SUBMARINE DISMANTLING PROJECT ADVISORY GROUP (SDPAG)

REPORT TO THE ADVISORY GROUP OF THE SDPAG OBSERVERS' COMMENTS ON THE MOD SDP OPTIONS SELECTION PROCESS

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Background

The Submarine Dismantling Project involves finding a solution for the disposal of 27 nuclear powered submarines when they have reached the end of their operational lives. The Ministry of Defence (MOD) has been carrying out technical studies and options selection processes to identify preferred options with a view to a national consultation on the MOD proposals.

As part of the MOD preparations the Submarine Dismantling Project Advisory Group (SDPAG) was set up in 2007 (then called ISOLUS AG) to provide independent challenge and advice to the MOD. The SDPAG works at a national level and its membership consists of representatives from industry, regulators, professional bodies, Non Governmental Organisations (NGOs), Community Based Organisations (CBOs), academic institutions, and specialist professions[1].

In order to give more detailed and timely advice to the MOD, two sub- groups of the SDPAG[2] were established, one to focus on the proposed public consultation and one to focus on the Strategic Environmental Assessment process (SEA). Members of these sub- groups operate under Non Disclosure Agreements due to the sensitive nature of draft documents and emerging proposals. The sub- groups report back to the SDP Advisory Group.

Three members of the sub- groups undertook to observe sections of the MOD options analysis workshops on behalf of the SDPAG. Their role has been to observe the process to ensure that it has been fair and unbiased and to provide feedback to

[1] Full details available on;
http://www.mod.uk/DefenceInternet/MicroSite/DES/WhatWeDo/SDP/SubmarineDismantlingProjectAbout.htm

[2] More information is available at
http://www.mod.uk/DefenceInternet/MicroSite/DES/WhatWeDo/SDP/SubmarineDismantlingProjectAbout.htm

the MOD and the SDPAG. The observers do not have the expertise to provide review of technical issues and have not commented on scoring and weighting procedures or any other methodological details of the Multi Criteria Decision Analysis (MCDA).

A more detailed description of the options selection processes is at Annex A.

A biography/conflict of interest statement for each of the observers (Dr P.Dorfman, D.Collier. L. Netherton) is included at Annex B.

Annex C contains a list of acronyms and key definitions..

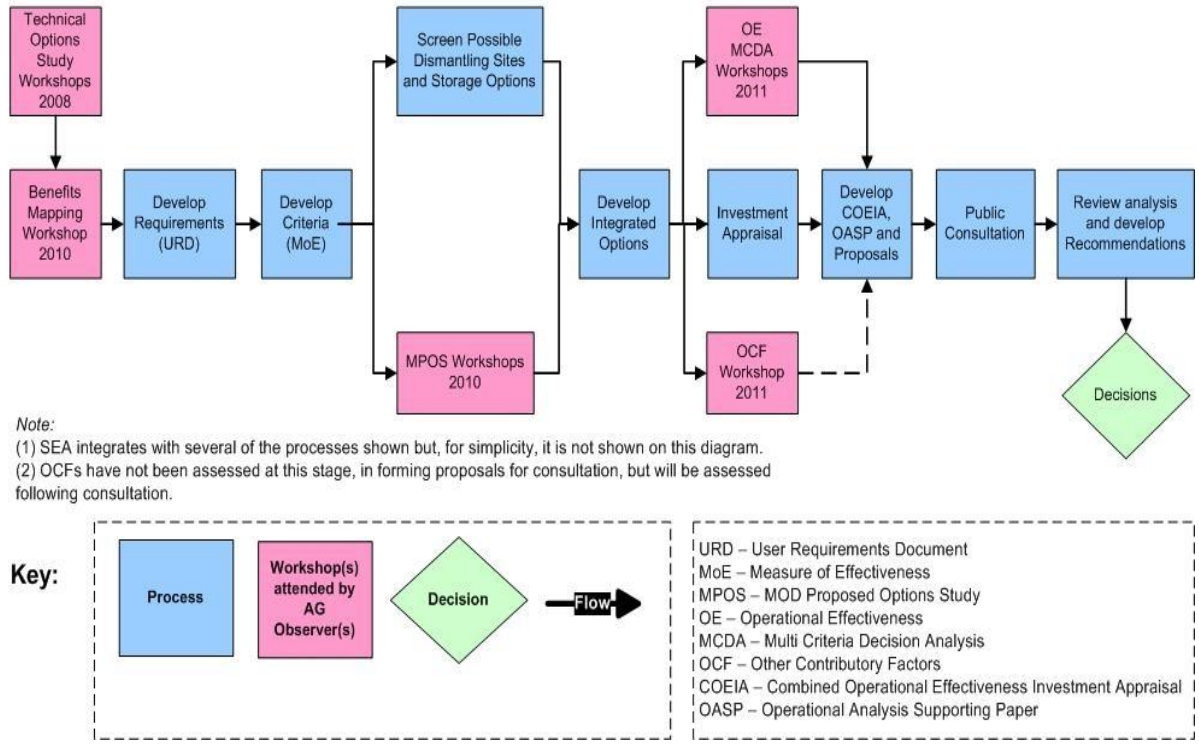
Purpose and scope of this report

This report records the observers' comments and provides a description and commentary on the relevant sections of the options analysis process for the SDPAG. The observers have had free and open access to the relevant reports and documents in the MOD decision making process but have not been involved in every strand. For instance, they have not observed or reviewed any aspect of the Investment Appraisal due to reasons of commercial confidentiality.

This report covers the Technical Options Study in 2008 (TOS), the MOD Proposed Option Selection process in 2010 (MPOS) and the SDP Operational Effectiveness Multi Criteria Decision Analysis of 2011(OEMCDA). The observers also reviewed the documents and initial preferred options which have been developed from these processes.

Figure 1 shows the SDP Options Analysis processes and the workshops attended by the SDPAG observers;

Figure 1: SDP Options Analysis Processes and Workshops



Observers' main conclusions and observations

- The observers recognise the inclusive and transparent approach of the MOD in encouraging SDPAG observers and facilitating their task.
- Members of the SDPAG who were not in the sub groups have perhaps seen less material and later in the process than they might have expected, due to the sensitive nature of the documents during development in advance of the public consultation. Sub-group members, on the other hand, who have signed a Non Disclosure Agreement (NDA), have been given progressively more detailed access to process documents as they have been developed.
- The observers recognise the unique nature of the Submarine Dismantling Project in MOD decision making which is not normally subject to public consultation. There will have been the Front End Consultation, The

Consultation on Initial Outline Proposals and the planned public consultation in 2011/12.

- SDPAG observers note that only the TOS involved external non-governmental stakeholders. The MOD stated that they plan for external stakeholder views of their assessments to be gathered during the public consultation.
- There have been consistent levels of fundamental challenge throughout the processes with no apparent evidence of bias on behalf of the MOD. It should be noted that the leading option identified from each of the three successive processes has been different as more detailed information and analysis has been available.
- The Consultation on Initial Outline Proposals (CIOP) recommendations have been taken account of during the processes.
- The TOS and MPOS should be seen as initial stages to clarify issues and thinking for the MOD as there was a general lack of robustness in the processes and a concern over the availability of data at that time. There was no indication then of how these processes would relate to the standard Combined Operational Effectiveness and Investment Appraisal (COEIA) decision making process as eventually applied.
- The Operational Effectiveness Multi Criteria Decision Analysis (OEMCDA) is considered to be an objective process but will need to be seen in the context of the other factors of the final options selection process (e.g. Investment Appraisal, Other Contributory Factors) and the feedback from the public consultation.
- Concerns regarding the integration of the Strategic Environmental Assessment (SEA) outcomes into the OEMCDA were addressed during the MCDA process, though carrying this integration through subsequent levels of decision making, particularly the consultation document, will present challenges.
- The issue of worker dose and its relationship to the whole life cost has caused difficulty in the MCDA processes, and the treatment of worker dose eventually adopted will need careful explanation during the public consultation.

- There have been recurring issues over the existence or availability of data. It will be important that fundamental data reports (even if redacted) should be made available for the public and that the data underpinning assumptions is traceable. Future consultations (e.g. Environmental Impact Assessment during Town and Country Planning Application stage) will include more detailed information on key issues such as dose risk assessment, as the detailed design develops and more site specific data is available.
- Stakeholders have regularly raised issues during the process, relating to the extendibility of facilities for future classes of submarine, the availability of the planned geological disposal facility and the potential spread of radioactivity outside of the reactor compartment. It will be important that the MOD addresses these issues consistently throughout the SDP as it progresses the options selection process.
- Overall, the observers felt that although not perfect, the process has evolved into something which is fit for purpose at this stage of the decision-making process.

Detailed comments on the Technical Options Study (TOS).(2008)

The study consisted of two, two day workshops. It considered the three technical options for removing radioactive waste from submarines and was designed to identify the features of the options which would assist in the future development of the options analysis. There was a wide range of internal MOD and external stakeholders present, including attendees from the SDP Advisory Group, academia, NGOs, regulators, and industry experts. The workshops were facilitated by Frazer Nash. The study was designed to explore issues around the technical options and limited by the existence of data at that time. Cost was included as a factor.

The first workshop defined the technical parts of an option which would assist in discriminating between the options, and a report was produced describing the outcome[3]. The data available on the options against the criteria was collated[4] and a second workshop held to determine how each of the three options performed against these criteria. The outcomes of the study are reported in the "SDP Technical Options Study, Options Report[5]." The study did not determine a clear preference for an option but the Reactor Pressure Vessel removal and storage option was least favoured. The report included recommendations for further work.

The TOS was peer reviewed by two SDPAG members (Dr P. Dorfman and D. Collier) and an independent expert (Prof Malcolm Joyce). L.Netherton attended as a stakeholder.

The AG reviewers considered that:

- The process was well facilitated and largely consistent with typical option assessment studies.
- Weighting of criteria, which would have reflected the relative importance of criteria to stakeholders, was not carried out as a process could not be agreed with the workshop stakeholders.

[3] Isolus Technical Options Study, Attributes report.

[4] Isolus Technical Options Study, Data Report

[5] SDP Technical Options Study, Options Report.

- The report does not recommend any one option and acknowledges key caveats e.g. stakeholder assessments may change as more detail becomes available and the choice of site will have a large impact on the outcome.
- The assessment data pack had gaps due to the lack of existing data and some stakeholders felt that there was insufficient information in some areas to allow assessment.
- Overall, the process was felt to be generally useful within the confines of the data and time available. The TOS was more valuable in identifying differences than resolving choices.

Prof Joyce's report[6] concluded that:

- The workshops proceeded as per the process described in the Methodology Report with some important and largely beneficial amendments arrived at as a result of discussion at the workshops and via correspondence in between workshops.
- The reports represent an accurate record of the debate and the information used in the debate at the workshops. Some key issues were raised by stakeholders at the workshops, specifically with regard to the weighting of attributes and the completeness of data presented in the Data Report, and this has been recognised in the Options Report and the recommendations therein.
- In any subsequent exercise to improve the technical clarity of the proposed ISOLUS process, the inevitable compromise between what is achievable and what is desirable in terms of data needs to be explored more fully.
- Prof Joyce also made a number of technical comments.

[6] ISOLUS Technical Options Study: Independent Peer Review Report. Professor Malcolm Joyce. January 2009.

Detailed comments on the MOD Proposed Option Selection (MPOS) Multi Criteria Decision Analysis. (2010)

Following on from the TOS, a further options process took place in 2010 in an attempt to select the single proposed technical option. The MPOS was a two stage process with one day per stage and followed a Multi Criteria Decision Analysis (MCDA) model.

The first stage was a conference of MOD staff officers supported by technical and topic experts from the MOD and Industry. Each option was scored against a previously prepared set of criteria and scales and weights to each criterion assigned. The scores and weights were then combined for each option to produce a value for the options, which gave an overall “relative score”.

The next stage consisted of a Senior Officers workshop which considered the results of the staff officer’s workshop and the investment appraisal, both separately and then together in a Combined Operational Effectiveness and Investment Appraisal (COEIA).

The outcome was that one option was seen to be statistically better than the other options and this finding was not affected by changes to the key assumptions. However further development of other options would be required to demonstrate, with the necessary degree of rigour, that the conclusion remained valid.

The independent MOD scrutiny team was involved in observing the process.

The process included provision for peer review by independent expert Prof Malcolm Joyce and by three members of the Advisory Group (Dr P.Dorfman, D.Collier, and L.Netherton).

AG observers concluded:

- The first stage of the process was intensely time pressured, was not fully completed and there was inadequate opportunity for participants to develop a detailed understanding of the options. Therefore there are concerns over the validity of the conclusions.
- Data was fed into the workshops by technical experts but some supporting evidence (e.g. dose risk assessments) was not always available.
- There was a good level of constructive challenge from participants and no detectable bias.

- Overall, the process was fair but there needs to be a rigorous review and challenge of assumptions as part of the ongoing development of options selection.

Prof Joyce's report[7] concluded that:

- The level of challenge during the conference was of a good standard and that the debate had moved on significantly in terms of the buy-in of the AG as a result of this conference.
- The justification between cutting up and cutting out, given international differences with UK policy, may require further work to be done to convince strategists and the public.
- Professor Joyce also made a number of technical recommendations.

It should be noted that the three AG observers and Prof Joyce worked independently and therefore their comments differ.

Comments on the SDP Benefits Map workshop

A SDP 'Benefits Mapping Workshop' was held on 2/11/10 to ensure that the contents of the User Requirements Document (URD) were adequately reflected in the Option Assessment process. The benefits mapping exercise is part of the process as set out in the Concept of Analysis[8]. A range of MOD stakeholders and subject matter experts started with a 'straw man' map based on the URD, and developed it into a more comprehensive map with 52 benefits and 20 'dis-benefits', grouped into 6 broad categories. This workshop map was then compared with the criteria used in other parts of the SDP process and further rationalised as described in the 'Relevance of Previous Criteria' paper to generate the criteria set described in the 'MCDA Criteria' paper.

David Collier attended the Benefits Mapping Workshop on behalf of the AG as an observer, but also provided feedback to the workshop based on experience of a similar process at Sellafield.

[7] SDP: Independent Peer Review Report. July 2010, Prof Malcolm Joyce.

[8] SDP: Concept of Analysis

It was an open process which allowed participants to fundamentally review the potential benefits from the SDP.

Detailed comments on the "Operational Effectiveness" MCDA

Although the output from the TOS and MPOS processes helped shape it, this MCDA process was significantly different in that:

- It compared the integrated options of technical, siting and storage solutions not just the technical options.
- The criteria were formally and transparently derived from a benefits map.
- The process was both more rigorously applied and more sophisticated.

Three two-day workshops were held and involved MOD stakeholders, and independent subject matter experts from MOD, industry and the nuclear regulators. The three workshops separately covered technical assessment criteria, weighting and scoring respectively. A data report was made available prior to the last two workshops. Participants at the scoring workshop were divided into three groups; policy and health and safety, operations and environment. The latter group was informed by the SEA and the same subject matter experts were used to both undertake the SEA and to participate in the workshops.

A sensitivity analysis was carried out after the workshops and a report on the process and outcomes was produced[9]. The key finding was that "The operational effectiveness analysis did not identify clearly a single option or variant as delivering the highest effectiveness but the results can, in conjunction with the results of the IA and OCF, identify more cost effective and lower risk options".

Three observers attended on behalf of the SDPAG (Dr P.Dorfman, D.Collier, and L.Netherton). One observer attended each of the sub groups for the scoring. AG observers concluded that:

- There was a good level of constructive challenge and debate throughout the process, with a wide range of views expressed.

[9] SDP Operational Effectiveness Report.

- The system used in weighting and scoring was implemented well; participants used cards to reflect their numerical assessment, followed by debate and then re-scoring.
- There were initial concerns that the outcomes from the SEA had not been fully integrated, however this was addressed by the second workshop.
- Observers were allowed to participate in discussions on criteria.
- Worker dose was scored, but not used in the MCDA, as internal MOD guidance was that this should be covered in the whole life cost model. Participants were aware of the public interest in worker dose and its importance to the community. Dose was assessed assuming that statutory requirements had been met.
- Queries which arose during the process were adequately addressed. The OE report of the process and outcome was satisfactory.
- Overall, AG observers felt that it had been a reasonably robust process with fundamental challenge and no evidence of systematic bias towards any option. Observers will need to track the outcomes of this MCDA through the further options selection process.

Comments on the Other Contributory Factors (OCF) workshop

An 'Other Contributory Factors' (OCF) analysis was carried out to understand the potential significance of those factors that could affect the SDP project but which could not be quantified in cost or effectiveness terms. The assessment to date includes identification and characterisation of the key factors. The OCF report [10] identifies the implications of some OCFs for specific SDP options but a comprehensive assessment will only be possible following Public Consultation. The OCF analysis does not involve any quantitative assessment.

As part of this process, a workshop was held in June 2011 for project staff and MOD stakeholders to review and discuss the potential impact of individual OCFs. The workshop was attended by an internal MOD scrutineer and two observers on behalf of the AG (Dr P.Dorfman and D.Collier). AG observers concluded:

[10] SDP Other Contributory Factors (OCF)

- Consideration of OCF through a workshop was a new and untried process. The value of the workshop was in exploring the scope of likely OCF; no conclusive assessment of them was possible. The nature of OCF is that there may be little hard data and the process was to assist in clarifying thoughts on OCF.

- Although consideration of OCF is part of standard MOD decision making, the need for a workshop and separate report on OCF was recognised late in the process when it became apparent that the OCF would need more detailed consideration for SDP.

- The workshop was considered to be a fair attempt to make the OCF process more transparent and robust.

Conclusions

The main observations are set out earlier in the report. Overall, the observers felt that although not perfect, the process has evolved into something which is fit for purpose at this stage of the decision making process to provide tentative proposals for public consultation.

Annex A: Detailed Descriptions of MCDA Processes

1. MCDA Context

1.1. Introduction

The SDP references most relevant to the MCDA aspects of the decision making process are listed in Annex A. Additional detailed supporting references for individual studies are listed within the main text. The most accessible description of the SDP decision making process as a whole is 'SDP-Our Approach to Decision Making', on which the process summary which makes up the rest of this context section is based.

1.2. Option Screening

There are a number of strategic decisions which must be made before it is possible to develop a more detailed approach to dismantling the UK's submarines. These key parts are:

- How the radioactive wastes are removed from the submarines ('technical options');
- Where the radioactive wastes are removed from the submarines ('siting options');
- Which option to chose for storing the radioactive waste that cannot be disposed of immediately (interim storage options).

For each of these, screening was first carried out on a wide range of options to generate short lists of practicable options. Detailed studies were then carried out to understand their performance and cost.

To ensure that factors such as transport are fully accounted for, the shortlisted options were then brought together into a list of integrated solutions ('integrated options'), each of which included a technical, siting and a storage option.

Option	Variants
Option 0: Do Minimum	None
Option 1: Reactor Compartment (RC) separation with interim storage at point of waste generation	Three variants for each: dismantling at Devonport,

Option	Variants
Option 2: Reactor Pressure Vessel (RPV) removal with interim storage at point of waste generation	Rosyth, and at both Devonport and Rosyth.
Option 3: RPV removal with interim storage at a remote commercial site	
Option 4: RPV removal with interim storage at a remote MoD site	
Option 5: RPV removal and size reduction to form Packaged Waste with interim storage at a point of waste generation	
Option 6: RPV removal and size reduction to form Packaged Waste with interim storage at a remote commercial site	
Option 7: RPV removal and size reduction to form Packaged Waste with interim storage at a remote MoD site	
Option 8: RPV removal and size reduction to form Packaged Waste with interim storage at NDA site(s)	

1.3. Option Assessment

Those integrated options which were not ruled out by transport or other constraints were then compared in detail based on the following strands of analysis:

- An Operational Effectiveness (OE) analysis to determine how effectively each SDP option meets the needs of the MOD set out in the User Requirements Document;
- An Investment Appraisal (IA) analysis to determine the Whole Life Cost (WLC) of each SDP option.
- An ‘Other Contributory Factors’ (OCF) analysis to determine the significance of non-quantifiable factors on each SDP option.
- The OE and the IA combined together to form the COEIA which contains the option summary comparison charts.

The SEA, which includes both environmental and socio-economic assessment criteria, informed all three types of analysis with care taken to avoid double counting. The results of these analyses and all the other work to date have been brought together in a paper which summarises the base. This paper is the Operational Analysis Supporting Paper (OASP), which will be a key reference during the public consultation process.

Throughout this process the integrated options have been compared against the alternative of continuing to store submarines afloat and intact – the 'do minimum' option, to act as a comparator.

1.4. Use of MCDA

Within this overall process, workshop-based MCDA methodologies have been applied in two different contexts: comparing technical options only and then comparing the integrated options.

After technical option shortlisting, detailed performance, cost, and SEA studies were carried out on each option, including the following two rounds of preliminary studies using multi criteria approaches. The purpose of these two MCDA studies was to consider the strengths and weaknesses of the **technical options** only i.e. how the radioactive wastes are removed from the submarines

- **The 'Technical Options Study' (TOS) MCDA**

  A preliminary study involving internal and external stakeholders was carried out in 2008 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 outputs were used to help define the eventual option comparison criteria and scope the data requirements. The details are contained in 'SDP Technical Options Study: Options Report'.

- **The 'MOD Proposed Option Selection' (MPOS) MCDA**

  A two-stage 'MOD Proposed Option Selection' (MPOS) conference was held in 2010. A 'desk officer' assessment of option performance was first carried out using an MCDA framework. The results of this assessment along with the results of Investment Appraisal work to date were then presented to a panel of Senior Officers review and critique the evidence, the analysis, and the emerging picture. The details are contained in 'SDP Technical Options: Analysis Paper'.

The more rigorous main MCDA came much later in the process, as part of the Operational Effectiveness analysis strand. It had a much wider scope and was the primary tool for comparing non-financial performance of the **integrated options**, each of which included a technical, siting and a storage option.

Each of these three MCDA studies is described in more detail in the sections that follow, with a commentary on its implementation from the SDP Advisory Group observers.

2. The 'Technical Options Study' MCDA

2.1. Process Overview

The Technical Options Study (TOS) was carried out in 2008 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'. It considered only the 3 current technical options for removing radioactive waste from the submarines.

The intended methodology employed for the Technical Options Study is described in detail in the 'ISOLUS Technical Options Study, Methodology Report', although in practice the methodology evolved as the study proceeded and modifications had to be made because of time constraints.

Because the aim was to explore the full range of issues that needed to be taken account of in choosing a technical option and get some initial feedback on different perspectives of their relative importance, the methodology was structured around two workshops involving a cross section of stakeholders including the MoD, subject matter experts and representatives from across the (then) ISOLUS Advisory Group. Cost was included in this MCDA.

The attributes workshop was held in 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, then to generate value functions (scoring scales) for them. The intention was also to understand the relative importance of the attributes by completing a weighting exercise but this was not in the end possible (see below). We do not currently have a reference for the data pack for this workshop, which was reported in the 'ISOLUS Technical Options Study, Attributes Report'.

Following the issue of the Attributes Report, Frazer-Nash collated the available data on the options against the agreed criteria and published the 'ISOLUS Technical Options Study, Data Report'. A second stakeholder workshop was then held at the Frazer-Nash offices in Dorking in October 2008. The objective of this workshop was to determine how each of the three options performed against each of the attributes i.e. 'scoring'. The data pack for this workshop, which included the Data Report, is available as 'ISOLUS Technical Options Study, Workshop 2 Briefing Pack'. The outcome was reported in the 'SDP Technical Options Study, Options Report'.

Sensitivity analysis was carried out afterwards, when the results had been collated.

2.2. MCDA Activities

The five main intended activities were thus:

- Deriving the criteria
- Generating the scales
- Weighting the criteria
- Scoring the options
- Sensitivity analysis

Each is briefly described in turn below. Text in italics indicates an extract from the relevant workshop report.

Deriving Criteria

Following a discussion of the technical options, the participants generated their own individual lists which were then be grouped into themes and refined through group discussion to give a working set of criteria. These criteria were then rationalised somewhat by Frazer-Nash in the Data Report issued before the second workshop.

Generating Scales

The intent had been to generate scoring scales at the first workshop but the criteria definitions were not sufficiently tight and so this was deferred. Frazer-Nash included their proposed scales in the Data Report. The scales varied between criteria, some being absolute and some being relative, some being data based and some being entirely subjective.

Although the dimensions of the scales used for scoring in the second workshop generally matched those in the Data Report, the options however were not scored with reference to the Data Report scales but rather simply scaled between best and worst as described below.

Scoring

Each [criterion] was considered by the stakeholders in turn. In order to generate discussion, one stakeholder was asked to introduce each attribute, summarising the relevant information [from the data report] 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.

The top and bottom of each criterion scale were thus set by the best and worst performing option, with a score for the remaining option based on a consensus of its position on the scale relative to the other two. Numerical values were not part of the workshop discussion but presumably the software used scaled each criterion in the background (e.g. from worst =zero to best=10). On some attributes a consensus was not reached and for these attributes the range was recorded.

Weighting

The original aspiration was to establish the relative weightings of the attributes during the first workshop but there was not sufficient time available. Attempts to collect weightings from stakeholders ‘off line’ between the two workshops also proved problematic so weighting was deferred until the second workshop. However, this was not possible in the time available there either.

After the second workshop, Frazer-Nash therefore produced and distributed to stakeholders a document (ISOLUS Technical Options Study, Workshop 2 – Post Meeting Note to Stakeholders on Weighting) that suggested a set of weightings based on their interpretation of the discussions during the workshop. This approach

was not generally supported by either participating stakeholders or Observers, so the scores were left unweighted.

Sensitivity Analysis

The sensitivity analysis explores the attributes that differentiate between the options and assesses whether any potential changes to the issues that would 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.

TOS Study Conclusions

This was an early exploratory study with a developing methodology, therefore the conclusions were not expected to carry much weight in the decision making process. The MOD confirmed at the second workshop 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*", which seems consistent with this.

It is of interest, however, to note that although none of the options emerged as a clear favourite from the discussions RPV storage was never judged as the most attractive option. *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*[11]*.*

2.3. Participants Observations recorded during the workshops.

- Some external 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.
- These concerns over data 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

[11] Technical Options Report Issue 2, Section 7.

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.

- A stakeholder pointed out that Frazer-Nash Consultancy is a wholly owned subsidiary of the Babcock Group
- 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.
- 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 assess the effects of transport, such as public safety, nuisance, public acceptability etc. Each of these issues are captured as separate attributes.

The issue of “extensibility” (the potential for the project scope to be extended to include future classes of submarines) which had been 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 (i.e. impact on future generations) 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. The MoD health physicist however 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 UK National Strategy for radioactive waste (such as that the MoD accounts for only 4% of total UK radioactive waste by volume) 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.

2.4. Observers’ Role

The Technical Options study included provision for peer review by an independent expert (Professor Malcolm Joyce) and by two members of the ISOLUS Advisory Group (AG).

The AG nominated David Collier (then of Golder Associates) and Paul Dorfman (of Warwick University) to represent it, both acting as individuals rather than as

employees of their respective organisations. Their role was to participate as observers in the process, '*raising any concerns directly to the MOD to ensure timely corrective action and feeding back to and from the full Group as appropriate*'.

The emphasis was on review of the process as a whole, the assessment process, stakeholder engagement, and the main reports. The IAG reviewers did not have access to detailed data, though in selected cases they did consider whether this has been independently checked in line with AG recommendations. They had access to the Draft TOS Options Report but did not review the final report. Their observations (summarised below) were reported to the IAG at its meeting in March 2009 following a presentation by Frazer Nash on the TOS.

2.5. Observers Comments

Process

The observers' comments on the process were as follows.

- The basic process was decently facilitated and largely consistent with typical option assessment studies, with a reasonable spread of IAG and 'IAG like' stakeholders involved in the assessments. However, there was significant debate at times between the various parties involved as to what was realistic in terms of process and as the project proceeded.
- The contractors and MOD involved the IAG peer reviewers and communicated well. Technical discussions on methodology at various points in the process were productive, issues raised by IAG members were passed on, and views were usually properly recorded.
- The project team were receptive and flexible in making changes as necessary but the down side was that stakeholders experienced a changing process, some false starts, shifting workshop dates, and some venue issues. It seems to us that in some key areas the process had not been was not yet fully thought through or the challenges were not fully appreciated. This might have been more damaging under other circumstances but on this occasion there seemed to be a willingness even on the part of sceptical stakeholders to go with the evolving process as far as they could.
- The initial methodology report was satisfactory, though optimistic about the complexity of process that could be delivered in the time available. It recognised that multi-attribute option assessments of this type can only be

one input to the decision making. The TOS was more valuable in 'outing' differences than resolving choices.

- The involvement of an independent technical expert to work in support of NGO, CBO and 'community' stakeholders may have helped the process but there are differences of opinion as to the circumstances under which this is appropriate.
- In summary, we felt that the overall process was generally useful. There were shortcomings but it generally makes more sense to focus now on making sure the results are not used inappropriately or given inappropriate weight in the decision process rather than to worry over-much about the detail of those limitations.
- The other inputs to decision making must now be transparent, as must the logic used to combine them. The whole constitutes the decision process, which is what broad stakeholder engagement has to focus on.

Workshops and Reports

The observers' comments on the workshops and reports were as follows.

- We note the coverage of the options study and other reports in the Independent Peer Review Report. We have not generally commented in this note on detailed issues already included there.
- The Scoping Workshop had its process shortcomings, but was well run and broadly in line with normal practice and it did elicit attributes of interest.
- The assessment data report had its gaps. The level of information was variable and was not always backed by evidence. Whilst some stakeholders concluded that it sufficed for the assessment as eventually conducted (though it may not have done had a detailed scoring scheme been applied), there were areas where NGO, CBO and 'community' stakeholders concluded that there was insufficient information.
- The two-day assessment workshop was also well conducted. It focused on ranking the three options and capturing the strength of discrimination rather than scoring them. The original value-function based approach to scales was dropped. Some attributes were discussed at length while others were treated more superficially, but generally the discussion was sufficient.
- The weighting note originally issued caused some contention and weightings were sensibly dropped. Weighting could not be derived from the preferences

expressed, though the extent of consensus could, but there were in any case no scores to weight. Combination of weights and ranks (as opposed to normalised scales) is usually meaningless.

- Generally, the draft report seems to be acceptable, though there will of course be debate as to the weight that should be placed on it and some IAG members clearly perceive that a number of internal inconsistencies remain.
- There were some issues with the draft but also some unnecessary irritants. For instance, MOD positions tended to be set out as reasoned arguments whereas other views were set out, no doubt subconsciously, as bullet point responses without rationalisation. The characterisation12 in the report of participants as either technical experts with a tendency to form a consensus view (i.e. 'rational') or as specific interest groups not swayed from their initial ideas by the data presented, or the arguments put forward by experts (i.e. 'irrational') seems to us to be simplistic and somewhat provocative.
- Some discussion appears to not to have been included, presumably as being 'out of scope', whereas NGO/CBO representatives in particular did make a clear link e.g. concerning differing views on radiation risk, CIOP Recommendations, and the distinction between disposal and storage.
- Conclusions on weightings and a representation of the range of views on discriminating attributes are given in Appendix A of the draft Options Report 'for completeness' and not used in reaching conclusions. However, we would like to note that they are in our view not valid, both on the basis of the methodology used and time constraints during the final workshop.
- The Draft Report does not recommend any one option, and in our view properly acknowledges key caveats e.g. the stakeholders assessments might change as more detail becomes available and that the choice of site will have a large impact on the outcome.

Overall Impressions

Overall, the process was felt to be generally useful within the confines of the data and time available. The TOS was more valuable in identifying differences than resolving choices

[12] 5.3, p.56.

2.6. References

- ISOLUS Technical Options Study, Methodology Report, FNC 35114/34530R
- ISOLUS Technical Options Study, Attributes Report, FNC 35114/34646R
- ISOLUS Technical Options Study, Data Report, FNC 35114/34735R
- ISOLUS Technical Options Study, Workshop 2 Briefing Pack, FNC 35114/58642V
- ISOLUS Options Study Project Progress Meeting, FNC 35114/57912V
- ISOLUS Technical Options Study, Workshop 2 – Post Meeting Note to Stakeholders on Weighting, FNC 35114/58829V Issue
- SDP Technical Options Study, Options Report, FNC 35114/35042R Issue 2

3. The 'MOD Proposed Option Selection' MCDA

3.1. Process Overview

Following on from the 2008 Technical Options Study (TOS), a decision workshop was proposed in 2009 for MoD stakeholders to assess the identified options. In April 2010, the scope of the options study – now termed the MoD Proposed Option Study (MPOS) – was changed to more closely support the standard MOD OE/IA/OCF framework set out in the Concept of Analysis.

The aim is stated in the 'MOD Preferred Options Study Methodology Statement' as being "*to select the single proposed technical option for the interim land storage of intermediate level waste arising from the dismantling of defueled nuclear submarines*".

The MPOS utilised a two stage process, as described within the methodology statement (SDP Technical Options Study – MoD Preferred Option Study Methodology Statement). In the first stage, desk officers representing senior '1*' personnel took part in a facilitated MCDA workshop to assess the technical options. The output of this workshop was one input to a subsequent 1* Approvals Board workshop, which also considered the conclusions to date of the separate investment appraisal work.

The Desk Officers' workshop was conducted on 12 May 2010 and included the desk officers themselves (representing the Senior Officers who provide project assurance) supported by industry and MOD subject matter experts, facilitators, recorders and representatives from D Scrutiny and the SDP AG (as observers). The criteria and scales were established prior to the workshop. At the workshop, the desk officers, supported by advice from subject matter experts, scored each of the options against

each criteria and assigned weights to each criterion. The scores and weights were combined for each option to produce values for the options, which gave an overall '*relative score*'.

The five main activities were thus again:

- Deriving the criteria
- Generating the scales
- Weighting the criteria
- Scoring the options
- Sensitivity analysis

Each is briefly described in turn below. Text in italics indicates an extract from the relevant workshop report.

The results of the evidence gathered up to early June 2010, including the results of the Desk Officers' workshop and the Investment Appraisal work to date (separately and combined in 'COEIA' form), were then presented to a panel of Senior Officers to provide project assurance on 16 June 2010.

The Panel reviewed and critiqued the evidence, the MCDA-based performance analysis and Investment Appraisal, and conclusions drawn from the COEIA. The significance of OCF was discussed but insufficient information was available and they were not incorporated into the process. The information presented and the results of the review are summarised in the July 2010 'Technical Options Analysis Paper'.

3.2. MCDA Activities

Deriving Criteria

The initial proposal was to use the criteria based on those eventually arrived at during the TOS MCDA process. However, Peer review and the ongoing 'benefits mapping process' also suggested that changes were needed. The resulting 15 criteria were presented in the 'SDP Technical Options Study, Selection of Criteria for MPOS Study' report.

Cost was removed as a criterion, since it was now covered by the separate Investment Appraisal and MOD guidance (JSP 507) requires cost and effectiveness to be treated as separate parameters.

Generating the Scales

The approach to scales was also carried forward from the original TOS intent. Some of the scores would be '*analytic, for example the amount of intermediate-level waste generated by an option, whilst others will be drawn from the subjective judgement of experts*'. In the latter case, scoring was on a subjective scale (e.g. 0 to 9).

Scoring the Options

The scales were presented at the workshop for discussion and agreement as each criterion was considered. The desk officers, supported by advice from SMEs, scored each of the options against each criterion. In the case of the subjective criteria this was done through discussion and agreement. In the case of criteria measured by a physical quantity the values were reaffirmed or adjusted by the desk officers.

Weighting the Criteria

A Swing Weighting methodology was used to derive weights. The scores and weights were then combined to produce effectiveness values for the options using HiView software, which also allowed the facilitators to show the results to participants.

Sensitivity Analysis

The intent had been to do some initial exploration of the sensitivity of the selected option to variation in scores and the weights at the workshop using HiView. However, time constraints meant that in practice sensitivity was done after the event and the results were presented instead to the Senior Officers' Panel. The conclusions were said to be robust within the range of scores and weights offered at the workshop..

Study Conclusions

The conclusion was that one of the options had apparent advantages over the other two, and that SDP should continue to plan on the basis that this would be the proposed approach. However, further development of the other options would still be required to demonstrate with the necessary degree of rigour that the conclusion remained valid.

3.3. MOD Scrutiny Perspective

- Scrutiny was concerned about independence between scoring and weighting.

3.4. Observers' Role

The MPOS process included provision for peer review by independent expert Professor Malcolm Joyce and by members of the Advisory Group.

The AG nominated as Observers David Collier (then of Golder Associates), Paul Dorfman (of Warwick University) and Les Netherton (of Environmental Health Advisory Services Ltd) to represent it, again acting as individuals rather than as employees of their respective organisations. The Observers reported back to the AG, mainly on their impressions of the process as a whole, at its meeting on July 2010.

3.5. Observers' Comments[13]

- It is clear that this was intended to establish a preferred option, which would be subject to more detailed analysis than the others. The impression is that the MPOS was originally framed as a key part of the decision making process with provisional 'sign-off' of the choice of the proposed option by those senior participants present.
- The first stage was pressurised and the process was not complete as some officers had to leave.
- There was inadequate time for participants to understand the options, assess data and score.
- There was no opportunity to question experts, review data, view sensitivity analysis
- New information was verbally fed into the conference by technical specialists e.g. Babcock.(new information was recorded and written up subsequently in an updated Data Report)
- Some of the information was important e.g. dose risk assessments but the supporting evidence was not available.
- There was fundamental challenge during the process
- Bias could not be detected although we did not see all the evidence e.g. financial, new reports etc.

[13] Ref email correspondance

- Within the significant limitations of such a process, it seemed fair but now needs rigorous review and challenge of assumptions.

- All reports and evidence should be made available (after redaction) and placed on web with the other reports.

- The final analysis, assumptions, and evidence for the preferred option should be publically available and placed on the web.

Overall Impressions

Overall, the process appeared fair but there needed to be a rigorous review and challenge of assumptions as part of the ongoing development of options selection

3.6. References

- SDP, Selection of Criteria for MPOS Study, FNC 36995/63406V, April 2010.
- SDP, MoD Preferred Option Study Methodology Statement, FNC 36995/63422V, April 2010.
- SDP, Briefing Pack for MPOS Desk Officers' Conference, 12th May 2010, FNC 36995/63581V, April 2010
- SDP, Desk Level MPOS Conference Report, FNC 36995/36702, June 2010
- SDP, MOD Preferred Options Study Methodology Statement, FNC 36995/63442V, April 2010
- SDP, Technical Options Analysis Paper. ISM, July 2010

4. The ‘Operational Effectiveness’ MCDA

4.1. Process Overview

The Operational Effectiveness (OE) analysis solely comprised an MCDA performance comparison of the 8 remaining integrated options plus their variants. A great deal of preparatory work, including technical option comparisons, been done in the past but this was unambiguously a major component of the decision making on the MOD’s preferred option, alongside the Investment Appraisal and Other Contributing Factors analysis.

The OE MCDA was different from the TOS and MPOS equivalents discussed above in three major respects:

- The options being compared were now integrated options, not just technical options for removing radioactive wastes from the submarines;
- The criteria were formally and transparently derived from the benefits map;
- The MCDA process was both more rigorously applied and more sophisticated in its modelling.

The process by which the technical, siting, and storage options were combined into 25 'integrated options' is described in the Integrated Options Report. The MCDA model was then developed and populated using the outputs of three two-day workshops in June-July 2010 attended by MOD stakeholders, subject matter experts, and Observers:

- A Criteria Workshop on 5/6 April 2011 to confirm the criteria and scoring scales;
- A Weighting Workshop on 4/5 May 2011 to weight each criterion; and
- Scoring Workshop on 23/24 May 2011 to allocate a score against the criteria to each option and variant.

The workshops and subsequent OE analysis are documented in detail in the 'SDP Operational Effectiveness Report'.

Criteria workshop

The starting point for the MCDA criteria was the Benefits Map (see the 'SDP Benefits Report), which was expanded into the more comprehensive User Requirements Document. The benefits represented potential performance criteria, which were partitioned for investigation and option comparison between the OE, IA or OCF analysis strands as appropriate. The process by which these were developed into a draft set of 30 criteria for consideration at the first workshop is described in the 'SDP: Development of MoE[14] MCDA Criteria' report.

These 30 proposed criteria were reviewed one at a time in the first of the two-day MCDA workshops, which reduced the number to 21.

Weighting Workshop

The methodology used was for delegates to provide an initial weight for each criterion in turn (by holding up printed cards with a score from 0 to 10) and to mark it on the sheets provided, followed by a discussion, after which they were asked to

[14] Measures of Effectiveness

mark their weighting sheets for a second and final time. The aim was to address potential issues of bias identified in the previous studies. Where there was no consensus, the range was recorded. 'Swing weighting' was not used, weighting was independent of score.

The MCDA model was made up of 21 criteria arranged in 4 groups: Policy (POL), Operations (OP), Health & Safety (H&S) and Environment (ENV). The criteria within H&S were arranged such that three of them gathered under one criterion, U-H&S, which was, along with 1-H&S and 2-H&S, part of the H&S group. Weighting was done in criteria groups, with sub-criteria weighted first and then the corresponding top level criteria.

Delegates were informed during the workshop that although worker dose (criterion 1-H&S) was being weighted, the weights would not be used in the MCDA model as DASA/DESA had stipulated that dose had to be managed through WLC, following NDA guidelines[15].

Scoring Workshop

Due to the number of criteria (now 20) and options (now 25 including variants), scoring for MCDA was divided between three parallel syndicates containing relevant subject matter experts and other stakeholders:

- Policy and Health & Safety
- Operations
- Environment

The process was the same as that employed for weighting. Delegates provided an initial score (by holding up printed cards with a score from 0 to 9), followed by a discussion, after which they were asked to mark their scoring sheets. Each score for each criterion was given a specific meaning. In principle, a score of 1 corresponded to meeting a 'threshold value' and 9 to an objective value representing the 'performance beyond which there is no benefit to SDP'. A score of zero indicated 'non-compliance' and could rule an option out of contention. The resulting scores are, therefore, objective measures of effectiveness with error bounds generated from the spread of weights and scores captured at the workshop. Some Options were not

[15] NDA Guidance for the production of Business cases. Doc No EGG 08. Rev6, Nov 2009.

explicitly discussed, as variants and options were grouped, where appropriate, and scored together.

Sensitivity Analysis

The uncertainty and variation in quantitative data and expert judgements was recorded, and the measures of effectiveness of each option had associated error bars. A comprehensive sensitivity analysis was conducted using Monte Carlo simulation and alternative weighting sets were used to explore the impact of different stakeholder group perspectives. The AG Observers' interpretation of the draft OE Report is that the sensitivity analysis did not offer any particularly significant insights, although work on this document and the OASP is still ongoing.

Study Conclusions

Three overlapping groupings of integrated options were identified. Two options were in the lower scoring group, the bulk of the options were in a somewhat higher scoring group, and two options were in a higher (but still not clearly differentiated) third group. Therefore, it seems likely that other strands of analysis and factors within the decision logic will determine the MOD's proposed solution.

4.2. Observers Role

The AG nominated as Observers David Collier (independent consultant), Paul Dorfman (of Warwick University) and Les Netherton (of Environmental Health Advisory Services Ltd) to represent it, again acting as individuals rather than as employees of their respective organisations. The Observers reported back to the AG, mainly on their impressions of the process as a whole, at its meeting in July 2011. There was one difference from pervious practice, in that all Observers (including AG representatives) were allowed to participate in discussions on criteria (though not on scoring or weighting).

4.3. Observers Comments

It was commented [at weighting WS] by the AG observers that the process had encompassed a healthy degree of challenge and engendered honest and open discussion. It was added that there is a perception that MoD have made their decision, but the weighting workshop had demonstrated a genuine desire to make the decision on the basis of the available evidence and SME opinion[16].

[16] IN OE Report Annex C

Delegates were informed that although 1-H&S was being weighted, the weights would not be used in the MCDA model as DASA/DESA had stipulated that dose had to be managed through WLC, following NDA guidelines.

As stated above, it was noted that the working assumption for the dual site options associated with ILW storage at the point of waste generation (1B, 2B and 5B) was that storage would be at Devonport (necessitating the movement of RC's, RPV's or packaged waste from Rosyth to Devonport). The delegates were largely uncomfortable with this decision but it was necessary to allow scoring to continue and reflects the assumption of the project that it is better to move the smallest number of submarines between sites.

Queries and issues which arose were effectively dealt with. There was considerable work and effort put in between the workshops to ensure that this took place and that the next workshop benefited. The operation of workshops were revised following this process.

The final workshop on scoring was divided into three groups with the participants being allocated according to the area of expertise. This worked well and effectively dealt with early concerns over the apparent lack of integration of SEA issues.

An extensive data report was available for the last two workshops and expert informers answered further queries.

The workshops were effectively recorded in a full report[17] which was revised following comment by participants.

Overall impressions

Overall, AG observers felt that it had been a reasonably robust process with fundamental challenge and no evidence of bias towards any option. Observers will need to track the outcomes of this MCDA through the further options selection process.

[17] SDP. Operational Effectiveness Report. July 2011

Annex B: Biographies of the SDPAG observers and conflict of interest statements.

Dr Paul Dorfman

Dr Dorfman is Founding Co-ordinator of the Nuclear Consulting Group (NCG); Joseph Rowntree Charitable Trust UK Nuclear Policy Research Fellow; Senior Researcher, University of Warwick; Steering Group Member, SAFEGROUNDS (Safety and Environmental Guidance for the Remediation of Nuclear and Defence Sites); Member of the European Nuclear Energy Forum (ENEF); served as Secretary to the UK government scientific advisory Committee Examining Radiation Risks from Internal Emitters (CERRIE), and advised the Policy Interpretation Network on Childhood Health in Europe (PINCHE), EU, Brussels. Paul has drafted sets of national guidance for the Department of Health, and co-edited the Routledge publication: 'Globalisation, Markets, and Healthcare Policy'. Paul has published extensively about the recent Fukushima disaster, and is strongly critical of plans for nuclear energy new-build in the UK.

David Collier

David is a freelance consultant specialising in strategic and project level decision making, and is a visiting Senior Fellow with the Department of management at the London School of Economics. He has been providing the stakeholder Advisory Group with specialist decision science and stakeholder engagement input since 2006. David has played a significant role in the development and UK nuclear sector application of structured decision making and strategic choice methods. He has delivered high profile evaluations of a wide range of contentious nuclear sector policy decisions and stakeholder programmes over a 15 year period, including independent programme assessments for EBRD, CoRWM, NDA, RWMD, three nuclear sites stakeholder groups and for the West Cumbria MRWS Partnership.

Note: Since participating in this independent review, David has separately carried out further assessment of elements of its decision making processes and reviewed consultation documents for the MOD on a consultancy basis.

Les Netherton

Les is the Chair of the SDP Advisory Group and the SDP Consultation Sub Group. He has been involved with the then ISOLUS and now SDP project from the time of the Front End Consultation. He has been a member of the Committee on Radioactive Waste Management (CoRWM) since 2007.

An Environmental Health Officer by profession with over 34 years of experience in Local Government. He was Head of Service with Plymouth City council with responsibility for offsite emergency planning, discharge consent consultations and all issues relating to the nuclear submarine refitting complex at Devonport. He is now the Director of Environmental Health Advisory Services Ltd.

Annex C: Acronyms and definitions

COEIA	The Combined Operational Effectiveness Investment Appraisal draws together the previously separate measurement of effectiveness (how well an integrated option is delivering the goals of SDP) with cost (what is the Whole Life Cost of an integrated option). The COEIA is represented on a graph showing each option against cost and effectiveness, supported by more detailed analysis. The COEIA is reported in the OASP.
IA	"Investment Appraisal is a method of gathering information in a structured format, to enable decisions to be made as to which of a number of options to meet a specific requirement offers the best value for money."
Integrated Option	In SDP an 'integrated option' represents one *complete* solution to submarine dismantling, and is made up of a series of options for different processes or alternatives – such as where a submarine will be dismantled. A range of these integrated options is analysed to determine the best solution for SDP.
ISOLUS	Interim Storage Of Laid Up Submarines. Previous name for the SDP
MCDA	Multi Criteria Decision Analysis
MPOS	Ministry of Defence Proposed Options Study
NDA	Non Disclosure Agreement
NGO	Non Governmental Organisation
OASP	The Operational Analysis Supporting Paper provides a summary of all the evidence which underpins a proposed or recommended approach which requires MOD funding. It contains a COEIA, narrative of the impact of OCF, and all supporting analysis necessary to make a balanced and informed case.
OCF	The focus of the COEIA and other quantitative analysis is measurable performance, whether it is in terms of effectiveness or cost. Other Contributory Factors represent significant factors with a potential material bearing on

	decision making, but which cannot be measured quantitatively
OE	In the case of SDP, Operational Effectiveness is the measurable ability of each integrated option to meet the goals of SDP, such as safety, impact on the environment or impact on military operations. This includes taking account of the results of the SEA.
RC	Reactor Compartment
RPV	Reactor Pressure Vessel
SDPAG	Submarine Dismantling Project Advisory Group
SEA	Strategic Environmental Assessment. Ref Directive 2001/42/EC
TOS	Technical Options Study
URD	The User Requirements Document is a written statement of the need of the MOD, and is closely related to the Benefits Map and the OE. When contracts are placed on commercial organisations to deliver some or all of SDP, they must meet the URD to be considered fully compliant.
WLC	Whole Life Cost refers to the total cost of ownership over the life of an asset. In the case of SDP it includes the total cost of carrying out the project scope including the eventual decommissioning of facilities and waste disposal costs such as geological disposal.