have changed significantly in the past and should be expected to change in the future, however the technology to deal with such waste streams should also progress and help respond to any change in regulations. This discussion did not lead to any differentiators between the options.

3.13.3 Most Attractive Option

All options are equally attractive. Given the current level of specification of the options, no option produces any additional non-radioactive waste streams which distinguish between the options.

3.13.4 Least Attractive Option

All options are equally attractive. Given the current level of specification of the options, no option produces any additional non-radioactive waste streams which distinguish between the options.

3.13.5 Third Option

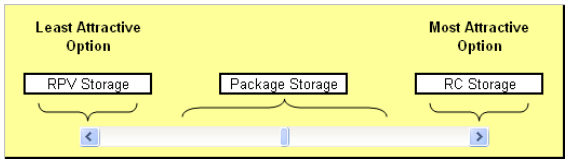
All options are equally attractive. Given the current level of specification of the options, no option produces any additional non-radioactive waste streams which distinguish between the options.

3.14 ENVIRONMENTAL – ROUTINE OPERATIONS - RADIOLOGICAL DISCHARGES

The radiological discharges / emissions in normal operations.

3.14.1 Option Ranking

A consensus view was recorded:



3.14.2 Supplementary Discussion

The view was put forwards that the majority of routine radiological discharges will arise from the cut out and dismantling of the RC, and the cutting up and packaging of the RPV. Hence it was suggested that RC storage is preferred on this attribute, since this option allows greater time for radiation levels to decay before intrusive work is completed in the reactor compartment. A number of Stakeholders pointed out that the additional decay over the ISOLUS storage period was small in comparison to the decay during the 30-year period of afloat storage and that even though there could be a difference between the three options, it was a small difference.

It was suggested that radiological discharges in routine operations will be minimal; - the discharges are related to facilities construction and decommissioning which are non-radioactive.

One stakeholder suggested that there is uncertainty in current scientific understanding concerning safe exposure levels and that in the future regulation could increase. The stakeholder noted that this was not necessarily be a bad thing and referred to asbestos as an example.

The MoD clarified that OSPAR does not necessarily apply to individual defence facilities, rather the commitment under OSPAR is to the national discharge strategy.

3.14.3 Most Attractive Option

RC storage is the most attractive option as this delays the cut-up activity, providing additional time to exploit increased knowledge of discharges to better inform the decision. In addition the deferred time to cut up increases the radioactive decay.

3.14.4 Least Attractive Option

RPV storage is the least attractive option as it involves two intrusive activities rather than one for the other two options, i.e. separation and packaging of the primary plant for storage and then subsequently removing them from their packaging before the cut-up and re-package.

3.14.5 Third Option

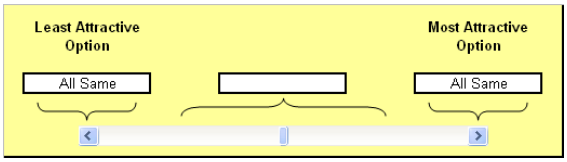
Packaged waste storage is placed between the two options; above RPV storage since it does not involve the additional activity, but behind RC storage since the cut-up activity would be conducted earlier than in the other options.

3.15 ENVIRONMENTAL – ROUTINE OPERATIONS - NON-RADIOLOGICAL DISCHARGES

The non-radiological discharges / emissions in normal operations.

3.15.1 Option Ranking

A consensus view was recorded:



3.15.2 Supporting Discussion

Frazer-Nash introduced this attribute, suggesting that the issues apply equally across all options. Based on the environmental work completed to date, the bulk of the non-radioactive discharges from the ISOLUS options are related to construction activities. Hence the difference between options arises from the difference in the facilities which they require. Based on the present level of definition of the ISOLUS options, and until a site is chosen, there is little to discriminate between the options.

It was noted that a RC storage facility would be bigger compared to the other options and that if you have a bigger store you will use more energy and materials to construct and maintain the store, but this was not felt to be a significant discriminator.

3.15.3 Most Attractive Option

All options are equally attractive.

3.15.4 Least Attractive Option

All options are equally attractive.

3.15.5 Third Option

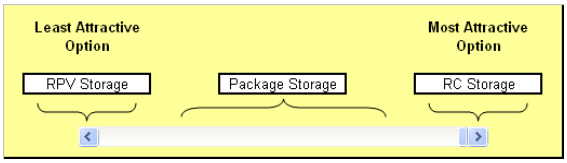
All options are equally attractive.

3.16 ENVIRONMENTAL – ACCIDENTAL CASE - RADIOLOGICAL DISCHARGES

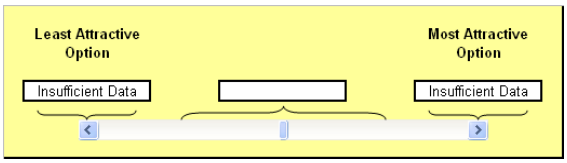
The radiological discharges and emissions resulting from accidents and deliberate actions.

3.16.1 Option Ranking

Two views were recorded:



View 1



View 2

3.16.2 Supporting Discussion

The MoD introduced this attribute. It was suggested that the most likely accident which could lead to a discharge was during transport. During dismantling and cut-up activities, safeguards would be in place to prevent any accidental discharge from reaching an environmental receptor. Moreover, the dismantling and cutting up activities were common to all options, the only difference being the time at which they were conducted.

Discussions centred on the effectiveness of the various options as transport and storage containers. There was a clear perception that the RC was a robust storage and transport container. One group of stakeholders viewed that the RC and Nirex boxes were equally effective containers, and hence ranked them equal “most attractive options.” The containerised RPV was perceived to be a significantly inferior transport and storage container.

It is recommended that further work is undertaken to examine the effectiveness of the RC as a transport and storage container compared to the Nirex box (Recommendation 3).

One stakeholder suggested that natural aging of the reactor compartment during storage could count against RC storage. As time moves on, corrosion and natural ageing will become an increasing issue and is likely to require a maintenance regime for the RC in storage.

One stakeholder suggested that a specialist should attend an IAG meeting to brief the stakeholder group on internal decomposition processes inside the RC and the effect over time. This led to a broader point that there is currently insufficient data to make an informed judgment on the attractiveness of options.

In response the MoD stated that, because full designs for the processing facilities are not yet available, it is inevitable that data will be incomplete at this stage in the process. This issue will be revisited as the project progresses and design data becomes available, until that point the assessments are reliant on professional and expert opinion.

A common theme emerged during discussion of this attribute. Some stakeholders were happy to make judgements based on information that included a degree of uncertainty. Others were not willing to make judgements unless data specifically addressing the point under review could be made available and that data had a known level of certainty.

3.16.3 Most Attractive Option / Third Option

View one: RC storage and packaged waste storage are jointly the most attractive options. The RC is viewed as a highly effective container, acting as a barrier between the radioactive material and the environment. Nirex boxes were viewed as equally attractive, since they immobilise the material in a passively safe way, with no liquid waste present.

View two: Insufficient data is available to make an informed choice about which option is most attractive.

3.16.4 Least Attractive Option

View one: RPV storage is the least attractive option as it is perceived as the least effective container and therefore more vulnerable to any accident that may produce a discharge to the environment.

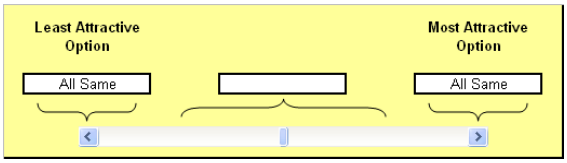
View two: Insufficient data is available to make an informed choice about which option is least attractive.

3.17 ENVIRONMENTAL – ACCIDENTAL CASE - NON-RADIOLOGICAL DISCHARGES

The non-radiological discharges and emissions resulting from accidents and deliberate actions.

3.17.1 Option Ranking

A consensus view was recorded:



3.17.2 Supporting Discussion

The arguments made for the Environmental – Routine Operations – Non-Radioactive Discharges attribute were felt to apply equally here. No additional accidental non-radioactive discharges were proposed for any particular option.

3.17.3 Most Attractive Option

All options are equally attractive.

3.17.4 Least Attractive Option

All options are equally attractive.

3.17.5 Third Option

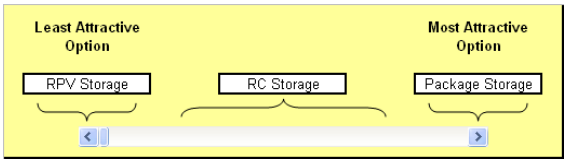
All options are equally attractive.

3.18 ENVIRONMENTAL - NUISANCE

The statutory and non-statutory nuisances and other environmental impacts which differentiate between the options and are not captured elsewhere.

3.18.1 Option Ranking

A consensus view was recorded:



3.18.2 Supporting Discussion

Frazer-Nash introduced this attribute, outlining the conclusions from the EISS and EIA work completed to date. It was noted that removal of fore and aft sections of the submarine will cause the bulk of the nuisances, but this is common to all options. Beyond this, the major contributions to nuisance are during the construction and decommissioning of facilities rather than during the operating phase of a facility. Until detailed information for specific sites is made available it is difficult to make a well informed judgement, for example different sites will have different traffic considerations, dependant on the surrounding area, and the preferred methods of transport to supply that site.

Consideration was given to the differences between facilities required for each option. RC storage requires a large storage facility, and the subsequent construction of a dismantling / cut-up facility.

RPV storage requires the construction of two separate dismantling / cut up facilities. One facility will be needed to dismantle the RC and remove and package the primary plant components, and another will be required to cut up the primary plant components after the storage period. The interim store for this option is likely to be of a size between that of the other two options.

Packaged waste storage requires the construction of a single facility to dismantle, cut-up and package the reactor compartments, and the smallest of the three interim stores.

It was suggested that the amount of nuisance will be in proportion to the size of buildings required; however one stakeholder noted that a study by N. Pigeon (Cardiff University) suggests that large buildings contribute to a “sense of place” for a community and therefore the larger the buildings, the better.

3.18.3 Most Attractive Option

Package waste was viewed to be the most attractive option as it requires the smallest site and least construction activity.

3.18.4 Least Attractive Option

RPV storage was viewed as the least attractive option as it has an additional construction requirement compared to each of the other options.

3.18.5 Third Option

RC storage was viewed as very close to RPV storage as it would be the largest of all sites creating the greatest visual impact.

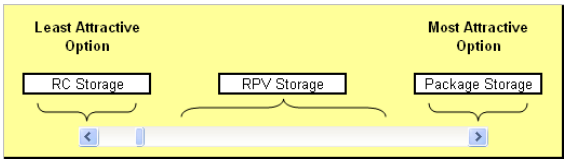
3.19 POLICY - VULNERABILITY TO POLITICAL RISK

Vulnerability to future political decisions.

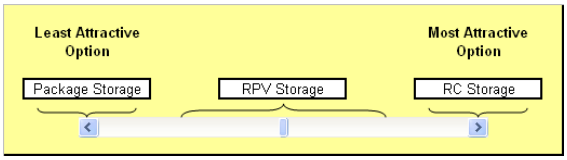
3.19.1 Option Ranking

This attribute was split into two attributes as a result of the discussion:

Vulnerability To Political Risk:



Opportunity For Political Change:



3.19.2 Supporting Discussion

Frazer-Nash introduced this attribute, putting forwards the view that the vulnerability of each option to changing political will (i.e. the chance of political influence preventing an option from being completed as defined) was related to the time period until the waste reaches its final packaged state (i.e. Nirex boxes, ready for the national repository).

In the course of the discussion, it became apparent that vulnerability to political risk may be seen as a positive thing or a negative thing, dependant on whether you wish to assess the resilience of the option to political change, or the opportunity afforded by political change to pursue a revised option.

To capture this, the attribute was split into two:

- Vulnerability to Political Risk, assessing the resilience of the option to political change; and
- Opportunity for Political Change, assessing the opportunity afforded by political change to pursue a revised course of action.

The view was expressed that the option which produces a more generic waste type (i.e. Nirex boxes) sooner may be less vulnerable to political risk. ISOLUS waste in this form would not require specific intervention decisions to be made as it could be treated in the same way as the larger amount of similarly packaged wasted from the civil sector. The same argument cannot be applied to unique waste in the form of an RC or RPV during the interim storage period. During this discussion, it was clarified that all options end with the waste packaged in Nirex boxes, the discriminator is only the form of the waste during the interim storage period.

It was noted that not all of the stakeholders were satisfied with this interpretation of the options, though stakeholders did recognise the need to adopt clear assumptions such as this to clarify the options and enable them to be adequately explored.

Significant discussion took place on the relationship between the devolved administration in Scotland and Westminster. It was concluded that this may have an influence on this attribute, but it is inappropriate to second-guess how.

3.19.3 Most Attractive Option

Vulnerability to Political Risk: Packaged waste storage is the most attractive option as decisions on planning and regulation are made early on, and the packaged waste

conforms to that from the civil sector; this reduces the time over which the option is vulnerability to political change.

Opportunity for Political Change: RC storage is the most attractive option as more flexibility remains for longer, to allow the process to be adapted in response to any future political intervention.

3.19.4 Least Attractive Option

Vulnerability to Political Risk: RC storage is the least attractive option as it delays the cut-up activity providing the greatest risk of political intervention.

Opportunity for Political Change: Packaged waste storage is least attractive as it closes off the possibility of any positive future political intervention by making decisions on planning and regulation in the short term, and reducing the waste to its fully packed form soonest.

3.19.5 Third Option

Vulnerability to Political Risk: RPV storage is very close to RC storage, as both require repackaging of waste after the interim storage period. It was felt to be slightly less vulnerable to political risk than RC storage as more of the process is completed earlier.

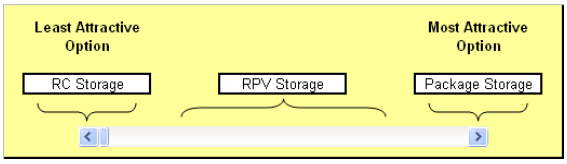
Opportunity for Political Change: RPV storage was felt to fall between the other options, as some flexibility is removed when the primary plant components are removed from the reactor compartment and the remainder of the RC scrapped.

3.20 POLICY - LEGAL REQUIREMENTS

The effort to comply with the relevant legal and regulatory requirements, and obtain the necessary permissions.

3.20.1 Option Ranking

A consensus view was recorded:



3.20.2 Supporting Discussion

Frazer-Nash introduced this attribute, asking stakeholders to consider the amount of effort necessary to comply with legal requirements.

The key issue during discussions was the inability to get planning permission today for the cut-up facility for the RC storage option, since it is assumed that the facility won't be built until it is required. This problem applies equally to the cut-up facility for RPV storage. Furthermore, it was noted that public acceptability may change over time; - the public may accept a storage facility today, but their attitude to a cut-up facility in the future could not be anticipated.

The remainder of the discussion explored a number of the legal requirements for the ISOLUS programme, which were of significant interest to some of the stakeholders, but did not lead to aspects which differentiated between the options. It was noted

however, that there is a MoD assumption that 'volunteerism' will not apply to ISOLUS, i.e. communities will not be asked to volunteer to host the facilities.

3.20.3 Most Attractive Option

Packaged waste storage is the most attractive option as planning and regulation decisions can be made sooner in comparison to the other options, avoiding additional complications to legal requirements that are likely to emerge in the future.

3.20.4 Least Attractive Option

RC storage is the least attractive option as it delays application for planning that is likely to be subject to more complicated legal requirements in the future.

3.20.5 Third Option

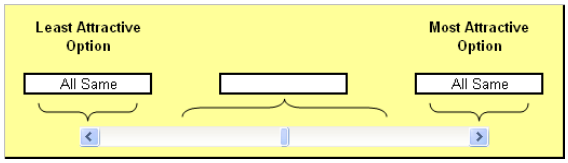
RPV storage is similar to RC storage as the requirement for an additional facility will lead to further complication of the legal process involved.

3.21 POLICY - COMPLIANCE WITH POLICY

The degree to which the option complies with current policy statements.

3.21.1 Option Ranking

A consensus view was recorded.



3.21.2 Supporting Discussion

The MoD introduced this attribute, stating that the policy which must be complied with is contained in Cmd 2919 (September 2004). It was stated that packaged waste storage is the only option that fully complies with passive safety requirements. Their view is that packaged waste is the most passively safe.

Explanation of the term 'passively safe' was requested and it was explained that the MoD interpretation was that the radioactive substances are immobilized. This was not true of the RC storage or RPV storage options where liquid heals could be present during the interim storage period. Explanation of the term heals was requested and explained as the residue left in pipe work where a liquid will naturally settle once the system has been drained.

A number of stakeholders requested that information be provided to evidence the assertion that only the packaged waste storage option was passively safe. Commenting on the data presented in the Data Report [Ref 3] on this attribute, one stakeholder asked it to be noted that where a statement is made in an e-mail it should be substantiated by a paper document providing the supporting evidence for that statement.

The discussion also recognised that policy allowed for activities to be delayed in order to harness the benefits of radioactive decay. Because of this, all options were viewed

to be compliant with policy, and indeed the MoD explained that they could be subject to judicial review if ISOLUS did not comply with government policy.

3.21.3 Most Attractive Option

All options are equally attractive as “All three options could be compliant with policy”.

3.21.4 Least Attractive Option

All options are equally attractive as “All three options could be compliant with policy”.

3.21.5 Third Option

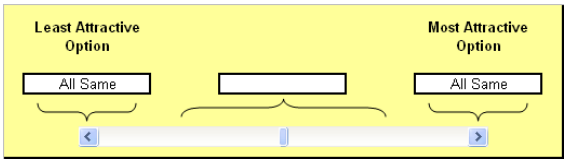
All options are equally attractive as “All three options could be compliant with policy”.

3.22 POLICY - VULNERABILITY TO POLICY AND REGULATORY CHANGE

The vulnerability of each option to future legislation and policy change.

3.22.1 Option Ranking

A consensus view was recorded:



3.22.2 Supporting Discussion

The Defence Nuclear Safety Regulator introduced this attribute, explaining that whenever activities are conducted, they must comply with the extant legislation at that time. The standards being worked to now are higher than historic standards and it seems reasonable to assume that standards will only ever get tighter. This would seem to imply that the longer an activity is delayed, the harder it will be to comply with the emerging standards.

However the overall ISOLUS timescales were considered and it was noted that if submarines are processed at a rate of one per year, the last submarine will be entering the ISOLUS programme at approximately the same time as the waste from the first is coming out of interim storage. It was suggested that legislation is likely to change during all the options, and since legislation applies retrospectively, facilities will have to be upgraded in response to regulatory change in the future.

Some stakeholders cautioned that the discussions could seem to imply that change is a bad thing. In fact, change could equally be "for the better".

3.22.3 Most Attractive Option

Overall, it was felt that all options are equally attractive on this attribute.

3.22.4 Least Attractive Option

Overall, it was felt that all options are equally attractive on this attribute.

3.22.5 Third Option

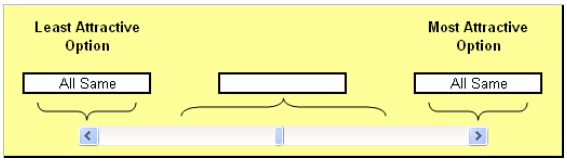
Overall, it was felt that all options are equally attractive on this attribute.

3.23 PUBLIC – LOCAL COMMUNITIES - EMPLOYMENT

The profile of employment over time.

3.23.1 Option Ranking

A consensus view was recorded:



3.23.2 Supporting Discussion

The employment profiles presented in the Data Report [Ref 3] were considered, and it was identified that there will be 'peaks' in jobs created in both the construction and decommissioning phases of the facilities, but these will be relatively short lived in comparison with the longer term employment from operation of the plant. It was noted that views on employment are changing in the current economic climate and that the creation of jobs in a locality could bring additional community benefits.

However, excluding the peaks in employment associated with construction and decommissioning activity the sustained level of employment will be similar between the options.

During the discussions, one stakeholder stated that Plymouth City Council feel that they have previously been misled on predictions of job creation associated with MoD work. There is a concern in Plymouth that the naval surface fleet will leave and that they will be left with needing decommissioning work and ISOLUS to fill the gap. It was also suggested that there is anecdotal evidence that Plymouth's reputation as a tourist destination is being tarnished by association with nuclear activity. This is noted here, although it did not assist in differentiating between the options.

3.23.3 Most Attractive Option

On the basis of data provided, all options we considered are equally attractive, as the sustained level of employment is very similar between the options.

3.23.4 Least Attractive Option

On the basis of data provided, all options we considered are equally attractive, as the sustained level of employment is very similar between the options.

3.23.5 Third Option

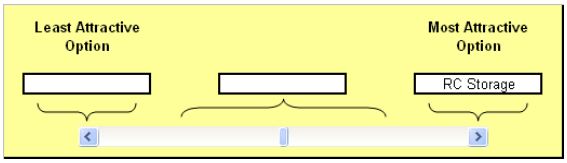
On the basis of data provided, all options we considered are equally attractive, as the sustained level of employment is very similar between the options.

3.24 PUBLIC – LOCAL COMMUNITIES - LOCAL ACCEPTABILITY

The acceptability of the option to local population.

3.24.1 Option Ranking

A consensus view was recorded:



3.24.2 Supporting Discussion

The stakeholder interpreting the public view introduced this attribute, and explained the difficulties of predicting the acceptability of an option. Whilst with quantitative technical data you are able to draw conclusions, it is more difficult with social data. Indeed it is very difficult to second guess the reaction of a local community, especially as the sites have not yet been chosen. It is only possible therefore to consider what local populations thought about the options generally. The public was, understandably, likely to prefer not to have a dubious risk near it rather than to show enthusiasm for it.

It was explained that different assumptions had been made in the current workshop to those which were presented to the public at the last consultation. These assumptions would inform local opinion if they were made aware of them.

For example, one stakeholder explained that the Navy had always told their local community that the walls of the RC were (metaphorically) “three feet thick” and it is from information such as this that the public perception has developed is that RC storage would be the best option.

It was suggested that the relevant section in the Data Report [Ref 3] reported the CIOP findings out of context and a fuller extract from the CIOP was read to the workshop to clarify the meaning. This stressed the overwhelming strength of the CIOP Final Report Section 5.3, leading to CIOP Recommendation 34, and also drew attention to CIOP Recommendations 35, 36 and 37. The stakeholder criticised the data for this attribute in the Data Report for being inappropriate and weak. The stakeholder put forward two other documents which showed what the public knew at the time they were last asked about the matter. One of these was a democratically inspired Edinburgh City Council criticism of the proposed Renown Cut-Up; the other a newspaper cutting showing the publicity accorded to a statement by John Large that the Renown plan was half-baked.

One stakeholder suggested that, though vitally important, it would not be possible to predict the acceptability of the options to a local community at this stage, since different information was available now than when the CIOP was completed in 2003. It became clear at this stage that further public consultation would be required to determine the views of both the local and national public on the options (Recommendation 4).

It was noted that it is possible to perform sociological research on how generic groups of people are likely to perceive a scenario. As an example, a study by Nick Pigeon at Cardiff University entitled “Living with Risk” was cited.

It was also noted that there is a difference between data collected from thoroughly sampled research and the rich data made available through consultation; a combination of both data sources would assist robust decision making.

The view was put forward that although further public consultation is required, one must also abide by what has been said in the past. It was noted that there is a lot of data available from the past, in the form of the CIOP, and that this should be

complemented by an update. The CIOP reported a preference for RC storage at a national level, but at a local level no community was willing to accept it.

It was concluded that though the recommendations of the CIOP may need updating, they are a relevant data set, and hence it is most likely that, at present, RC storage is the most attractive option to a local community. It was recognised, however, that this was flowed-down from the national preference, since no local community had expressed a desire for the ISOLUS work.

3.24.3 Most Attractive Option

Stakeholders judged that RC storage may be the most attractive option as informed by the CIOP preference for RC storage at a national level. It was recognised, however, that this was flowed down from the national preference, since no local community had expressed a desire for the ISOLUS work.

3.24.4 Least Attractive Option

There was a lack of up-to-date data to inform a preference.

3.24.5 Third Option

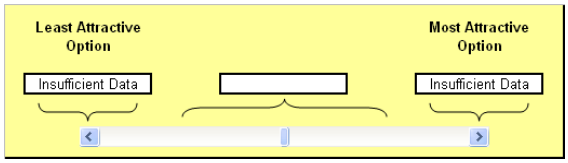
There was a lack of up-to-date data to inform a preference.

3.25 PUBLIC – LOCAL COMMUNITIES - SOCIO-ECONOMIC IMPACTS

The wider socio-economic issues arising from each option.

3.25.1 Option Ranking

A consensus view was recorded:



3.25.2 Supporting Discussion

Frazer-Nash introduced this attribute, suggesting that though the options would certainly have a socio-economic impact on the communities where the work took place, it was difficult to see at this stage how that might differ between the options.

It was suggested that there would be situations where there is a negative socio-economic impact and not a positive one. For example inward investment in a city maybe negatively affected as there is a perception that the area is a nuclear scrap yard. A parallel was drawn in this respect with the situation in Hartlepool and the stigma of its “ghost ships”.

Stakeholders reached agreement that the issues around this attribute should be revisited once the process is better informed about site specific issues. Sufficient data is not yet available here to inform the debate.

3.25.3 Most Attractive Option

Insufficient data was available to make an informed judgement.

3.25.4 Least Attractive Option

Insufficient data was available to make an informed judgement.

3.25.5 Third Option

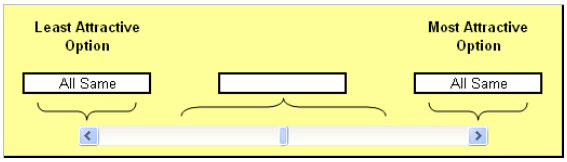
Insufficient data was available to make an informed judgement.

3.26 PUBLIC – NATIONAL - OPENNESS OF PROCESS

The amount of industrial secrecy which would necessarily apply to the three options and the knock-on effect of this on public perceptions.

3.26.1 Option Ranking

A consensus view was recorded:



3.26.2 Supporting Discussion

In discussing this attribute, stakeholders found it difficult to distinguish between the level of industrial secrecy applicable to the options, and the military security aspects which are discussed as a separate attribute.

One stakeholder suggested that the MoD have to be proactive in providing access to available documents and participation in discussions. The MoD responded that in respect of this attribute, information such as industrial contracts etc. can't be made available by the MoD as they are the property of the companies concerned, and hence it is not the MoD's place to release them.

Stakeholders were asked if any one of the options have any novelty such that a contractor may be more unwilling to release information on the work being carried out with respect to that option. The stakeholders were unable to identify any of these novelty issues.

3.26.3 Most Attractive Option

Stakeholders agreed that industrial secrecy would apply equally to each of the options.

3.26.4 Least Attractive Option

Stakeholders agreed that industrial secrecy would apply equally to each of the options.

3.26.5 Third Option

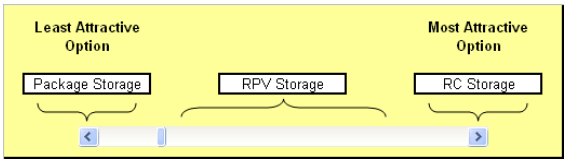
Stakeholders agreed that industrial secrecy would apply equally to each of the options.

3.27 PUBLIC – NATIONAL - PUBLIC ACCEPTABILITY

The acceptability of the option to the public at large.

3.27.1 Option Ranking

A consensus view was recorded:



3.27.2 Supporting Discussion

This attribute was discussed at the same time as "Public - Local Communities – Local Acceptability." However the stakeholders felt able to rank all three options in this case, based on the information in the CIOP.

3.27.3 Most Attractive Option

RC storage was the preferred option by a significant margin, in accordance with the recommendations of the CIOP.

3.27.4 Least Attractive Option

Packaged waste storage was the least attractive option, following the recommendations of the CIOP.

3.27.5 Third Option

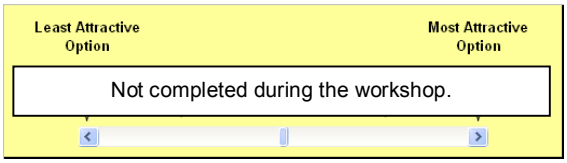
RPV storage was felt to be significantly less attractive that RC storage, and was ranked close to packaged waste storage in attractiveness.

3.28 SECURITY - VULNERABILITY

The vulnerability of material to accidental or deliberate misuse.

3.28.1 Option Ranking

This attribute was not discussed explicitly in the time available during the workshop, and hence the ranking table below was not completed. However a significant amount of discussion on this attribute took place when discussing other attributes and is captured here.



3.28.2 Supporting Discussion

The view was put forwards that the material is in its least vulnerable state once it is packaged in Nirex boxes. In this state it was felt that it is most resilient to being appropriated, since to access the material, the boxes must be obtained, and the box and the grout destroyed to release the material. When released, the material is solid, and hence is relatively resilient to dispersion into the environment by deliberate actions. Since all options end with the material in Nirex boxes, the longer cut-up is deferred the

more time the material is at risk seeming to favour packaged waste storage, with RC storage and RPV storage almost equally worst.

However one stakeholder expressed surprise, since the Navy have previously expressed how robust the RC is to attack, leading to a perception that it is an extremely secure container. However, it was pointed out that the RC could contain liquids, which would be more vulnerable to dispersion into the environment. In addition, if access to the RC could be gained, then access to the radioactive material would be more straightforward than accessing a Nirex box.

3.28.3 Most Attractive Option

Based on the arguments made during the workshop, Frazer-Nash suggest that Packaged waste would be the most attractive option on this attribute for most stakeholders, though it is not possible to know if this was a consensus view.

3.28.4 Least Attractive Option

Based on the arguments, made during the workshop, Frazer-Nash suggest that RPV storage would be the least attractive option on this attribute for most stakeholders, though it is not possible to know if this was a consensus view.

3.28.5 Third Option

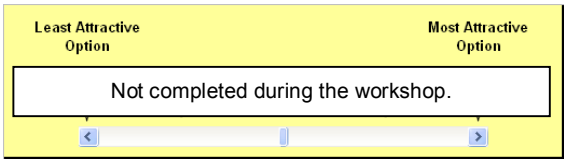
Based on the arguments, made during the workshop, Frazer-Nash suggest that RC storage would be the third option on this attribute, and would rank closer to Packaged waste storage than to RPV storage for most stakeholders, though it is not possible to know if this was a consensus view.

3.29 SECURITY - MILITARY SECURITY

Vulnerability to reverse engineering of the material.

3.29.1 Option Ranking

This attribute was not discussed explicitly in the time available during the workshop, and hence the ranking table below was not completed. However a significant amount of discussion on this attribute took place when discussing other attributes and is captured here.



3.29.2 Supporting Discussion

There were two possible points of view put forwards which relate to Military Security:

- The same level of security will apply equally to all options, and measures will be put in place to bring each option up to the same level of security; or
- RC storage is the most vulnerable, as sensitive information can be gleaned by observation should anyone enter the reactor compartment. Conversely, packaged waste storage is most preferred on this option, as the shape of the original material is destroyed, and it would be very difficult to gain useful

information, even if the boxes were stolen and the packages radiographed. RPV storage falls between the other two options, as useful information could be gained by radio-graphing the packages, however direct inspection would be inadvisable since the intruder would receive a significant radioactive dose during the activity.

A relevant clarification was also made by the MoD. It was explained that delaying an activity will not reduce the classification of the information; it will still not be possible to release information on the engineering detail of the reactor compartment within any anticipated ISOLUS timescale.

Some stakeholders registered surprise at this, in response to which the MoD indicated that some of the decommissioned submarines in the ISOLUS programme are capable of outperforming the in-service submarines of other nations. Furthermore, the technology of the ISOLUS submarines is relevant both to current in-service British submarines and, through bilateral agreements, to the performance of those of other nations. Hence the MoD cannot conceive of releasing any detail of the reactor compartments of the ISOLUS submarines within the timescales of ISOLUS.

3.29.3 Most Attractive Option

Based on the arguments made during the workshop, Frazer-Nash suggest that stakeholders were unable to distinguish between the options, since Military Security is an attribute where an absolute level of performance is required. Hence all options will be brought up to this level of performance. It is not possible, however, to know if this was a consensus view.

3.29.4 Least Attractive Option

Based on the arguments, made during the workshop, Frazer-Nash suggest that stakeholders were unable to distinguish between the options, since Military Security is an attribute where an absolute level of performance is required. Hence all options will be brought up to this level of performance. It is not possible, however, to know if this was a consensus view.

3.29.5 Third Option

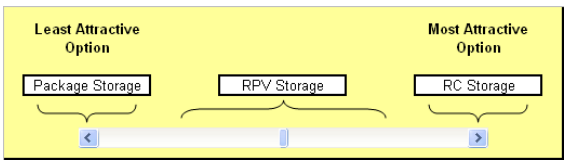
Based on the arguments, made during the workshop, Frazer-Nash suggest that stakeholders were unable to distinguish between the options, since Military Security is an attribute where an absolute level of performance is required. Hence all options will be brought up to this level of performance. It is not possible, however, to know if this was a consensus view.

3.30 THE FUTURE - FLEXIBILITY

The ability for future developments to provide a better solution

3.30.1 Option Ranking

A consensus view was recorded:



3.30.2 Supporting Discussion

Throughout the discussions of other attributes, ideas that "the performance on this attribute may be different if we wait for future advances" were discussed with reasonable frequency. These issues were recorded at the time of discussion under this attribute, and the ranking of the options on this attribute was completed at the end of the workshop. The points raised were:

- One stakeholder suggested that human ingenuity may enable us to reverse the consequences of any decision made, enabling us to deal with our own stupidities, and hence even packaged waste storage allowed for a degree of flexibility.
- A common view was that improved technology (for example robotics) may exist in 30 years, reducing risk during cut–up, and allowing improved methods to be used. This view was discussed many times during the workshop.
- The work that would need to be done to ensure the RC is a viable storage package may restrict its future flexibility.
- The Health and Safety Executive has a strong focus on improving safety in the construction industry, so it is possible that construction activities conducted in the future may be done more safely than construction activities conducted today.

3.30.3 Most Attractive Option

RC storage is the most attractive option as you minimise the closing-out of future options.

3.30.4 Least Attractive Option

Packaged waste storage is the least attractive option, since once the material is size-reduced and grouted into Nirex boxes, the opportunity to take advantage of better cut-up technology is lost, and there remains little flexibility to store the waste in other ways.

3.30.5 Third Option

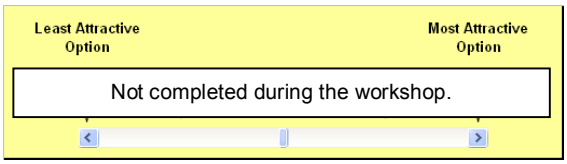
RPV storage was felt to retain a significant amount of flexibility, since the focus of discussions was on how technology may improve safety and reduce doses in the cut-up activity, and this is delayed under this option.

3.31 THE FUTURE - INTERGENERATIONAL ENDOWMENT

The endowment of cost and / or burden to future generations.

3.31.1 Option Ranking

The preference table was not completed during the workshop, however a discussion was had on this attribute and is recorded below.



3.31.2 Supporting Discussion

Two points of view were put forwards. This first was that it is wrong to leave things to future generations when we can take responsibility for the problem and deal with it today. This point of view supports packaged waste storage, and counts against RC storage and RPV storage.

The other point of view was that storing an RC intact would enable future generations to take a different course of action, as alternative options are not prematurely foregone. Note that this argument is a repeat of that used to justify the assessment of the "future flexibility" attribute. To avoid double counting Frazer-Nash has based the assessment of this attribute on the first view, although this would not necessarily have been a consensus view.

3.31.3 Most Attractive Option

Based on the arguments made during the workshop, Frazer-Nash suggest that packaged waste would be the most attractive option on this attribute for most stakeholders, since it leaves the least burden of work to future generations. It should be noted, however, that it is unlikely that this was a consensus view.

3.31.4 Least Attractive Option

Based on the arguments made during the workshop, Frazer-Nash suggest that RC storage would be the least attractive option on this attribute for most stakeholders, since it leaves the most burden of work to future generations. It should be noted, however, that it is unlikely that this was a consensus view.

3.31.5 Third Option

Based on the arguments made during the workshop, Frazer-Nash suggest that RPV storage would be the third option on this attribute for most stakeholders, since it leaves more work than packaged waste storage, but less than RC storage to future generations. It should be noted, however, that it is unlikely that this was a consensus view.

4. WEIGHTING THE ATTRIBUTES

Following discussions with both the IAG oversight team and the MoD it was agreed that it would not be helpful to apply a weighting scheme to the attributes in the analysis of the workshop data.

The justification for this decision, together with the output from the various weighting activities that have been carried out, is included in Annex A.

5. REVIEW OF WORKSHOP OUTCOME

5.1 OVERVIEW

The scoring of the options is summarised in table 5.1, below. Where stakeholders were able to express a preference between the options, the most attractive option is identified in green, the least attractive in red, and the intermediate option in amber. Note that for some attributes, two options were judged jointly most or least attractive, and hence no option is denoted in amber. Where a consensus view was not reached, the alternative view is shown in the column to the right.

The workshop over-ran on the second day, and as a result three attributes were not fully considered in the presence of all attendees. Judgements were made by Frazer Nash on the basis of the discussions that did occur. The relevant criteria are identified below, and discussed further in Sections 3 and 5.2.

			View 1			View 2		
Category	**Sub-Category**	**Attribute**	Option 1 RC Storage	Option 2 RPV Storage	Option 3 Package Storage	Option 1 RC Storage	Option 2 RPV Storage	Option 3 Package Storage
Public	Local Communities	Employment	Same	Same	Same			
		Local Acceptability						
		Socio-Economic Impacts	No Data	No Data	No Data			
	National	Openness of process	Same	Same	Same			
		Public Acceptability						
Facilities & Skills		Flexibility						
		Skill Set						
		Achievability	Same	Same	Same			
Safety	Public	Radioactive Discharge (Routine Op's)				Same	Same	Same
		Accident (Radiological)	Same	Same	Same			
	Workers	Accident (Radiological)	Same	Same	Same			
		Worker Dose (Routine Op's)						
		Accident (Non-Radiological)	Same	Same	Same			
The Future		Flexibility						
		Intergenerational endowment *						
Security		Vulnerability *						
		Military Security *	Same	Same	Same			
Cost		Total Cost	Same	Same	Same			
		Cost Profile	Same	Same	Same			
Policy		Vulnerability to Political Risk						
		Opportunity for Political Change						
		Legal Requirements						
		Compliance with Policy	Same	Same	Same			
		Vulnerability to Policy and Regulatory Change	Same	Same	Same			
Waste Management		Radioactive Waste	Same	Same	Same	No Data	No Data	No Data
		Non-radioactive waste	Same	Same	Same			
Environmental	Routine Ops	Radiological Discharges						
		Non-Radiological Discharges	Same	Same	Same			
	Accidental case	Radiological Discharges				No Data	No Data	No Data
		Non-Radiological Discharges	Same	Same	Same			
		Nuisance						

Table 5.1: - Overview of Results

Note: The legend "No Data" is an abbreviation for "Insufficient Data" (used to save space in the table)
The scoring for attributes marked with * were not completed during the workshop, hence the judgements outlined in section 3 of this report have been applied.

5.2 INTERPRETATION OF THE OPTION SCORES

To reveal the richest picture from the scoring process the results have been examined from two perspectives; the options view and the attributes view. These alternative views are discussed in the following sections, followed by a brief discussion that combines these two views.

5.2.1 The Options View

None of the options emerged as a clear favourite from the discussions:

- RC storage was judged the most attractive option by all stakeholders in 6 attributes and by at least some stakeholders in 10 attributes.
- Conversely, packaged waste storage was judged most attractive by all stakeholders in 6 attributes and by at least some stakeholders in 8 attributes (it should be noted that 2 of these 6 attributes were those whose assessment were not fully completed during the workshop).

However a clear conclusion did emerge in respect of RPV storage. This option was never judged as the most attractive option, being dominated by either RC storage or packaged waste storage on those attributes where a preference was identified. Furthermore, the majority of discussions sought to examine the merits of RC storage versus packaged waste storage, and place RPV storage between them, rather than considering RPV storage in its own right.

Hence it is suggested that, based on the technical options study workshops and the information currently available, the option of RPV storage should not be pursued further.

5.2.2 The Attributes View

5.2.2.1 Attributes That Do Not Differentiate Between the Options

The stakeholders agreed that, given the currently available information, twelve of the attributes did not assist in differentiating between the options. Many of these attributes were recognised as very important issues within the ISOLUS programme, however it did not appear that there would be any significant difference between the options on these attributes. The twelve attributes were:

- Public -Local Communities-Employment;
- Public -National-Openness of Process;
- Facilities & Skills-Achievability;
- Safety-Public-Accident (Radiological);
- Safety-Workers-Accident (Radiological);
- Safety-Workers-Accident (Non-Radiological);
- Cost-Total Cost;
- Policy-Compliance with Policy;
- Policy-Vulnerability to Policy and Regulatory Change;

- Waste Management-Non-radioactive waste;
- Environmental-Routine Ops-Non-Radiological Discharges; and
- Environmental-Accident Case-Non-Radiological Discharges.

Based on the discussions during the workshop Frazer-Nash assessed that stakeholders would also have concluded that the following attribute did not differentiate between the options:

- Security – Military Security

5.2.2.2 Attributes with Insufficient Data

All the stakeholders agreed that there was insufficient data to inform a judgement on one attribute. This attribute was:

- Public - Local Communities - Socio-Economic Impacts.

Stakeholders felt that no meaningful judgement could be made on this attribute until the community of concern was defined, and the detail of the process identified.

On one attribute it was felt that the data clearly identified the preferred option, but did not assist in differentiating between the other two options. This attribute was:

- Public – Local Communities – Local Acceptability

On two other attributes, a proportion of the stakeholders felt that there was insufficient data available to make a judgement, although the remaining stakeholders were able to express a preference. These were:

- Waste Management – Radioactive Waste
- Environmental – Accidental Case – Radiological Discharges

5.2.2.3 Consensus View on Attributes that Differentiate Between the Options

There was consensus between the stakeholders on the ranking of the options against ten of the attributes, and Frazer-Nash assessed that stakeholders would also have reached a consensus on two more attributes. However it must be recognised that just because stakeholders agreed on the ranking they did not necessarily agree on the rationale that underpinned the ranking, and stakeholders had different opinions on the scale of the difference between the most and least attractive options.

Table 5.2a below lists the ten attributes and highlights the most attractive option selected by stakeholders. Table 5.2b summarises Frazer-Nash's assessment of the other two attributes. The comments highlight the key points made by stakeholders during the discussion, however this was not necessarily the only issue of importance to stakeholders, more detail is provided in section 3.

Attribute	Most Attractive Option	Comments
Public - Local Communities - Local Acceptability	1	Based on the CIOP
Public – National - Public Acceptability	1	Based on the CIOP

Attribute	Most Attractive Option	Comments
Facilities & Skills - Flexibility	3	Transport key issue, Option 2 close second
Safety – Workers - Worker Dose	1	Option 3 close second, difference between options based additional decay during storage
The Future - Flexibility	1	Based on doing things as late as possible
Policy – Vulnerability to Political Risk	3	Based on doing things as soon as possible and conforming to approach adopted in civil nuclear sector.
Policy – Opportunity for Political Change	1	Waiting allows flexibility to respond to political intervention.
Policy - Legal Requirements	3	Not able to apply for planning now for future ops on Options 2 & 3
Environmental - Routine Ops - Radiological Discharges	1	Based on decay during storage
Environmental - Nuisance	3	Based on Construction activities and Visual Impact

Table 5.2a: - Stakeholders Consensus Views

Attribute	Most Attractive Option	Comments
The Future – Intergenerational Endowment	3	Wrong to leave future generations to deal with our problems when solutions available now
Security - Vulnerability	3	Material least vulnerable when packaged

Table 5.2b: - Frazer Nash assessment of likely Consensus View

5.2.2.4 Opposing Views on Attributes that Differentiate Between the Options

There were five attributes where stakeholders did not achieve a consensus. Again it must be noted that individual stakeholders may not agree on the rationale for their choice even thought they supported the same choice for most and least attractive option.

Table 5.3 below lists the five attributes and highlights the most attractive option from the two views taken by the stakeholders. The comments highlight the key points made by stakeholders during the discussion, however this was not necessarily the only issue of importance to stakeholders, more detail is provided in section 3.

Attribute	View 1		View 2	
	Most Attractive Option	Comment	Most Attractive Option	Comment
Facilities & Skills - Skill Set	3	Must use current knowledge and skills while they are available.	1	Waiting allows new skills to develop.

Safety - Public - Radioactive Discharge (Routine Op's)	1	Waiting allows knowledge of discharges to develop and radioactivity levels to decay.	All options same	It is possible to configure all options to the same extremely low levels of discharge.
Cost - Cost Profile	All options same	No significant difference in cost profiles	1	Based on estimated present value.
Waste Management - Radioactive Waste	All options same	Same quantity of waste from all options	Insufficient data	Insufficient data for an informed decision.
Environmental-Accidental case-Radiological Discharges	1 & 3	RC and Nirex boxes provide effective containers.	Insufficient data	Insufficient data for an informed decision.

Table 5.3: - Opposing Views

5.2.3 Common Themes

The discussion in this section draws together the threads that run through the stakeholders' discussions during the assessment of the three options and attempts to present some common themes.

The assessment has revealed that, depending on stakeholders' position, both RC storage and Packaged Waste storage (Options 1 & 3) have attractive features. RPV storage (Option 2) is outperformed by at least one of the other two options in all areas.

Frazer-Nash has reviewed the discussions during the workshop to identify the key issues that stakeholders used to make their judgements. These are as follows:

- The outcome of previous public consultations, i.e. the CIOP and to a lesser extent the FEC.
- The implications of transport at various stages during the processes.
- The effects of radioactive decay both prior to and during the ISOLUS storage period, and the implications this has on carrying out operations at different times during the ISOLUS programme.
- The effectiveness of the RC as a robust storage container.
- Completing cut-up early in the programme as there is no insurmountable reason to delay and potentially there are benefits.
- Delay cut-up for as long as possible as there are benefits to be gained from the passage of time.

The robustness of any future decisions on the selection of an ISOLUS solution could be enhanced by deepening the level of understanding on these issues within the relevant stakeholder community.

5.3 WORKSHOP OBSERVATIONS

Whilst some attendees, including many of the technical specialists, were broadly content to make judgements based on imperfect information, other stakeholders were very uncomfortable in making judgements in the absence of independent, verified data

specifically relating to the aspect of the ISOLUS programme under discussion. For a majority of the attributes, such data is not currently available.

These concerns were particularly prevalent when discussing the attributes concerning radioactive material, whether relating to routine or accidental discharge or the management of radioactive waste. The discussions were indicative of an understandable unease on the part of some stakeholders; of whom some did not feel qualified or experienced to assess the veracity of the data with which they were presented, and others were concerned about the method and motivation for the generation of the data.

To address these concerns, Frazer-Nash suggests that more detailed information relating to the handling and disposal of the radioactive material in the ISOLUS programme is produced (recommendation 5), indicating:

- The radioactive inventory, both before and after the ISOLUS programme.
- The manner in which it will be handled in the options under consideration.
- The manner and likelihood of any release:
    - As routine discharges
    - As worker dose
    - As accidental discharges.
- The effects of any release on the local population and the environment.

This information must be produced in a manner which makes it credible and understandable to all stakeholders. In practice this implies that it must be produced or verified by an independent expert who is accepted by the stakeholder community.

5.4 COMMENTARY ON TRANSPORT ISSUES

The issues raised by stakeholders covered a number of topics relating to transport, under the discussions of other attributes. This section of the report is provided in response to the stakeholders' request to provide a summary of where the transport issues were discussed.

The attributes where stakeholders discussed transport issues during their evaluation were:

- Facilities & Skills - Flexibility
- Safety - Public - Accident (Radiological)
- Environmental - Accidental Case - Radiological Discharges
- Environmental – Nuisance

The issues relating to transport discussed when evaluating these attributes were:

- A larger number of sites could be considered for ISOLUS operations if the material can be transported on the national road network.
- The size and weight of the RC precludes it being transported on conventional road transport, and routes would be severely restricted by bridges and overhead cables.

- There is existing experience of transporting packaged waste by road and rail, and the size of the package does not unduly restrict the choice of routes.
- It was suggested that accidents leading to a radioactive discharge (that would discriminate between the options) would be most likely to occur during the transport phase of operations.
- There was a clear perception that a suitably prepared RC was a robust transport container.
- The packaged RPV was perceived to be a significantly inferior transport and storage container and it was generally recognised that it would need bespoke packaging for any form of transport.
- The work necessary to prepare the RC or the RPV for transport, such as measures to immobilise any liquids or dust, may complicate subsequent cut-up processes. However, no evidence was provided to support this argument.
- The characteristics of the transport in and out of an ISOLUS site could affect the environmental nuisance and the perceptions of the local community.

6. SENSITIVITY

6.1 OVERVIEW

The workshop identified a number of characteristics of the options which could be used to differentiate between RC storage and packaged waste storage. Sensitivity analysis seeks to examine the robustness of the judgements made during the workshop, and to explore what may change the outcome.

Numerical sensitivity analysis cannot be sensibly applied to the semantic information collected during the workshop; to do so is likely to prove misleading. Rather the sensitivity analysis carried out here seeks to address the question:

"To what extent could the assessment be affected by changing the characteristics of the options?"

6.2 ATTRIBUTES OF INTEREST

It is recognised that the ISOLUS options are still at an early stage of development and that work would be required before any of them were implemented. The sensitivity analysis explores the attributes that differentiate between the options and assesses the issues that may lead to a change in stakeholders' views on the relative ranking of the options as they are developed. The extent of any change in stakeholders view cannot be assessed, and it is difficult to postulate if the change would be sufficient to lead to a different option emerging as the most attractive under any of the attributes.

There are sixteen attributes that differentiated between the options for some of the stakeholders. Of these:

- The issues associated with four attributes arise from fundamental characteristics of the options and it is not likely that stakeholders' views would change. Two of these attributes were assessed by stakeholders during the workshop, the second two were assessed by Frazer-Nash based on discussions during the workshop:

Facilities & Skills – Flexibility	RC storage *is* the most difficult option to site.
Environmental – Nuisance	RPV storage *does* need extra construction and RC storage *does* need a bigger store.

The Future – Intergenerational Endowment	Packaged Storage minimises the burden on future generations
Security - Vulnerability	Packaged Storage minimises misuse of the material

- The assessment of performance on four of the attributes was linked in such a way that if the characteristics of an option were changed to improve the score against one attribute the same change would reduce the score on other attributes:

Policy - Vulnerability to Political Risk	It is possible to increase the preference for RC storage on these attributes by building the necessary facilities for the whole ISOLUS project at the beginning of the time span. However this would reduce flexibility in terms of future developments and change the cost profile, therefore reducing the preference for RC storage on a number of other attributes.
Policy - Legal Requirements	
The Future - Flexibility	The enhancements necessary to make the RC a robust transport and storage container may reduce the flexibility of this option to respond to changes in the political climate or respond to technology development (recommendation 3).
Policy – Opportunity for Political Change	

- On seven attributes (listed below) stakeholders were not persuaded that the data was sufficiently complete or compelling to form the basis of their assessment, although they still felt able to express a preference for a particular option. It is reasonable to assume therefore that if more relevant and detailed data were presented in these areas that stakeholders may either change their judgements or become more certain of their current judgement:

Public – Local Communities - Local Acceptability	The CIOP is the most relevant background information on public issues (both local and national) but as the options are developed more detailed information will be available on the critical issues, including site specific information, more detailed plans of the facilities and operations together with supporting data (see recommendation 4).
Public – National - Public Acceptability	
Cost – Cost Profile	Some stakeholders wished to apply discounting to the cost profile. A more detailed cost calculation to generate a Present Value for the options would provide better quality data to inform these views.
Safety - Public - Radiological Discharge (Routine Operations)	These attributes all relate to the quantity, characteristics and processing of radioactive material. Further definition of the implications of handling and disposal of the radioactive material in the ISOLUS programme would provide better quality data to inform these attributes (recommendation 5).
Safety – Workers – Worker Dose (Routine Operations)	
Environmental – Routine Operations – Radiological Discharges	
Environmental – Accidental Case – Radiological Discharges	

- A number of attributes were based on stakeholders' interpretation of other peoples' view or developments that may occur in the future. The implication is that although more detailed information may become available as the options are developed, resulting in a change on stakeholders' preference for particular options, there will always be a level of uncertainty associated with the assessment. However, there was one attribute where it is difficult to envisage how more detailed information could resolve the different views presented by stakeholders:

Facilities & Skills - Skill Set	The difference in view between stakeholders about the necessity of utilising currently available skills before they expire or waiting to allow new skills to develop cannot be resolved until history has shown which view was correct. However, this does not mean that gathering further information, based on the experience of people involved in similar activities, would not help to inform stakeholders' views.

6.3 RESULT OF THE SENSITIVITY ASSESSMENT

Of the sixteen attributes which differentiated between the options, only four were judged to be insensitive to ongoing development of the way in which the option is implemented. Another four attributes were characterised such that changes that raised the preference for an option on one attribute would also reduce the preference on another attribute. The remaining attributes were based on various levels of interpretation of background information, either that presented in the Data Report or stakeholders' views from other applications and situations. The implication therefore is that stakeholders' assessments could change as more detailed information about the options becomes available.

It was also clear that the choice of site will have a large impact on the final outcome. It was difficult for stakeholders to evaluate some attributes without knowledge of specific sites.

7. OUTCOMES

A number of outcomes can be drawn from the work:

1. The stakeholder workshop did not identify a clear preference for any of the three options, based on the currently available information.

2. RPV Storage was the least preferred option and indeed it was not the preferred option under any of the attributes considered. Overall, stakeholders saw little merit in this option, and the focus of the majority of the discussion was on the options of RC storage and packaged waste storage.

3. Some stakeholders found it difficult to make a judgement on their preferred option on some attributes, given the level of detail with which information can be generated at the current stage of development. These stakeholders are likely to be more comfortable in expressing their preferences when greater clarity in the definition of the ISOLUS processes is available.

4. Some stakeholders did not view some of the information presented in the data report [Ref. 3] as credible, particularly that relating to deliberate or accidental radiological discharges, and the radioactive waste inventory arising from each of the processes. Recommendations 2 and 5 seek to address this issue.

5. The way in which the options are developed could change stakeholders' preferences for each option. In particular the likely siting of the operations is a key issue for many stakeholders.

8. RECOMMENDATIONS

Stakeholders were reminded during the second workshop that the Technical Options Study is one of a number of elements of work being undertaken by the ISOLUS project team to investigate the three options, and this work is not attempting to reach a final conclusion. During the course of the work therefore Frazer-Nash has identified a number of recommendations that could contribute towards reaching a conclusion. The recommendations are collected here for consideration by the ISOLUS community, and are numbered in the order in which they arise from the text of this report.

1. During the second workshop, there was some difficulty in understanding the skills and experience required to conduct the ISOLUS activities. Some stakeholders felt that the skills were little different to standard mechanical fitting skills, whilst others stressed the importance of the specific knowledge of the reactor plant available only by consulting those who worked on the submarines.

   It is recommended that the MoD provide clarity on this issue, detailing what skills and knowledge will be required at what stage in the ISOLUS programme, and identifying the risks arising from conducting ISOLUS activities when those with “hands-on” experience of the submarines are not available to be consulted.

2. Some stakeholders had difficulty in inferring the likely radiological discharges and doses for the ISOLUS processes from data for similar activities, where data for the ISOLUS processes themselves was not available.

   It is recommended that the MoD should produce ISOLUS-specific data on levels of radiological discharge and radiological dose associated with ISOLUS processes to clarify discussions on these two aspects.

3. During the second workshop, it became clear that many stakeholders perceive the RC as a highly effective transport and storage container.

   It is recommended that further work is undertaken to examine the effectiveness of the RC both as a transport and as a storage container, in comparison to a Nirex box.

4. In discussions on the public perceptions of ISOLUS activities, it became clear that the CIOP is the most relevant background information on both local and national public issues which is available at present. However the CIOP is a record of public opinion based on the information available to them at the time at which it was conducted (September to December 2003). These views are based on beliefs, and are strongly held by the public.

   However, as the options continue to be developed more detailed information will be available on the critical issues, for example site specific information, and more detailed plans of the facilities and operations together with supporting data. Since the public view is based on the information made available to them at the time of consultation, it is extremely important that the public be provided

with the best information available and are given the opportunity to express their views in the light of this information.

Hence it is recommended that further public consultation is undertaken, providing the best available information to the public and inviting them to express their opinions in the light of this.

5. During discussions on the radiation-related attributes, it became clear that there was some difference of opinion between stakeholders on the way in which radiation could cause harm to workers, the public, and the wider environment, and the level of harm which would arise. It was clear in the workshop that this is an area where different stakeholders hold differing views and hence any information provided to stakeholders must be produced in such a way as to be credible to all parties.

   Hence it is recommended that work is undertaken, building on Recommendation 2, to identify the radioactive inventory, as well as the radioactive discharges and doses arising from each of the options. The effects of any differences in dose, discharges, or inventory should then be explored to identify whether these aspects differentiate between the options. This work must be credible to all stakeholders, and it was suggested in the workshop that "co-production" of such information between the MoD and other experts, trusted by non-technical stakeholders, should be considered to address this issue.

9. REFERENCES

1. ISOLUS Technical Options Study, Methodology Report, FNC 35114/34530R

2. ISOLUS Technical Options Study, Attributes Report, FNC 35114/34646R

3. ISOLUS Technical Options Study, Data Report, FNC 35114/34735R

4. ISOLUS Technical Options Study, Workshop 2 Briefing Pack, FNC 35114/58642V

5. ISOLUS Options Study Project Progress Meeting, FNC 35114/57912V

6. ISOLUS Technical Options Study, Workshop 2 – Post Meeting Note to Stakeholders on Weighting, FNC 35114/58829V Issue 1

10. GLOSSARY OF TERMS

CIOP	Consultation on Outline Proposals
EA	Environment Agency
EIA	Environmental Impact Assessment
EISS	Environmental Impact Screening and Scoping
IAG	ISOLUS Advisory Group
ILW	Intermediate Level Waste
IPR	Independent Peer Review
ISOLUS	Intermediate Storage of Laid-Up Submarines
LLW	Low Level Waste
MoD	Ministry of Defence
OSPAR	Oslo and Paris Convention/Commission
RC	Reactor Compartment
RPV	Reactor Pressure Vessel
SQEP	Suitably Qualified and Experienced Personnel
TRL	Technology Readiness Level
UK	United Kingdom

ANNEX A - WEIGHTING ACTIVITIES

A.1 WEIGHTING ACTIVITIES

The information in this Annex is provided for completeness. As is explained in section 4 of this report it became clear as the work progressed that it would be inappropriate to apply a weighting scheme at this stage of the option assessment. However, a number of preliminary weighting activities had been completed and it is prudent to record the outcome even though it was not used during the assessment.

A.1.1 INITIAL STAKEHOLDER RANKING

Following the Attributes Workshop, stakeholders were circulated with a questionnaire that asked them to identify their top five most important attributes from the initial list produced during the workshop. Stakeholders were encouraged, where possible, to put their top five attributes into rank order, and if they felt able to continue with the process, to rank their top ten attributes. Stakeholders were also given the opportunity to identify attributes that were least important to them. Twelve stakeholders completed and returned the questionnaire.

Analysis of the view expressed by stakeholders in the questionnaire revealed that there was no clear consensus between stakeholders on the importance of any of the attributes. Indeed, there were almost as many different views as there were responses from stakeholders. It was not possible to identify an overall ranking for the attributes, nor was it possible to identify groups of stakeholders who expressed similar views. In several cases where one stakeholder had identified an attribute as important, another stakeholder would identify the attribute as least important.

A.1.2 CATEGORY DIFFERENTIATION

At the beginning of the second workshop stakeholders discussed the relative importance of the attribute categories. This was carried out as a visual exercise. The implications of each category were discussed in turn and stakeholders were asked to position the category within or between one of three board categories;

- Does not differentiate;
- Differentiates; and
- Strongly differentiates.

The result of this exercise is illustrated in Figure A1 below, followed by notes of the discussions. Where attribute categories span two categories in the diagram this is indicative of a range of views amongst the stakeholders.

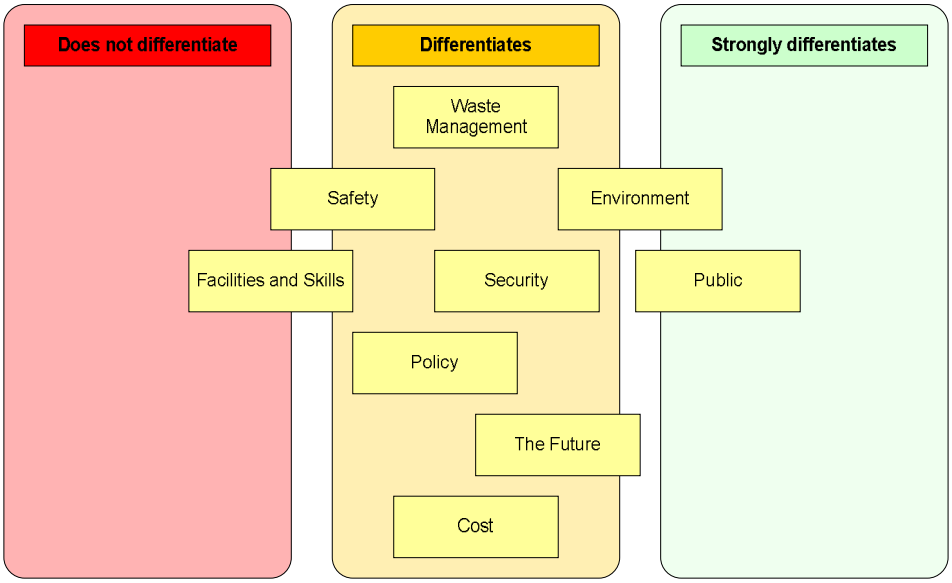


Figure A1: - Category Differentiation

Waste Management – A mixture of opinions were expressed as to how much this differentiates. The amount of liquid waste that would be produced, the handling requirements and the implications of packaged ILW were the key issues discussed by stakeholders.

Safety – Some stakeholders expressed the view that all options have to comply with regulations and therefore safety is not a differentiator. However, it was recognised that the public would probably view this as a differentiator. The extent to which regulations are applied was raised, as was the need to debate safety vs. perception of safety.

Environment – There was a general consensus that environmental issues differentiate between the options. The environmental specialist indicated that studies to date have concluded that environmental issues do not differentiate between the technical options per se; differentiation will only become apparent when site and technology issues are finalised for each option.

Facilities and Skill – There were a mixture of views expressed on the level of differentiation from facilities and skill issues. The discussions centred on the availability and or improvement of nuclear skills as time passes versus several views that this category does not differentiate as plenty of sites are available for all options.

Security – The MoD view is that security differentiates between the options. This was questioned by some stakeholders as there is a public perception that the design of the equipment in the laid-up submarines was considered obsolete by the public.

Public – There was a general consensus that this category strongly differentiates.

Policy – There was a general consensus that this category differentiates.

The Future – There was a general consensus that this category differentiates.

Cost – The MoD view is that cost strongly differentiates. The counter view expressed by stakeholders was that it is not possible to estimate costs in the current economic climate and as there was uncertainty in cost figures, it was difficult to determine if it differentiates or not.

A.1.3 POST WORKSHOP EXERCISE

The original aspiration was to establish the relative weightings of the attributes during the second workshop. However, this was not possible in the time available. During the workshop Frazer-Nash suggested that they could make an initial judgement on the relative importance of the attributes from the discussions between stakeholders as they assessed the options against each attribute. Stakeholders agreed that the time available during the workshop should be devoted to completing the options assessment and that they would review a note presenting the initial weightings derived by Frazer-Nash after the workshop.

Frazer-Nash produced and distributed to stakeholders a document [Ref. 6] that presented an initial judgement on weighting based on Frazer-Nash's interpretation of the discussions during the workshop. As stated during the workshop the weighting would not use a numeric scale. Rather, the focus was to capture issues that influence the relative importance of attributes.

Even though Frazer-Nash had produced an initial judgement on weighting, they were concerned that it would be difficult to apply this judgement in a way that is meaningful and instructive to the assessment of the options. To apply a weighting scheme with any degree of rigour to the attributes it is important that the value scales used to score the options are also known. This implies that, when assessing an option against an attribute, it is necessary to know the difference in value between the best and worst option as well as which option is best and worst. It was evident from the discussions during the workshop that in many cases stakeholders were only just able to identify best and worst options and that the level of detail in the supporting information was not sufficient to allow them to go to the next step of establishing a value scale with any degree of confidence.

Frazer-Nash discussed these concerns with the IAG oversight team and the peer reviewer, who fed back a number of concerns received from the stakeholders over the weighting note. These views confirmed Frazer-Nash's opinion that it would not be instructive to apply a weighting scheme to the analysis of the options at this stage. Hence Frazer-Nash proposed that outcome of this study was based on the scoring process without the application of a weighting scheme. This proposal was accepted by both the oversight team and subsequently by the MoD ISOLUS project.

ANNEX B - COMMENTS FROM THE STAKEHOLDER GROUP

B.1 INTRODUCTION

The stakeholders who contributed to the assessment of the three technical options were invited to comment on the content of a draft version of this report.

Comments were received from three stakeholders. Where their comments relate to shortcomings in the text the relevant amendments have been made. Comments that provide clarification or additional information are recorded in this Annex. Each stakeholder's comments are reproduced in separate sub-sections and are linked to the section of the report to which they relate.

B.2 COMMENTS FROM FIRST STAKEHOLDER

B.2.1 SECTION 1.1

The stakeholder wished to point out that Frazer-Nash Consultancy is a wholly owned subsidiary of the Babcock Group.

B.2.2 SECTION 3.2.5

In relation to the scoring for the Total Cost attribute the stakeholder commented:

> This is rather glib, it is likely that there will be huge initial cost implications for options 1 and 2 due to the experimental nature of the cutting up / repackaging facility and the robotics developments required to tackle the RC's.
>
> I think that you should indicate here - that whilst the overall lifetime project costs for the 3 options would be similar, - Options 1 and 2 would have much larger 'up front' costs

B.2.3 SECTION 3.10.2

To support the discussions on the relationship between radiological and non-radiological worker safety the stakeholder added a further illustrative example:

> As an illustrative example – how does the project risk assessment compare a worker exposure/dose (threat of a cancer in 30 years time) to a conventional 'strikes thumb with hammer' accident?

B.2.4 SECTION 7

In relation to the first outcome the stakeholder provided the following additional perspective:

> There was no clear consensus perhaps some of us have very clear preferences.

B.2.5 SECTION 8

The stakeholder made the following comment on the first recommendation:

> Present available skills and experience are being used as an argument for complete dismantling of the RC a.s.a.p. This is false – skills along with technology in 25-30 years time will have improved – people with hands on knowledge will not be required, just a 'nice to have'.

On the third recommendation they commented:

> It was stated many times and understood that the RC was the best containment vessel available, designed to withstand enemy attack. The transport issue is pure engineering. We can transport whole submarines or Frigates if we need too.

For the forth recommendation the comments were:

> The CIOP consultation arrived at the correct answer for the Public – but the incorrect answer for the contractors. MoD response - driven by politicians and industry – Please try harder!

B.3 COMMENTS FROM SECOND STAKEHOLDER

B.3.1 SUMMARY

In response to the declared aim of the ISOLUS project given in the first paragraph (and also in section 1.1) the stakeholder commented:

> A number of us have long had reservations about both "solution" and "disposal" in this mission statement, convinced that only "management" and "storage" respectively are acceptable here.

Commenting on the fact that the workshop did not identify a clear preference for any of the three options the stakeholder observed:

> There was a preference, as there has been all along, for the first option by those who respect the public stakeholders' position, in so far as it may be assessed.

To amplify the point concerning the level of detail with which information was available the stakeholder added:

> Some of us doubt whether the MoD will ever be able to release enough information about some aspects of the process for us to be comfortable, concerning both secure details and the history of the Project that the public will need to know in order for it to have the necessary confidence in the process.

On the issue of data credibility the stakeholder commented:

> It was the manner in which the data report was issued, and the scant respect accorded to our views of it and our role in approving it and suggesting alterations to it, that tested our credibility.

The stakeholder wished to see an additional recommendation included:

> Doubts about the adequacy of the ICRP model of radiation risk undermine the reliability of all the radiation data, and more accommodation should be given to other models. At present the presumption by the nuclear establishment and the MoD that the ICRP model is correct leads to a profound bias, since the existence of that establishment is predicated upon that model. If it were found to be far too permissive, as is felt by some of the public to be the case, the establishment and MoD position would be untenable.

B.3.2 SECTION 1.2

The stakeholder made the following comment in response to the structure of the workshops:

> There was a wide disparity in the extent to which the workshop members felt they were limited by their particular "representative" status, and the workshop's intentions in this respect were never clear and seemed to alter over time.

And the following four comments on the availability of data and the Data Report:

> The data was made available by the MoD alone, although previous queries had been raised about this.

> The Data Report was not issues far enough ahead for stakeholders to study it thoroughly and offer detailed views on it.

The CD-ROM containing background data was sent to stakeholders very shortly in advance of the second workshop.

Several members voiced disquiet over the secret emails from the MoD that had formed part of the data report but which members were not shown. Data means "information that is given", so a Data Report cannot contain material that has not been given. There was no satisfactory answer provided to this problem.

B.3.3 SECTION 2.2

In response to the MoD's estimate that the preferred way ahead would be issued within 18 months the stakeholder commented:

> This time frame seems remarkable now, in view of the preferred way ahead constituting a rebrand, presented by the MoD at the MISG Meeting on 13 the November, which must have been in preparation at the time of this workshop.

B.3.4 SECTION 2.3

The stakeholder states that the second paragraph misrepresents two profound problems:

> In agreeing that the workshop should proceed, the stakeholders were demonstrating their bona fides in seeking progress in the ISOLUS Project, yet this was at the expense of the integrity that could only have come from a better considered data report and its references; we were in a double bind.
>
> The MoD's presumption – in this case that other stakeholders would inevitably accept the MoD's own data without question - has been a major and unresolved problem for the ISOLUS Project. It lies behind the grave dissatisfaction with which many of the stakeholders and of the IAG have regarded the choice of method of this study and the speed with which it has been conducted.

B.3.5 SECTION 2.4

Commenting on the MoD's action to confirm that the ISOLUS programme is limited to 27 submarines the stakeholder noted:

> Which it (ie MoD) has still not done. May this invalidate the workshop's findings on this attribute, or perhaps have even more serious repercussions on the Project?

In response to the comments from the MoD health physicist on the collective dose over long periods of time (1000 years) the stakeholder commented:

> This presumes that the ICRP model will remain indefinitely the guide here. If a substantially different model comes to be accepted, then the MoD health physicist's claim clarifies nothing, for a different model might differentiate between the options.

B.3.6 SECTION 3.2

In support of the discussions on the Total Cost attribute the stakeholder notes:

> Since the workshop, doubts about the validity of the costs data have been hugely amplified by the economic crisis, and again by the feeling that the MISG's subsequent "rebrand" of the Project may have in part been dictated by financial considerations. So I think it is impossible any longer to rely on these costs data.

B.3.7 SECTION 3.7

In support of the discussions under the Safety-Public-Radioactive Discharge attribute and the suggestion by some stakeholders that any course of action other than RC storage would lead to greater levels of discharge the stakeholder wishes to add:

> This view is so obviously a public one that the two representatives of the public view should be counted here as well as the one stakeholder mentioned. It is also a view shared by many of the public around nuclear installations at present, ie not only at the time of the CIOP consultation, and it is a reason too for the public doubts about the ICRP model, so it deserves far more emphasis than is given here. The stakeholders who did not accept it have an interest in upholding the ICRP model.

B.3.8 SECTION 3.10

On the discussions on the effect of Carbon-14 on worker dose the stakeholder commented:

> Surely this is a curious argument? On its basis, one could say there is no danger anywhere because adequate steps would be taken to prevent it.

On the discussion on adapting processes and protective measures to address dose rates to workers the stakeholder commented:

> This supposes that the model of radiation risk used is adequate. So long as it relies upon external radiation only and whole body dose, as does the ICRP model, it cannot be adequate.

Under the comments on the selection of RC storage as the most attractive option the stakeholder added:

> It provides time too for a better model of radiation risk to be agreed upon.

B.3.9 SECTION 3.12

Commenting on the statement that the public perception is that RC storage allows more time for the material to decay, the stakeholder added the following clarification:

> I am not sure that public perception is always as specific as this; more likely that it is often seen in terms of “less radioactivity” or “less danger”.

Following the request for stakeholders to consider what additional data was required to make an informed decision on this attribute, the stakeholder commented:

> Yes! An impartial and open investigation of radiation risk – to do what the CERRIE Committee was supposed to and failed to do.

B.3.10 SECTION 3.14

In response to the discussions on OSPAR the stakeholder commented:

> I’m not sure what the MoD is saying here. Unless it is suggesting that the individual defence facilities will work against OSPAR to get around it, it seems irrelevant.

B.3.11 SECTION 3.16

Following the comment in the supporting discussion that until design data becomes available the assessments are reliant on professional and expert opinion, the stakeholder added:

> Yes, but so far only MOD expert opinion, not counter-expert opinion, has been available although this has been firmly recommended in both public consultations.

B.3.12 SECTION 3.21

In the supporting discussions on the Compliance with Policy attribute the stakeholder commented about the date of Cmd 2919:

> Interesting to note the date of this – about the time when the previous "rebrand" of the ISOLUS Project was being set up, in the wake of the CIOP difficulties.

Under the comment that the MoD would be subject to judicial review if it did not comply with government policy the stakeholder made the following observation:

> The implications behind this whole supporting discussion are generally disquieting. I think it needs looking at a good deal more closely. It looks as though, just at the time when the public had expressed a marked and awkward preference for Option 1, the MoD invented new rules that made Option 1 difficult to pursue.

B.3.13 SECTION 3.24

In response to the note on the study by Nick Pigeon titled "Living with Risk" the stakeholder added:

> Yet this has not been done for any submarine risk and cross-references from Nick Pigeon's work to ISOLUS would be extremely tenuous.

Under the comment in the supporting discussion that the CIOP reported a preference for RC storage at a national level, but at a local level no community was willing to accept it the stakeholder added:

> So what? This is the way the public thinks, and it is entirely logical, given the way CIOP was presented to the public. RC storage was for the public the least worst option, but very little effort was made by industry to suggest why a community might be willing to accept it. This is a limitation of the validity of this attribute currently.

B.3.14 SECTION 3.26

In response to the supporting discussion item on contractors' willingness to release information the stakeholder comments:

> It was not so much the contractor we considered, as the process. And clearly there would be less likelihood for the process to involve exposure of internal secrets in Option One than in the other two options.

B.3.15 SECTION 3.28

Under the discussion for the most attractive option for the vulnerability attribute the stakeholder noted:

> When presented as in the paragraphs above, however, it also seems as though a packaged Nirex box would be the easiest option for a terrorist to drive off with.

B.3.16 SECTION 3.29

Under the supporting discussion for the Military Security attribute the stakeholder commented:

> There seems to be a reflection here of the ongoing arguments between military security and human security, and the public view is likely to be that – in view of the futility and nihilism of nuclear powered defence – human security ought to prevail, and the details should be made accessible on those grounds.

B.3.17 SECTION 3.31

The stakeholder added the following comment in response to the first view outlined in the supporting discussion:

> There is an increasingly held view that all of the present ideas about packaging and stabilising radioactive material may be based upon too short durations, and may not be the best for the massive time-scales involved in a deep repository. This surely is the corollary of the next paragraph, so it too has also been considered under "future flexibility"?

B.3.18 SECTION 5.4

The stakeholder made the following observations on the commentary on transport issues:

> The MoD is not short of coastal sites possible for RC storage.
>
> There is no need to think of storing RC's away from the coast.
>
> The MoD has evidently avoided seeking any evidence that the RC is a robust transport container, while actively seeking problems with RC transport.

B.3.19 SECTION 6.3

In support of the comment that it was difficult for stakeholders to evaluate some attributes without knowledge of specific sites the stakeholder added:

> I think it is worth mentioning that some members have, since the outset of the Study, said that it had very limited value without sites being explicitly involved.

B.3.20 SECTION 8

Commenting on the point made in recommendation 4 about the views of the public the stakeholder makes the point that:

> So are the views of the nuclear establishment strongly held beliefs too, as say the validity of the ICRP model of radiation risk. And these may change too in the light of further information.

Commenting on the point made in recommendation 5 on the co-production of information between the MoD and other experts the stakeholder noted that:

> This must include experts capable of questioning the established model of radiation risk.

B.4 COMMENTS FROM THIRD STAKEHOLDER

The comments received from this stakeholder have all been incorporated in the body of the report.