Ministry of Defence

July 2023

Submarine Disposal Capability Project

Market Engagement Paper

Contents

Executive Summary

The Government is committed to providing a safe, secure, sustainable and cost-effective solution for the disposal of the UK's legacy, current and future out-of-service nuclear-powered submarines. In line with this, the Ministry of Defence (MOD) has established the Submarine Disposal Capability (SDC) Project to conduct a strategic review of its Submarine Disposal Programme.

A Market Interest Day (MID) was held on 6 July 2023 which; introduced the Submarine Disposal Programme and the SDC project, highlighted the current challenges within them, and identified opportunities for Industry[1] to contribute to and shape the development of the future submarine disposal capability. This capability must be resilient to change, comply with all UK legislation and regulations, meet UK/US binding agreements, deliver in line with our ambitions to improve reuse and recycling, contribute to net zero and sustainability targets and deliver tangible social value. SDC includes all activities to decommission, defuel and dismantle along with reuse, recycling and waste management.

This paper explains the current disposal practices, describes how Industry can engage and invites Industry to answer the questions presented. To raise any other areas for engagement, please contact the SDC team. Industry engagements are designed to be informative, and we encourage Industry to exploit this opportunity to maximise the benefit afforded by this engagement phase. At the MID the MOD confirmed its requirement:

"To establish an enduring Submarine Disposal Capability and dispose of out-of-service nuclear submarines."

[1] 'Industry' includes organisations who conduct business in both or either civil and defence environments.

Introduction

The Submarine Disposal Capability (SDC) Project held a market interest day on 6 July 2023. The event set out the current challenge, introduced the SDC project, and highlighted the requirement for input from Industry over the next few months to contribute to and shape the development of the future submarine disposal capability. The Ministry of Defence (MOD) now intends to facilitate a series of market engagements to better understand the appetite, capability and capacity within Industry to contribute towards the SDC Programme.

Market engagement will help the MOD answer three strategic questions:

- Are there any prospective 'turnkey' suppliers with the appetite, capability and capacity to develop and sustain a submarine disposal capability?
- Could a disposal solution be delivered by multiple companies/organisations and how could each stage be delivered to enable an optimal approach to disposal of a submarine?
- What is the optimal programme for disposal of all legacy, current and future out-of-service submarines? This programme should also ensure delivery of the first major milestone; to receive the first retired Vanguard Class submarine in the early 2030s.

These questions are expanded upon in later sections.

Small or Medium Sized Enterprises (SMEs) are encouraged to engage where they feel they can add value and support key activities within the disposal process[2].

There are a number of 'Ways to Engage' available to industry:

- Turnkey 1:1 engagements.
- Supply Chain 1:1 engagements.
- Themed Question and Answers (Q&As).
- Industry responses to this paper.

These are described in more detail on page 8.

[2] It should be noted that there is a large proportion of activity within SDC which is non-classified and non-nuclear.

Questions for Industry

If your company/organisation could be a potential ‘turnkey’ provider, please answer questions 1 and 3. If your company/organisations is interested in particular stages of SDC, please answer questions 2 and 3.

Question 1: Are there any prospective ‘turnkey’ suppliers with the appetite, capability and capacity to develop a submarine disposal capability solution?

Please answer all relevant questions from the following:

a) Is your company/organisation interested in providing a ‘turnkey’ solution for submarine disposal?
b) Can, or could your company/organisation, deliver the whole of SDC scope as presented by the Submarine Disposal Capability Architecture (SDCA) - (see Annex A)?
c) What assumptions and dependencies have you made?
d) How would your company/organisation deliver each stage of the SDCA?
e) Does your company/organisation have, or could you develop, a site capable of conducting submarine disposal and might this site also be capable of conducting the defueling of submarines?
f) What role would your company/organisation wish to fulfil and how would you establish and sustain the appropriate resilient organisation to deliver the whole scope of submarine disposal? (E.g., would your company/organisation require partnering with another company/organisation? How would your company/organisation align themselves with other organisations such as the Submarine Delivery Agency, Defence Equipment Sales Authority and other suppliers such as waste management companies?)
g) What evidence do you have of your Suitably Qualified and Experienced Personnel (SQEP) industrial base being able to deliver your proposal? If not currently available, how would you ensure these skills and competencies are generated, developed and sustained?
h) How will your company/organisation ensure a resilient and enduring disposal capability and capacity that is sustainable throughout the delivery of the submarine disposal programme?
i) What experience does your company/organisation have in delivering large scale projects similar to submarine disposal?

j) What experience does your company/organisation have of conducting activities against the constraints of multiple (integrated) safety cases (e.g., a nuclear reactor plant safety case with a platform safety case and/or a facility safety case or site safety case)?
k) What experience/track-record does your company/organisation have of working in nuclear and/or other high hazard industries and managing nuclear and radiological hazards?
l) What experience does your company/organisation have of engaging with third party Approving/Design/Technical Authorities?
m) What commercial and funding model would your company/organisation propose to use?
n) What are the key risks and opportunities your company/organisation foresee relating to deliver of the SDC project? How will your company/organisation mitigate risks and exploit opportunities?

Question 2: Could a disposal solution be delivered by multiple companies/organisations and how could each stage be delivered to enable an optimal approach to disposal of a submarine?

Please answer all relevant questions from the following:

a) Is your company/organisation interested in delivering a particular stage/s of submarine disposal?
b) What stage/s of the SDCA (see Annex A) can, or could, your company/organisation deliver?
c) Could your company/organisation deliver this/these stage/s now or would you need to develop the capability and capacity to deliver this/these stage/s fully?
d) How would your company/organisation propose this/these stage/s is/are delivered?
e) What delivery experience does your company/organisation have in this/these stage/s?
f) Does your company/organisation have a suitable location to carry out this/these stage/s?
g) Do you have evidence of a SQEP industrial base to deliver against your proposal? If not, how would you ensure these skills and competencies are generated, developed and sustained?
h) What do you perceive as opportunities for improvement within this/these stage/s?
i) What do you perceive to be the biggest risks within this/these stage/s?
j) What are the key risks and opportunities your company/organisation foresee relating to this stage/s? How will your company/organisation mitigate risks and exploit opportunities?
k) What assumptions and dependencies has your company/organisation made?
l) How would you propose the end-to-end submarine disposal process could be improved and/or optimised?
m) What commercial and funding models would your company/organisation propose?
n) What experience does your company/organisation have in delivering, or being part of, large scale projects similar to submarine disposal?
o) What experience/track-record does your company/organisation have of working in nuclear and/or other high hazard industries and managing nuclear and radiological hazards?
p) What experience does your company/organisation have of engaging with third party Approving/Design/Technical Authorities?

Question 3: What is the optimal programme for delivering submarine disposal of all legacy, current and future out-of-service submarines? This programme should also ensure delivery of the first major milestone; to receive the first retired Vanguard-Class submarine in the early 2030s.

Please answer all relevant questions from the following:

a) The MOD requires Industry to deliver an optimal programme as soon as is reasonably practicable including receipt of the first retired Vanguard Class submarine in the early 2030s. Do you consider this milestone to be feasible? Please explain your answer.
b) How would you approach delivery of the programme to ensure an optimised schedule over time?
c) How would you sequence the major elements of your delivery programme?
d) What would you define as the optimal key delivery milestones and durations for delivery of the project?
e) Can you identify any constraints which may prevent you from achieving the milestones and durations for delivery of the project (i.e., funding, training, equipment, technology, personnel, information, doctrine and concepts, organisation, infrastructure and logistics)?
f) What would you identify as key early investments and when would they be required?

Organisations are invited to respond to questions relevant to your organisation by submitting the accompanying form to SDA-SDC@MOD.GOV.UK no later than **17 November 2023**.

Ways you can engage

There are four opportunities for engagement:

- Turnkey 1:1s
- Supply Chain 1:1s
- Themed Q&As
- Industry responses to this paper

Turn-key 1:1s:

Turnkey 1:1s will be held in person in November 2023.

These sessions are reserved for those organisations who believe they have, or could develop, a 'turnkey' solution which addresses the full scope of the SDC challenge. Your company/ organisation will present and discuss your ideas to the MOD outlining the approach to the three strategic questions set out above. You are encouraged to present a profiled Rough Order of Magnitude (ROM) cost of your recommended submarine disposal programme solution.

Turnkey 1:1s can be requested by completing the accompanying registration form and submitting it to SDA-SDC@MOD.GOV.UK no later than **22 September 23**. The project team may also invite you to a 1:1 directly if deemed appropriate.

Commercially sensitive information shared during these sessions will be treated in confidence.

Supply Chain 1:1s:

Supply Chain 1:1s are 60-minute sessions which will be held via Microsoft Teams.

These sessions are intended to enable the SDC project to develop a detailed understanding of Industry capabilities and provide Industry with an opportunity to discuss ideas and ask questions about the project.

It is expected that Supply Chain 1:1s will run through to November 2023, however this is subject to change and, depending on interest and capacity, it is not guaranteed that every organisation that registers will be offered a Supply Chain 1:1. If deemed appropriate, some organisations may be able to request more than one 1:1 in addition to a Turnkey 1:1.

Organisations can request a Supply Chain 1:1 by completing the accompanying registration form and submitting it to SDA-SDC@MOD.GOV.UK.

Commercially sensitive information shared during these sessions will be treated in confidence.

Themed Questions and Answers:

Themed Q&As will be scheduled by the SDC project team to cover specific topics, themes or areas of focus within the SDC project. These events are open to organisations with subject matter expertise in the relevant areas. It is not guaranteed that every organisation that registers will be able to attend the themed Q&As. Each session will comprise of a short presentation from the MOD, followed by an opportunity for Q&As and discussion around the topic area. These sessions provide organisations with an understanding of specific submarine disposal activities prior to responding to the questions in this paper and allows MOD to understand more about the current capability and skills base and particular areas of interest.

Listed below is a proposed schedule of themed Q&A sessions.

1	**The Submarine** MOD will share information about the submarines, describe the current disposal process and highlight areas for potential improvement and innovation.	Thursday 24 August 2023 **Registration closes 18 August 2023**
2	**Dismantling and Waste Management: Learning from Experience** MOD will share learning from the on-going Submarine Dismantling Project (SDP) in Rosyth dockyard and current arrangements to manage submarine-derived wastes.	Wednesday 30 August 2023 **Registration closes 25 August 2023**
3	**Defuel** MOD will share information about the current Pressure Water Reactor (PWR) 1 defuel process at Devonport dockyard and the future requirements to defuel PWR 2 and PWR 3 submarines.	Thursday 21 September 2023 **Registration closes 15 September 2023**
4	**Social Value & Sustainability** MOD will share its current thinking on Social Value and submarine Sustainability including material re-use and recycling to reduce environmental impact, support the circular economy and drive towards net-zero.	24 October 23 **Registration closes 17 October 2023**
5	**Disposal Capability** This session will consider site requirements, acquisition and phased arrangements to develop and deliver an enduring, sustainable and resilient submarine disposal capability.	Thursday 2 November 2023 **Registration closes 27 October 2023**

You can propose additional themed Q&As by emailing SDA-SDC@MOD.GOV.UK. It is not guaranteed that all recommendations will be taken forward. You will be informed of any additional events or changes to the above timetable.

You can register interest for any event using the accompanying form. We may need to limit attendance if oversubscribed.

Industry Responses

You are invited to respond to the three strategic questions and supporting sub-questions within this paper which are relevant to your organisation. You can submit your responses by sending the accompanying form to SDA-SDC@MOD.GOV.UK no later than **17 November 2023.**

The following annexes within this paper set out the scope, current process for submarine disposal, the Government's approach to social value, current project assumptions and Frequently Asked Questions.

Annexes:

A. Scope Boundary.
B. The Current Disposal Process.
C. Social Value.
D. Current Assumptions.
E. Frequently Asked Questions.

Annex A – Scope Boundary

The strategic requirements for this project are:

- To deliver an enduring, sustainable and resilient nuclear submarine disposal capability.
- To dispose of legacy, current and future out-of-service nuclear submarines.

The key success factors are:

- Safety of the workforce and the public.
- Secure, with specific regard to Polaris Sales Agreement and US/UK 1958 Mutual Defence Agreement.
- Optimised rate of submarine disposal that supports a sustainable industrial base.
- Compliant with UK legislation and nuclear regulation.
- Adaptable and flexible to changes in legislation, regulation, technology and society.
- Maximise the UK's existing and planned industrial capabilities.
- Minimise impact on support to submarines and Royal Navy operations.
- Value for money for UK taxpayers.
- Maximise social value benefits.
- Prevent harm to the environment.
- Reduce, reuse and recycle in accordance with the waste hierarchy.

The SDCA shown in Figure 1 presents a logical breakdown of the disposal capability requirements and scope boundary for the SDC project. The architecture will form the basis of future engagements and support further development of sub-level requirements, constraints, risks, assumptions, dependencies and opportunities for each stage.

Further detail on each stage of the disposal process is provided at Annex B.

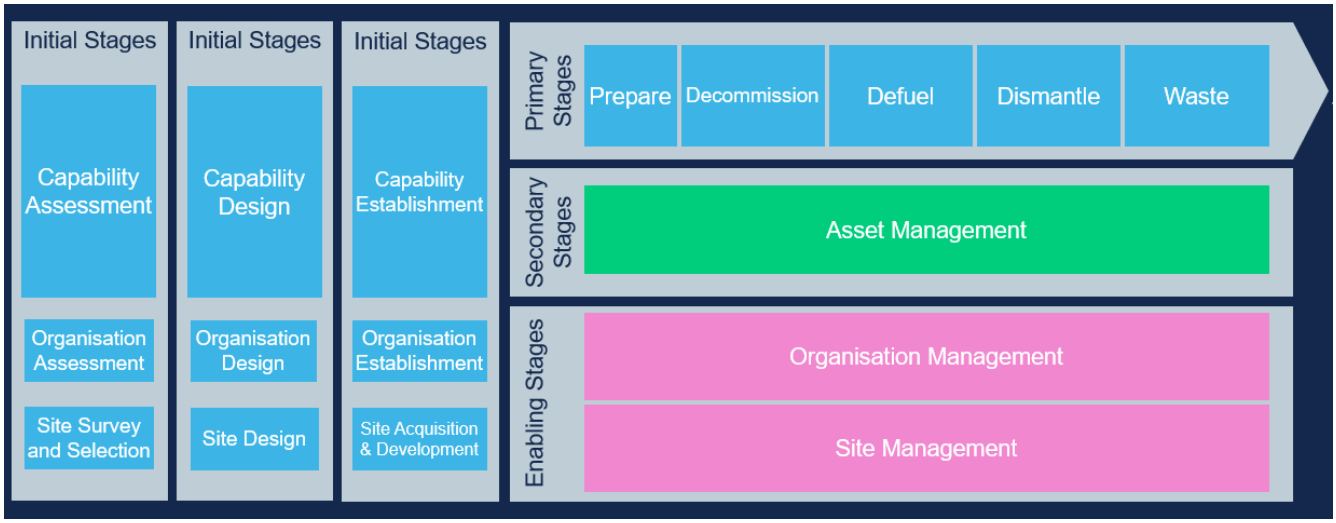

Figure 1: Submarine Disposal Capability Architecture (SDCA)

Annex B – The Current Submarine Disposal Process

All information provided below is based upon current practice and processes relating to submarine disposal. The planned engagements with Industry set out in this paper will enable discussion and input from Industry regarding how and if things could be done differently and/or improved.

Prepare the Submarine

MOD will hand over the submarine to Industry in an agreed condition.

The MOD will be responsible for ensuring the disposal facility is Authorised to berth a submarine at power. Handover Vessel Operational Control (HVOC) has taken place once the Royal Navy (RN) Watchkeepers have handed over operational control of all submarines and Naval Reactor Plant (NRP) systems to Industry's nuclear operators. Industry will be responsible for ensuring submarine and nuclear safety from this point onwards and it is likely that Industry's nuclear operators will have to maintain a constant onboard watchkeeping presence until the NRP is boronated, decay heat is less than natural heat losses and control rods are immobilised. This can take up to a year.

The submarine will be handed over to Industry in a material state that will support all required activities (e.g., berthing, storage, docking etc). The material state of the structure and systems will be fully documented by submarine specific drawings and information. An Inventory of Hazardous Material (IHM), compliant with the UK Ship Recycling Regulations, will form part of the contracted disposal work.

Industry's organisation and arrangements must be able to engage with: the MOD's NRPA as the Approving Authority for all nuclear activities that could affect the integrity of the nuclear fuel; and the NRPA as the Design Authority for the NRP (until defuel has completed), and with Rolls Royce who will remain under contract to the MOD and act as the Technical Authority to provide Original Equipment Manufacturer (OEM) information as required.

Decommissioning

Decommissioning primarily refers to the NRP. Decommissioning commences once HVOC is complete and concludes once the NRP is cooled down, depressurised, fully isolated, boronated, has had its control rods immobilised and has no reliance of any supporting systems. These supporting systems will be shut down and removed from service entailing deenergising, depressurising, removing fluids and isolating the system from other onboard systems to ensure that it cannot become hazardous in any way. Decommissioning is complete when all submarine and reactor systems have been individually decommissioned and the submarine is ready for the used fuel to be removed (i.e., defuel).

Depending upon resource, these activities can be carried out in a matter of weeks. However, the stage also includes the natural (time-based) reduction in used fuel decay heat levels to the Thermal Roll-Over (TRO) point (i.e., natural heat losses from the Reactor Pressure Vessel (RPV) are less than the decay heat level).

Defuel

Defueling of PWR1 submarines is currently performed in 14 Dock at Devonport dockyard using a well-established process and purpose designed equipment. PWR1 defuel operations are performed by Babcock using a specific SQEP defueling team.

A simplified description of the defueling process is as follows:

- Initial preparations take place.
- The submarine is taken into the dock and a moveable structure, the Reactor Access House (RAH), is moved along the dock and positioned over the RC.
- With the RAH in position, a hole is cut in the top of the submarine to provide access to the RC. The NRP is prepared for defueling by removal of the RPV head.
- Equipment is installed to facilitate fuel removal from the RPV and provide additional shielding during the fuel removal operations.
- Fuel is placed into an intermediate container which is then moved to a facility where it is loaded into the Used Fuel Flask (UFF).
- The UFF is transported by rail to the Sellafield nuclear licensed site where the fuel is placed in long term storage.

This process is based on existing practices used to refuel and return the submarine to service. Defueling of decommissioned PWR 2 (Vanguard and Astute Classes) and PWR 3 (Dreadnought Class and SSN AUKUS) submarines which do not require refuelling may provide an opportunity for an innovative, modified or quicker process to be developed whilst still achieving and adhering to the required safety and security standards and delivery of the fuel to the Sellafield nuclear licensed site in Cumbria or the Geological Disposal Facility (GDF) when available.

It is MOD's assumption that Industry will provide all the facilities, equipment and personnel to defuel submarines as part of the overall SDC. The defuel programme is likely, and subject to optimisation, to have a duration of at least 80 years.

Dismantling

The MOD is currently demonstrating dismantling capabilities which are unique to the UK on the demonstrator submarine, Swiftsure. This delivers in line with government policy and is informed by the results of two public consultations in 2010/11 and 2014/15. Taking place in Rosyth Royal Dockyard, this work will be completed by the end of 2026 and will provide an opportunity to learn from the experience gained and achieve process and performance improvements for dismantling of remaining submarines.

The dismantling of Swiftsure will use the following process:

- The submarine is placed in a nuclear licensed dry-dock.
- Cuts are made in the submarine hull to improve access to the RC and to enable the removal of low-level radioactive waste and the RPV, the main ILW component.
- The RPV is removed sideways out of the submarine together with the Primary Shield Tank (PST) and a cut section of the submarine pressure hull as a single unit of approximately 200 tonnes.
- The unit is traversed on rail-tracks along the dock bottom to the end of the dock and jacked up using standard lifting equipment to the top of the dock where it is positioned into a new dockside waste processing facility.
- Hazardous and controlled wastes are removed from the submarine through the same hull cuts.
- In the new dockside waste processing facility, the RPV is separated from the PST and placed in a bespoke-design RPV Transport Container (RPVTC).
- As ILW, the RPV is transported in approved transportation.
- The loaded RPVTC is transported to the Capenhurst nuclear licensed site in Cheshire for long-term storage pending final size reduction of the RPV into 3m³ packages that are approved for the disposition of waste in the UK's GDF. Based on GDF timescales, RPVs are expected to be disposed to the GDF starting in the 2060's.
- Final radiological clearance and monitoring surveys are conducted to ensure that the submarine is free of radioactive wastes.
- Following confirmation that the submarine is radiologically "clean" valuable materials are removed from the submarine for reuse within defence or recycled to generate revenue.
- Finally, conventional shipbreaking methodologies are used to cut up and remove the bulk of the submarine.

Some dismantling activities have already been tried and tested at Rosyth, e.g., LLW removal and disposal. However, there is an opportunity for an innovative, modified or quicker dismantling process to be developed whilst still achieving and adhering to the required safety, security and environmental protection standards.

Manage Waste

Waste from the submarine is categorised as either:

- Radioactive waste
- Hazardous waste
- Controlled waste

Radioactive waste is material that is either radioactive itself or because it has been contaminated by radioactivity including various pipework, valves, filters and activated metal components. Radioactive waste includes:

- Very Low-Level Waste (VLLW)
- Low-Level Waste (LLW)
- Intermediate-Level Waste (ILW)
- High-Level Waste (HLW)

The MOD owns all legacy radioactive wastes arising from submarine disposal and is responsible for ensuring it is managed safely and securely either in storage facilities or to final disposal.

The majority of MOD ILW is currently stored safely at the site where it was generated. The MOD proportion of the total UK ILW stocktake is about 1.3% by volume.

Following submarine defueling, there is no High-Level Waste (HLW) remaining on the submarines. The RC contains most of the radioactivity. Some wastes in the RC are radioactively activated due to their close proximity to the reactor core. Other wastes are radiologically contaminated.

Hazardous waste includes asbestos found in the lagging of older submarines; and potassium chromate which is used as a corrosion inhibitor. Controlled waste includes paints, oils, solvents, non-active solid wastes etc. LLW management and disposal methods undertaken as part of the dismantling work in Rosyth Dockyard have been proved during the removal of LLW from four submarines; Swiftsure, Resolution, Revenge and Repulse and are sufficiently robust to ensure the safe, secure, sustainable and environmentally responsible management of submarine LLW. Work is on-going to design, construct and commission infrastructure at Rosyth Dockyard to remove and manage ILW; primarily the RPVs.

The majority of MOD-owned radioactive wastes are LLW and lower activity ILW, however, safety, security and environmental protection remain key factors to be considered when developing MOD's waste management plans. Radioactive waste disposals are only made to facilities which have been suitably Permitted by one of the UK environment agencies.

Defueled submarines have been characterised to determine the quantities of materials for recycling, reuse, disposal or storage. MOD estimates that around 95% of the materials on the submarines outside the RC (mainly steel and other metals) can either be re-purposed or undergo conventional recycling. MOD is committed to adopting a more circular economy and is looking for opportunities to re-use components which can be re-purposed in our operational fleet or, potentially, used to manufacture new submarines.

MOD's strategy for managing ex-service nuclear submarines is reasonably mature, but there are unique challenges in developing a 'first of a kind' dismantling capability. Therefore, MOD continues to challenge its Disposal Programme of Record assumptions and seeks to ensure MOD employs an optimised approach for managing wastes.

MOD will require Industry to apply the Waste Hierarchy as a framework for waste management decision making, along with other criteria, to enable an effective balance of priorities including protection of health, safety, security and the environment; value for money; affordability; and technical maturity.

Asset Management

Asset management includes all of the activities that do not actively progress disposal but may be a requirement of the overall disposal capability.

These activities may include storage, berthing, docking, movements, lifting, transportation, examination, maintenance, inspection, testing (EMIT), modification and repair of the disposal submarine. These all consume time, resource and money. In simplistic terms, minimising these secondary activities, wherever practicable, is likely to minimise the demand on people, facilities, budget and programme.

Whilst the disposal submarine is required to float, (i.e., the period from HVOC to final docking) MOD has an expectation that the material state of the disposal submarine will be maintained to meet the required MOD safety, programme, finance and reputation outcomes. These are listed below.

Current Dismantling Required Outcomes & Disposal Submarine Material State Design Intent:

Outcomes	Material State Design Intent
Health & Safety	• The risks posed by disposal submarines to the public, workforce and environment (nuclear, radiological, environmental, conventional) should be minimised.
Nuclear Safety Case	• The disposal submarine (fuelled) must remain compliant with the NRP Authorisee's (NRPA's) fuelled safety case.
Safety Case	• The disposal submarine must be maintained in a material state that will be acceptable to all the nuclear facilities required to conduct remaining disposal activities
	• The disposal submarine must remain compliant with the safety case of the current (nuclear) facility
Programme	• The disposal submarine must facilitate the managed removal of all nuclear, radioactive, environmental and security hazards into appropriate waste and recycling streams.
	• The disposal submarine must remain in a state that it can be towed/transported on the open ocean (unless agreed otherwise)
	• The disposal submarine structure, systems and components must remain in a state that they can be reused or recycled on the open market (once hazards have been removed).
Reputation	• The disposal submarine must be maintained in a material state that does not undermine defence nuclear enterprise credibility and trust of the public, workforce and regulators. The reputation of MOD as a responsible nuclear operator must be upheld at all times.
Finance	• The disposal submarine material state should be managed through-life to minimise overall disposal costs (including through disposal upkeep costs).

Site Acquisition

It is assumed that MOD will be responsible for ensuring any disposal site is Authorised to berth a submarine at power. This will be in line with the operational berthing process that Defence Nuclear Safety Regulator (DNSR) uses to permission operational submarines to use commercial/non-nuclear berths such as Portland and HMNB Portsmouth. Industry is responsible for ensuring its nuclear licensed site(s) has (or have) all of the correct regulatory permissions to be able to conduct submarine disposal activities.

The following table includes those elements that need to be considered to ensure that any potential site is available for use, capable of facilitating disposal activities, acceptable to relevant stakeholders, licensable by the Office for Nuclear Regulation (ONR) and able to obtain all the permits/approvals required by other regulators and authorities.

Current assumed site acceptance criteria:

Outcomes	Criteria
Acceptability	• The site must be in line with the local community vision and its use accepted/desired by the community. • The site must be in line with national development, redevelopment, industrial & sustainability policies. • The site and its use must comply with legislative and regulatory requirements.
Availability	• The site (including coast and enclosed water areas) is to be available to MOD or a commercial entity on an indefinite commercial basis.
Capability	• The site(s) must be large enough to accommodate the facilities required for disposal submarines (Vanguard / Astute / Dreadnought / SSN(R)). Existing facilities are 8 and 9 dock in Devonport and 2 Dock in Rosyth). 14 dock will be used for PWR1 defuel. • The site must be large enough to store those submarines that are awaiting disposal. Existing facilities are 3 Basin at Devonport and the Tidal Basin at Rosyth). • The site must be accessible by the disposal submarines. • The ground/coast condition must be suitable for the required facility (flood, seismic, stability etc). • The transport links (existing or planned) must enable site development/facility construction, submarine disposal and recyclables/waste transport.
Engineering Feasibility	• The site must enable the constructability, sustainability, flexibility of the facilities required to conduct disposal activities.
Environment Protection	• Disposal activity impacts on the living and physical environment should be As Low As Reasonably Achievable.
Health & Safety	• The site must facilitate the safe construction, operation & site remediation in a demonstrably safe way.

Risk / Hazard Reduction	• Disposal activity impacts on the general public and workforce must be tolerable and As Low As Reasonably Practicable (ALARP).
Security	• The site must facilitate the security of Defence assets and information.
Skills	• The community must have or be able to develop/accommodate a suitably skilled workforce.
Socio-economic impacts	• The site must facilitate the overall wellbeing of the community and stakeholders.
Waste Management	• The site must have or be able to manage all radioactive, hazardous and controlled wastes arising from all disposal activities.

Annex C – Social Value

The SDC project's approach to Social Value is outlined below and should be considered when responding to questions relating to SDC.

Social Value

Social value benefits from any future procurement are an important consideration for the MOD, particularly with regards to achieving sustainable benefits from investment in the UK and support to UK industry in improving skills and industrial productivity.

The procurement of a Submarine Disposal Capability is unusual for MOD in that the end product is not a military capability but is a service that delivers value through effectively managing the waste products and liabilities that are present in a nuclear submarine.

The nature and scale of the activity involved in providing this service will achieve a significant social value benefit to the UK. The long-term nature of the project brings opportunities to consider how we can maximise the social value impact we can bring. As such, achieving social value is central to the delivery of the submarine disposal capability, and sits alongside safety, security and environmental protection in priority. The SDC project will assess how effectively parties through the supply chain contribute to delivering environmental, economic and societal social value benefits.

The SDC project's social value proposition is:

Submarine Disposal is a multi-generational, sustainable industrial and technological enterprise that brings wide-ranging economic and societal benefits:


Employment, skills, learning and development for future generations


Innovation, research and development in UK science and technology


Support to UK industry and business through a diverse supply chain delivering an array of products and services


Community enrichment and support

Our Waste Management approach brings further environmental and economic benefits:


Material re-use and recycling reduces our environmental impact, supports the circular economy and drives towards net-zero


Safe, secure and responsible nuclear and environmental stewardship


Managing our liability now rather than passing it on to future generations

The SDC project are using the Government Social Value Model and the Treasury Green Book guidance in our appraisal of options and potential solutions and recommend the following further reading:

1. The Social Value Model, Gov.uk. Social-Value-Model-Edn-1.1-3-Dec-20.pdf (publishing.service.gov.uk)
2. The Guide to Using the Social Value Model, Gov.uk. Guide-to-using-the-Social-Value-Model-Edn-1.1-3-Dec-20.pdf (publishing.service.gov.uk)
3. The Social Value Model Quick Reference Table, Gov.uk. Social-Value-Model-Quick-Reference-Table-Edn-1.1-3-Dec-20.pdf (publishing.service.gov.uk)
4. The Social Value Act: information and resources, Gov.uk. Social Value Act: information and resources - GOV.UK (www.gov.uk)
5. The Green Book – appraisal and evaluation in Central Government, HM Treasury. The Green Book (2022) - GOV.UK (www.gov.uk)

Annex D – Current Assumptions

The current high-level assumptions relating to each stage within the SDCA are captured below. All assumptions are subject to further discussion with Industry.

Prepare:

- This is the hand-over process from in-service to disposal.
- It is assumed that MOD will hand-over the submarine at an agreed condition.
- It is assumed that final transit to the disposal facility will be undertaken under the submarines own nuclear propulsion.

Decommission:

- It is assumed that Industry is willing and capable of developing a suitable decommissioning capability to support the decommissioning PWR 2 and PWR 3 submarines and possibly HMS TRIUMPH.

Defuel:

- It is assumed that Industry is willing and capable of developing a suitable defuel capability to support defuel of PWR 2 and PWR 3 submarines.
- It is assumed that a defueling capability will be available to defuel the first ex-service PWR2 submarine within fuel-in-core time limits.
- It is assumed that PWR 1 defuel at Devonport dockyard will continue to be undertaken by Babcock.
- Because of the differences between PWR 2 and PWR 3 core designs, it is assumed that a different capability might be required for the safe and optimal defueling of these different types of PWR.
- It is assumed that the Sellafield nuclear licensed site in Cumbria will receive spent fuel in alignment with the current defueling programme. It is possible the PWR 3 core(s) may go straight to the GDF and be dry stored.
- It is assumed that used fuel routes to the Sellafield Wet Inlet Facility and later the GDF are available and will continue to be available.

Dismantle:

- It is assumed that Industry is willing and capable of developing a suitable dismantling capability to support dismantling of PWR 1, PWR 2 and PWR 3 submarines.
- It is assumed that Swiftsure will continue to be dismantled by Babcock in Rosyth.

Waste:

- It is assumed that Industry is willing and capable of developing a suitable waste management capability and a plan to remove LLW and ILW, fully dismantle and reuse/recycle materials from PWR 1, PWR 2 and PWR 3 submarines.

- It is assumed that waste arising from submarine dismantling includes radioactive (ILW/LLW), hazardous and controlled wastes.
- It is assumed that radioactive wastes are present only in the submarine Reactor Compartment (RC).
- It is assumed that some components in the submarine RC are radiologically activated, others are radiologically contaminated
- It is assumed that routes to dispose all submarine-derived waste are available and will continue to be available.

Site:

- It is assumed that Industry is willing and capable of developing any new site(s) or premises to ensure it is available, acceptable and capable to accept all current and future submarines.
- It is assumed that Industry will ensure all appropriate transport links are in place and available for use when required.
- It is assumed that Industry will be the nuclear site licensee.
- It is assumed that the MOD will be responsible for ensuring that the disposal site(s) is Authorised to berth a submarine at power.

Organisation, Capability and Management:

- It is assumed that Industry is willing and capable of delivering or subcontracting all required capabilities.
- It is assumed that Industry is willing and capable of establishing, growing and maintaining the training, equipment and technology, personnel, information, doctrine and concepts, organisation, infrastructure and logistics required to deliver SDC.
- It is assumed that Industry is willing and capable of delivering SDC for as long as it is required.

Other assumptions:

- It is assumed that there is an enduring requirement to generate and maintain the capabilities to dispose of decommissioned submarines for the duration of the UK’s submarine programme.
- It is assumed that Industry will have in place or will apply for all required regulatory permissions and approvals.
- It is assumed that UK defence and civil site Regulators will accept a Safety Case and Waste Management Plan (to include a UK Ship Recycling Plan).
- It is assumed that UK defence and civil site Regulators will support the aims and objectives of submarine disposal programme.
- It is assumed that Industry will expect the MOD to protect any IPR, information, knowledge and understanding shared.
- It is assumed that there is no requirement for a Submarine Disposal Capability Project public consultation over and above the mandatory requirements for consultation by the Office for Nuclear Regulation (ONR) on Environmental Impact Assessment for

Decommissioning Regulations 1999 (EIADR) applications or public consultations required by the environment agencies on radioactive substances permit applications.

- It is assumed that there is no requirement for a Public Inquiry.
- It is assumed that because of the need to safely dispose of nuclear liabilities, there is a dependency on the Nuclear Reactor Plant Authorisee (NRPA) and Nuclear Propulsion Project Team to support and maintain the capabilities required during submarine Disposal (CADMID).

Annex E – Frequently Asked Questions

This list of Frequently Asked Questions (FAQs) reflect Industry questions submitted after the Market Interest Day (MID) on 6 July 2023.

The questions set out below have been generalised and may have been re-worded for the purpose of sharing with Industry organisations who attended the MID. Responses are limited to OFFICIAL classification.

If appropriate, a final set of FAQs will be shared in December 2023 with all individuals who participate in this phase of market engagement.

Programme and Timelines

1. **When is a disposal solution needed?**
   The SDC project requires a solution as soon as practicable. However, the minimum requirement is to accept the first Vanguard Class submarine when it retires in the early-2030s.

   The readiness of subsequent stages of disposal are to be determined pending recommendations from Industry on solutions and phasing options. The capability will be required for as long as there are UK nuclear-powered submarines requiring disposal.

2. **What is the earliest time at which the project would seek to relocate current submarines from Devonport?**
   It is not yet confirmed where submarine disposal will take place and the requirement to move submarines from and to any facility is, therefore, unknown.

   The SDC project requires a solution as soon as practicable and Industry are invited to propose the optimal programme for delivering submarine disposal inclusive of any submarine movements between facilities, if required.

3. **Will the current Submarine Dismantling Project programme be delayed while these decisions are being made?**
   No.

4. **When will the SDC decide on which direction they want to proceed?**
   The SDC project will present its recommended option to a Government investment body in 2024.

5. **When would the SDA plan to have a fully functional dedicated waste treatment facility?**
   The SDC project is interested in how Industry would adopt a waste-led approach that applies 'reduce, reuse and recycle' in preference to disposal to manage wastes arising from the disposal of all legacy, current and future out-of-service nuclear submarines.

6. **How much crossover is there envisaged to be with the Submarine Disposal Project at Rosyth?**
   The SDC project is working closely with the Submarine Dismantling Project in Rosyth Royal Dockyard to ensure key lessons, experience and information about submarine dismantling is transferred into the SDC project to inform future decisions. The Submarine Dismantling Project will continue to deliver dismantling on the demonstrator submarine (Swiftsure) as planned.

7. **What has so far been dissatisfactory with the process with Swiftsure?**
   The process used to dismantle Swiftsure is not dissatisfactory.

   Dismantling of out-of-service nuclear submarines is a complex and challenging undertaking. The Submarine Dismantling Project is currently developing and demonstrating the dismantling capabilities to meet all UK safety, security and environmental requirements to help establish a long-term dismantling solution that provides the best value for the UK taxpayer.

8. **For your Asset Management secondary stage, do you intend to be part of the MOD's BMfS DEEAMS defence-wide asset management programme?**
   The approach taken for Asset Management will be assessed during concept phase.

   The 'Asset Management' stage within the Submarine Disposal Capability Architecture is described in Annex B of this paper.

9. **Do you have a view on the likely workforce numbers for the site and operations?**
   Workforce numbers and Industry's approach to delivery will be considered as part of the overall proposition to demonstrate Value for Money. Industry will be expected to include workforce arrangements and approaches to organisation resilience as part of any proposal.

10. **Can you provide details on any advisory services you envisage requiring as part of this programme?**
    Any advisory services required to support the project will be dependent on the submarine disposal solution. The SDC project is interested in what advisory services you envisage or may wish to provide in support of the project.

Commercial and Finance

11. **How will any future work be contracted?**
    The project procurement and commercial strategy will define the preferred approach for executing procurement and awarding work. No decision has been made regarding any formal method of procurement. Feedback from Industry on how this might be managed most effectively is welcome. Please note that at this stage no decision has been made by the Authority to launch a formal procurement process.

12. **Can you elaborate on the tendering process timescales towards narrowing your site options?**
    Market engagement activity is currently scheduled to conclude in December 2023. Industry feedback during this time will be key to informing the optimal tendering process, timelines and next steps.

The SDC project welcomes discussions with Industry regarding sites that have the capability, or could be developed, for submarine disposal during this period of market engagement.

13. **Will the Defence Equipment Sales Authority be formally involved in the SDC project?**
    The SDC project delivery team are engaging with a wide range of UK Government organisations to explore delivery models and identify opportunities to exploit experience and capabilities – including the Defence Equipment Sales Authority.

14. **Has an estimate been made for the overall treatment of the current class boats and the future classes?**
    The SDA have estimated the programme costs for current and future classes as part of its standard estimating and forecasting processes and budgeting cycles. These estimates and budgets are reviewed on a regular basis to incorporate new data and assumptions.

15. **Is funding secured for the start of the project? Or will it ebb and flow?**
    The approach to funding will be developed and taken through the Government's investment approval process.

16. **How are the investment appraisal options due to be shared with the market?**
    The investment appraisal options are currently being presented to the Government for approval. Once approved, if deemed appropriate, the MOD will consider sharing these options with Industry.

Small and Medium Enterprises

17. **How will the SDA interact and facilitate the use of SMEs?**
    SMEs are strongly encouraged to engage throughout early market engagement and their participation in themed engagements and other early market engagement activities is highly valued.

    The SDC project early market engagement strategy is based on active engagement across industry with themed Q&A sessions conducted in-person and by providing access to SMEs

to request 1:1 sessions with the SDC project team to ask questions and provide feedback on project strategy and requirements.

The SDC project recognises the importance of protecting commercially sensitive information and will take steps to ensure that commercially sensitive information is protected.

The SDC project will be reviewing opportunities and methods for implementing the Social Value Model to procurement and contract opportunities where appropriate.

18. **What is the expected percentage spend on SMEs?**

    It is anticipated that SME spend and contract awards will form a key part of any future Social Value strategy, and this will be reviewed and discussed with industry during early market engagement. The SDC project will fully engage with industry to identify opportunities for SMEs and endeavours to create the right space during early market engagement to fully explore these opportunities either through direct engagement or through larger Industry partners.

19. **My organisation/company is an SME, but the parent company is based overseas. Am I eligible to work on the SDC project?**

    The definition of an SME in the United Kingdom can be found in the Companies Act 2006. The upper limits of what can be defined as an SME is a Medium Enterprise. A medium enterprise must meet two of the following criteria: (1) No more than 250 staff; (2) Turnover with no more than £36M; Balance sheet not exceeding £18M. There are further exclusions, including if the company is a public company, or a member of an ineligible group (as defined in the Companies Act 2006).

    There are no provisions in the Companies Act 2006 that specifically exclude a company from being treated as an SME on the basis of its parent company being a foreign entity providing it meets any relevant security requirements.

Sites, Process and Technical

20. Is there an absolute requirement for a new site? Could operations not take place on and next to the existing holding areas?

A new site to conduct disposal activities is not mandatory. Any proposed site(s) (either a new site, an adjacent site or by extending the existing site), must be accompanied by demonstrable evidence that it is fit-for-purpose, can deliver the full requirement and will comply with all UK legislation and regulatory requirements.

21. At what stage of the architecture is site selection and assessment for a disposal site?

The Submarine Disposal Capability Architecture (SDCA) captures site selection and assessment for a disposal site within the 'Site Survey and Selection' stage. This activity will take place during Concept phase and be developed over the course of Assessment phase.

22. Have any alternative sites been considered for submarine disposal?

The SDC project has launched a site feasibility study intended to identify potential alternative sites within the UK which have the characteristics required for nuclear submarine disposal. The target completion date for this study is December 2023.

23. Has any thought been given to re-instating the flap gates on Devonport 14 dock such that Resolution Class could fit? Or if the profile could fit with the RAH and what modifications would be required to the cradle?

The SDC project would like to discuss with Industry all options and opportunities to deliver the most efficient and effective solution for the long-term disposal of out-of-service nuclear submarines. At present Devonport 14 Dock is to be used for PWR 1 defuel.

24. Is there is a preference for disposal within a dry dock facility?

No. There is no preference to conduct any disposal activities within a dry dock facility.

25. Does the SDC project have an ideal acreage in mind for land requirement?

No. The land acreage will depend on the disposal capability offered by Industry.

26. What would be the workable minimum, underway and when alongside maximum draft?

Industry should be prepared to receive:

a. PWR1 defueled. A Trafalgar-Class submarine with a PWR1 reactor has a length of 85.4m, a beam of 9.8m and a draught of 9.5m. When fuelled the displacement of the submarine when submerged is 5,298 tonnes.
b. PWR2 fuelled. A Vanguard Class submarines with a PWR 2 reactor has a length of 149.9m, a beam of 12.8m and a draught of 12m. When fuelled the displacement of the submarine when submerged is 15,900 tonnes. An Astute Class submarine with a PWR2 reactor has a length of 97m, a beam of 11.3m and a draft of 10m. When fuelled the displacement of the submarine when submerged is 7,400 to 7,800 tonnes.
c. PWR3 fuelled. This information is not currently available.

27. What is the typical time frame between nuclear shutdown and fuel removal, after the thermal roll-over phase is complete? Can submarines be towed during that time?

Generally, it takes up to one year for the decay heat to reach a point where it is less than natural heat losses. Should movement of the submarine be required during this one-year period, appropriate clearances and safety provision would be required.

28. What is the required beam/width requirements of locks?

Please refer to answer 26.

29. What are the current tug requirements?

If Industry identify a requirement, as part of a proposed solution, to move either fuelled or defueled submarines, the SDC project would be interested to understand how Industry would propose to use tugs, heavy-lift, floating barges or any other equipment.

This is a decision for Industry based on a proposed solution.

For information the current tug requirements to move fuelled and defueled submarines are different and depend on various factors including weather, tug manoeuvrability and the

requirements set by the Harbour Master.

30. Is there a requirement for weather protection (permanent or temporary)?

If Industry identify a requirement as part of a proposed solution to provide weather protection, the SDC project would be interested in how and when weather protection is used.

Weather protection of submarine infrastructure, plant and equipment is a decision for Industry based on the proposed solution, but, for information: weather protection is currently used at Rosyth and Devonport dockyards when removing components from any submarine. The current programme has undertaken activities both with and without weather protection depending on the approach taken, the disposal activity being carried out and the duration of that activity. There is no requirement for weather protection for stored submarines.

31. What are the expected security requirements of any site?

No decision has been taken. However, we would expect a proposed solution to meet security requirements as required by Joint Services Publications 628 and 440.

32. What are the expected workforce security requirements?

No decision has been taken. However, the MOD would expect a proposed solution to meet security requirements as required by Joint Services Publications (JSP) 628 and 440.

33. Will PWR1 defuel continue to be undertaken at Devonport Dockyard?

It is currently assumed that PWR1 defueling will take place in Devonport 14 Dock.

34. Will any novel technologies be needed to manage the hazardous wastes described?

The SDC project is interested in how existing and novel technologies could be used throughout all stages of the project, including to manage hazardous wastes, where they deliver benefit and Value for Money.

Future submarines

35. Will the future classes of boats be designed with dismantling in mind?

Learning from the Submarine Dismantling Project work on the Demonstrator submarine

(Swiftsure) will be made available to future project teams to consider. The SDC project and acquisition teams will continue to engage as the approach to submarine disposal develops.

36. **Will SDC be expanded to include a disposal capability for future submarines as part of the AUKUS arrangement?**

The SDC project aspires to develop a long-term capability which will adapt to account for all future requirements for submarine disposal.

Disclaimer

Industry participants should note that all information provided in and appended to this paper is in draft and subject to further development. Information provided by MOD is shared in a purely collaborative manner for the purposes of market engagement only and are not to be relied upon in any future competition. Any information shared directly with the MOD will be treated in confidence.

It should be noted that this period of market engagement is not a guarantee of any future procurement. Should a procurement take place, the MOD shall not be bound to incorporate any feedback received as part of the market engagement into the documentation and the MOD has sole discretion over how it chooses to construct the procurement documents and structure the process for any subsequent competitive phases.

Neither the MOD nor its respective advisers will be liable for any costs or expenses incurred by Industry participants in connection with the market engagement. The MOD does not bind itself to enter into any contract(s) in respect to the Submarine Disposal Capability Project and no contractual rights express or implied arise out of this paper or the procedures detailed within.