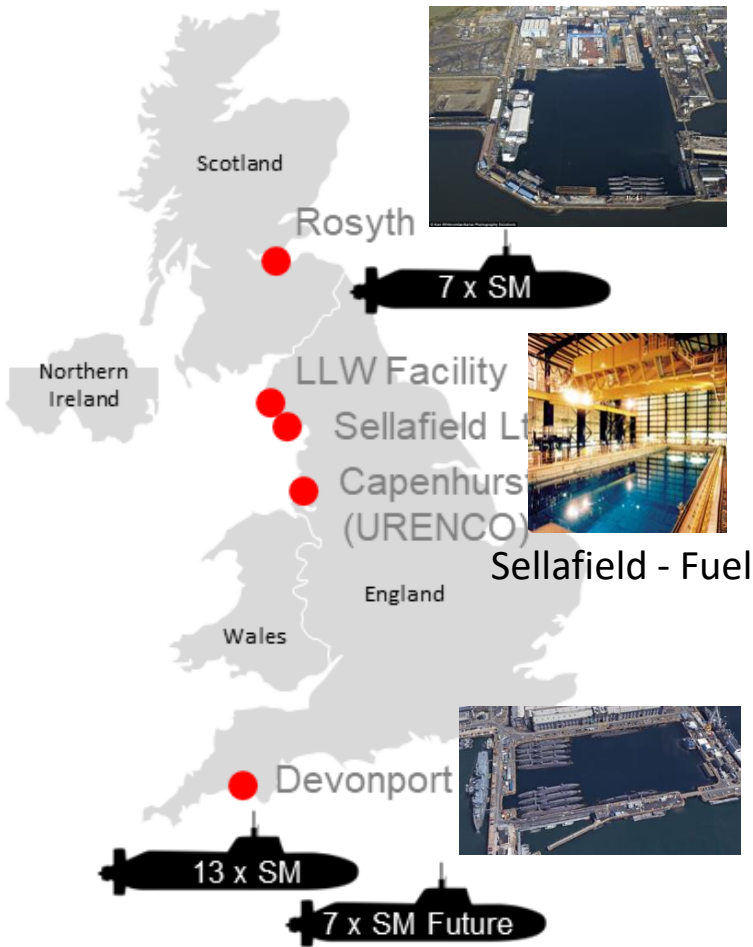


## Overview of the Submarine Dismantling Project (SDP)



# SDP Context



There are 20 submarines stored, safely, (13) at Devonport and (7) at Rosyth of which 9 still have radioactive fuel on board. An additional 7 submarines are due to come out of service in the next 20 years. SDP plans are to:

- Dismantle 7 submarines in Rosyth after which the SDP / MOD will exit the Rosyth dockyard site by 2037
- The remaining submarines will be defueled then dismantled in Devonport, starting 2035 with a planned end date 2070
- There are 2 main types of radioactive waste to be managed (i) Low-level radioactive waste which can be processed and disposed of through existing routes and (ii) Intermediate-level radioactive waste which has no disposal route so we plan to store until the UK constructs a disposal facility
- Once the LLW and ILW has been removed, the submarine will be towed to a licenced UK ship breaker for final dismantling and recycling, what's left of the submarine is mainly metals so we want to recycle as much material as possible



Submarine  
Storage

Submarine  
Dock

Babcock-owned Rosyth dockyard site

# Low-level Radioactive Waste (LLW) removal continuous improvement

## SWIFTSURE

- December 2016-August 2018
- 52 tonnes potential LLW removed
- Majority of metals recycled

## RESOLUTION

- November 2018-March 2020
- 77 tonnes potential LLW removed
- 50% increase in LLW removed
- 25% reduction in time

## REVENGE

- March 2020 start
- 120 tonnes potential LLW to be removed
- Further 50% increase in LLW removed – first time all LLW removed in the world



- Great HSE track record for LLW removal with over 600,000 Man Hours worked since last RIDDOR and no environmental incidents reported to SEPA since work started Dec 2016

# Working with Industry

- Maximising use of the LLWR framework for the likes of (i) characterisation of wastes (ii) final disposal of LLW
- Great work undertaken in 2019 with SL & REACT to look at In-Situ Dismantling of nuclear submarines
- Maximising use of Learning From Experience being applied from one boat to the next and the application of improved and innovative techniques. Examples of specific improvements in techniques and practices:
  - Using a more simple, fit for purpose lifting solution to remove large LLW components such as Steam Generators the original Babcock bid was £5M and is now under £1M.
  - Using laser technology to do submarine hull cuts to fleet out LLW – this has saved man hours in cutting and hull reinstatement – this is estimated to have saved over £1M
- Civil / Defence collaboration with a joint LLWR/RWM Peer Assist of SDP held in Jan 2020. This was attended by Subject Matter Experts (SME's) across the industry and representatives from both MOD and Babcock with the objective of independently evaluating the key elements of SDP dismantling and waste management options to test their strength and performance. This demonstrates collaborative working to drive innovation and best practice to meet the Nuclear Sector Deal objectives.

# What else we're doing

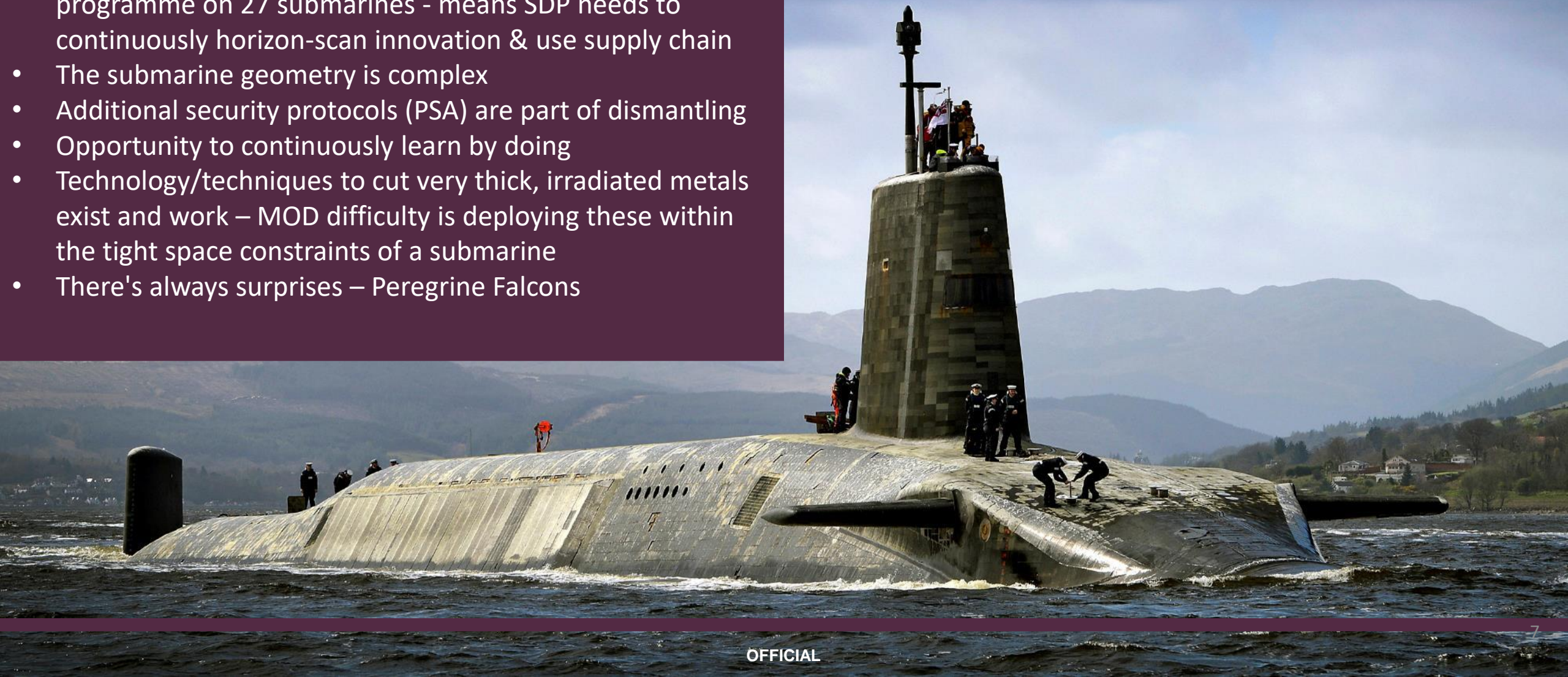
- SDP focus over next 6 months is to take samples from the components in the reactor compartment and send them to a lab for analysis – called characterisation investigations - this will provide invaluable info to inform how best to dismantle submarines and how to dispose LLW and store ILW - spend some money now to save costs later (stop a Leaning Tower of Pisa problem)
- Designing one of the biggest transport containers to transport the main ILW component (the Reactor Pressure Vessel) from Scotland to north-west England, safely and in accordance with nuclear transport regulations – design work nearly complete
- Now on contract with Tradebe to treat some radioactive resins by removing reactive chemicals that prevent their disposal
- Engaging with UK & US security staff to work out how best to remove submarine components that have security implications if they fell into the wrong hands – a unique defence “issue”
- Working out what needs to be done to clean-up the submarine after all the LLW & ILW has been removed



“We can save 10 lira and six months if we skip the geotechnical investigation!”

# What we're learning

- SDP is different from civil – we have a 70 year dismantling programme on 27 submarines - means SDP needs to continuously horizon-scan innovation & use supply chain
- The submarine geometry is complex
- Additional security protocols (PSA) are part of dismantling
- Opportunity to continuously learn by doing
- Technology/techniques to cut very thick, irradiated metals exist and work – MOD difficulty is deploying these within the tight space constraints of a submarine
- There's always surprises – Peregrine Falcons



## The Future

- Obtain a permit from SEPA to allow disposal of all LLW & ILW
- Fully recycle a submarine - an international first
- Learn – get it right on submarine 1 – learn on submarines 2-27
- What about Astute & new classes – SDP?



*Le Redoutable* at the Navy Museum (FR)



Hanford Nuclear Reservation (USA)



Saida Bay (RUS)



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