Replacing the UK's strategic nuclear deterrent: progress of the Dreadnought class

By Claire Mills

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Summary

This briefing paper examines the Dreadnought SSBN programme as it advances. It does not examine the Government’s overall nuclear policies, the synergies between the civil and military nuclear sectors, broader programmes within the nuclear enterprise, or the UK’s position on disarmament. Nor does it set out in detail the arguments for and against nuclear weapons.

The decision to replace the nuclear deterrent

In a vote in July 2016 the House of Commons approved the decision to maintain the UK’s nuclear deterrent beyond the early 2030s. After almost a decade of work on the project, that vote subsequently enabled the programme to move forward into its manufacturing phase, which will see the construction of four new Dreadnought class ballistic missile submarines (SSBN) over the next 15-20 years.

What is the Dreadnought programme?

Although commonly referred to as the renewal or replacement of Trident, the Dreadnought programme is about the design, development and manufacture of four new Dreadnought class ballistic missile submarines (SSBN) that will maintain the UK’s nuclear posture of Continuous at Sea Deterrence (C ASD).

A Common Missile Compartment (CMC) for the SSBN, which will house the existing Trident strategic weapons system, is being developed in conjunction with the United States.

Under changes introduced in the 2015 Strategic Defence and Security Review (SDSR), the first Dreadnought SSBN is now expected to enter service in the early 2030s and will have a service life of at least 30 years.

Replacement of the Trident II D5 missile itself is not part of the programme. The UK is, however, participating in the US’ current service-life extension programme for the Trident II D5 missile, which will extend the life of the missile potentially to the early 2060s.

Replacement of the nuclear warhead is also not part of the Dreadnought programme. After having deferred a decision on replacement in the 2010 SDSR, in February 2020 the Government confirmed that a replacement programme is underway. Transition to the new warhead, which will be compatible with the Trident missile system, is expected from the late 2030s onwards.

Delivery of the Programme

Recognising that the Dreadnought programme is one of the largest Government investment programmes going forward, the 2015 SDSR made a number of changes to the structure of the project, specifically with reference to governance and oversight of delivery.

A new Submarine Delivery Agency has been established, which became an Executive Agency of the MOD in April 2018. That agency will manage the procurement and in-service support of all current and future nuclear submarines, including Dreadnought. It sits alongside the MOD’s Defence Equipment and Support (DE&S).

In tandem, the MOD and its two key industrial partners on the dreadnought programme, BAE Systems and Rolls Royce, have formed a new commercial alliance in order to jointly deliver the programme.
Where is the programme at?

In May 2018 the MOD signed contracts for the second phase of the build programme. That phase had been expected to last for three years. However, due to the Covid-19 pandemic, Delivery Phase 2 (DP2) has now been extended for one year, to March 2022. The MOD estimates that the current work rate on the Dreadnought programme is around 95 per cent of pre-Covid-19 output.

Under the management of the Dreadnought Alliance Delivery Phase 2 will continue the design and build of the first Dreadnought submarine and commence the build of the second, including furthering the design and manufacture of the nuclear propulsion power plant. According to the MOD’s 2020 Annual Report the programme remains on schedule, despite the extension of Delivery Phase 2.

Jobs and Industry

BAE Systems, Rolls Royce and Babcock International are the Tier One industrial partners in this project. Although the MOD has contracted directly with BAE Systems and Rolls Royce for production, hundreds of suppliers across the UK are working on the Dreadnought programme. As the programme moves forward BAE Systems has estimated that 85 per cent of its supply chain will be based in the UK, potentially involving around 850 British companies.

Yet, it is unclear how much of the value of the overall programme rests with that supply chain in the UK and how much will be spent overseas. To date BAE Systems has contracted for the specialised high strength steel required for the submarines from a French supplier. The use of foreign steel in the construction of the Dreadnought class has raised many questions over whether more can be done to promote the British steel industry within MOD programmes.

Costs

The cost of the programme has been estimated at £31 billion, including defence inflation over the life of the programme. A £10 billion contingency has also been set aside. Once the new nuclear deterrent comes into service the annual in-service costs are expected to continue at approximately 6 per cent of the defence budget (£2.5 billion in 2020/21).

In its 2020 Update to Parliament the MOD confirmed that the programme remains within its cost estimate and that, by the end of March 2020, £8.5 billion has been spent on the concept, assessment and early delivery phases of the project.

To keep the programme on track, reduce risk and achieve cost efficiencies, additional investment for the early years of the programme was announced as part of the Autumn 2018 budget statement and the 2019 Spending Round. This was not extra funding for the programme, but money that has been re-profiled.

In December 2020 the MOD confirmed that £1 billion of the contingency fund has been made available to the Department thus far. A further £1.3 billion of the contingency fund has been made available for 2021-2025, should it be required.

In line with convention, the Dreadnought programme will be funded from the MOD’s core equipment budget. The National Audit Office has, however, raised concerns over the impact of the MOD’s nuclear programmes on the affordability of the Department’s overall equipment plan.
1. Background

This briefing paper examines the Dreadnought programme as it advances. It does not examine the Government’s overall nuclear policies, the synergies between the civil and military nuclear sectors, broader programmes within the nuclear enterprise, or the UK’s position on disarmament. Nor does it set out in detail the arguments for and against nuclear weapons.

Box 1: Suggested reading

The following reports examine these broader issues in greater detail:

- Public Accounts Committee, *Lessons from major projects and programmes*, HC694, Session 2019-21
- Public Accounts Committee, *Defence nuclear infrastructure*, HC86, Session 2019-21
- HM Treasury, *Government response to the Public Accounts Committee*, CP176, October 2019
- Public Accounts Committee, *Submarine defueling and dismantling*, HC2041, Session 2017-19
- National Audit Office, *Investigation into submarine defueling and dismantling*, HC2102, Session 2017-19
- HM Treasury, *Government response to the Public Accounts Committee*, Cm 9740, Session 2017-19, December 2018
- National Audit Office, *The Defence Nuclear Enterprise: a landscape review*, HC1003, Session 2017-19, May 2018
- Public Accounts Committee, *Hinkley Point C*, HC393, Session 2017-19
1.1 Origins of the replacement programme

The Labour Government’s 2006 White Paper The Future of the United Kingdom’s Nuclear Deterrent, concluded that the international security environment did not justify complete nuclear disarmament and that, in terms of both cost and capability, retaining the submarine-based Trident system would provide the most effective nuclear deterrent for the UK.

The decision was therefore taken to maintain the UK’s existing nuclear capability by replacing the Vanguard class submarines (SSBN) and participating in the current US service-life extension programme for the Trident II D5 missile.

A debate and vote in the House of Commons on the general principle of whether the UK should retain a strategic nuclear deterrent, beyond the life of the current system, was held on 14 March 2007. That motion passed on division by 409 to 161 votes.

Work began immediately on the concept phase of the ‘Successor’ programme, with the project passing its Initial Gate in April 2011. A five-year assessment phase followed which largely focused on the design of the successor platform. Several contracts were awarded to the main industrial partners on the project (BAE Systems, Rolls Royce and Babcock) in order to deliver on each of the stages of the assessment phase. Approximately £4.8 billion was assigned to the initial phases of the programme.

In a vote in July 2016 the House of Commons once again approved the decision to maintain the UK’s nuclear deterrent beyond the early 2030s.\(^1\)

After almost a decade of work on the project, that vote subsequently enabled the programme to move forward into its manufacturing phase, which will see the construction of four new Dreadnought class ballistic missile submarines (SSBN) over the next 15-20 years. The first submarine will enter service in the early 2030s.

Successive governments have expressed the belief that the programme to replace the UK’s nuclear deterrent is compatible with the UK’s obligations under the Nuclear Non-Proliferation Treaty (NPT), arguing that the treaty contains no prohibition on updating existing weapons systems and gives no explicit timeframe for nuclear disarmament.

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\(^1\) Division 46, 18 July 2016. Parliament had also voted in support of the Government’s plans in response to SNP-led Opposition Day debates in January 2015 and November 2015.
2. What is the Dreadnought programme?

Although commonly referred to as “the renewal or replacement of Trident”, the Dreadnought programme is about the design, development and manufacture of four new Dreadnought class ballistic missile submarines (SSBN) that will replace the current Vanguard class SSBN and maintain the UK’s posture of Continuous at Sea Deterrence (CASD).

A Common Missile Compartment (CMC) for the SSBN, which will house the current Trident strategic weapons system, is being developed in conjunction with the United States.

Under changes introduced in the 2015 SDSR, the first submarine is now expected to enter service in the early 2030s and will have a service life of at least 30 years. This was the third time the in-service life of the current Vanguard class SSBN had been extended and will now result in an overall lifespan of the Vanguard class of approximately 37-38 years. The MOD has refused to be drawn on specific dates for entry into service stating that “detailed planning assumptions for Service Entry are classified”. The four SSBN will be named HMS Dreadnought, HMS Valiant, HMS Warspite and HMS King George VI.

**Trident II D5 missile and warhead**

Replacement of the Trident II D5 missile itself is not part of the programme. The UK is, however, participating in the US’ current service-life extension programme for the Trident II D5 missile, which will extend the life of the Trident missile to the early 2060s.

The current nuclear warhead is expected to retire in the early 2040s. The transition to a new nuclear warhead would therefore be required from the late 2030s. Planning

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2 Previously referred to as the ‘Successor’ programme. The Ministry of Defence announced the name of the new class of SSBN on 21 October 2016 (HCWS206).

3 The UK has maintained a posture of CASD (Operation Relentless) since April 1969. There had initially been considerable debate over whether it would be possible to procure three boats, and still maintain CASD. The intention had been to make a decision on the size of the fleet at Main Gate. However, in April 2015 the government committed to the procurement of a 4-boat fleet.

4 The US is replacing its current SSBN fleet with a new Columbia class SSBN, which is due to enter service within a similar timeframe to the UK’s Dreadnought programme (early 2030s).The design for the Dreadnought’s common missile compartment (CMC) is being delivered under the 1963 Polaris Sales Agreement (PSA), as amended (HL Deb 11 February 2013, c92WA)

5 Ministry of Defence, Dreadnought submarine programme factsheet

6 The first time was in the 2006 White Paper when the service life of the submarine was extended from 25 to 30 years. The second was in the 2010 SDSR when the in-service date of the first submarine was earmarked for 2028.

7 HMS Vanguard entered service in December 1994; while the last in class, HMS Vengeance, entered service in February 2001.

8 PQ24643, Trident Submarines, 1 February 2016

9 PQ35764, Trident, 4 May 2016. In 2020, work began in the US on a second life-extension project (Trident D5 LE2) that will keep the Trident missile in service until at least 2084, to match the life of the US’ new Columbia class SSBN.
expectations are that it will take approximately 17 years to design, develop, certify and manufacture a new nuclear warhead.\textsuperscript{11}

Since 2006 the MOD has been undertaking work on replacement options. In its 2018 \textit{Update to Parliament}, the MOD confirmed that investment at the AWE continues under the Nuclear Warhead Capability Sustainment Programme, including projects to reduce technical, cost and schedule risks to any warhead replacement programme. The UK has also been undertaking work with the United States, through the UK-US Joint Technology Demonstrator project examining warhead safety, security and advanced manufacturing technologies.

In February 2020 the Government confirmed that a replacement warhead programme was underway\textsuperscript{12} after US officials inadvertently revealed that work on its new W93 warhead was being conducted in parallel with a British programme.\textsuperscript{13}

\textsuperscript{11} Executive Summary, para 18. The long lead time is largely based around the length of time required to certify a new nuclear warhead, in the absence of live nuclear testing. The UK signed the Comprehensive Test Ban Treaty in 1996 and ratified it in 1998. Although the treaty has yet to enter into force the UK is committed to its principles.

\textsuperscript{12} HCWS125, \textbf{Nuclear Deterrent}, 25 February 2020

\textsuperscript{13} The replacement warhead programme is examined in greater detail in Library Briefing, \textbf{CBP8941, Replacing the UK’s nuclear deterrent: the long-awaited warhead decision}
3. Delivery of the Dreadnought programme

The Dreadnought programme has been described as “the largest UK submarine project in a generation and will be one of the most complex undertaken by British industry”.14

3.1 Governance

Recognising that the Dreadnought programme is one of the largest Government investment programmes going forward, the 2015 SDSR made a number of changes to the structure of the project, specifically with reference to governance and oversight of delivery.

New organisational and managerial arrangements for the UK’s defence nuclear enterprise as a whole, and for delivering the Dreadnought programme specifically, were subsequently outlined in SDSR15. A new team within the MOD (Director General Nuclear), headed by a commercial specialist, would be established to oversee all aspects of the nuclear enterprise; while a new delivery body would be established in order to deliver the procurement and in-service support of all nuclear submarines, including Dreadnought.

Initial speculation among the media and other commentators suggested that the Treasury had been looking to bring the new delivery body under its own remit.15 The justification for doing so was reportedly the historical failure of the MOD to manage large and complex projects, with subsequent equipment being delivered several years late and vastly over budget.16

In a Parliamentary debate on 24 November 2015, however, then Minister for Defence Procurement, Philip Dunne, refuted suggestions that the Treasury would assume oversight of the programme:

On the governance of implementing a delivery organisation to make sure we deliver the Successor programme on time and to budget over the years to come, I can confirm that this will remain subject to oversight by the MOD […]

As the Prime Minister and the Secretary of State have made clear, this will be reporting through the MOD structures to the Secretary of State, and of course the Treasury will take its interest in the delivery of major programmes as it does in all our category A programmes, of which this will obviously be the largest.17

That position was reconfirmed by the MOD in December 2015.18

In November 2020 the Government announced that the Atomic Weapons Establishment (AWE) would be “renationalised” and become an arms-length body wholly owned by the MOD. This is examined in greater detail in Library briefing, Replacing the nuclear deterrent: the long-awaited warhead decision.

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15 See for example: “George Osborne issues Treasury ultimatum over Trident“, The Daily Telegraph, 12 November 2015
16 The most comparable programme is the Astute class submarine which, in 2015 was £1.4 billion over budget and several years late (National Audit office, Major Projects Report 2015, HC488-II, October 2015)
17 HC Deb 24 November 2015, c1254
18 PQ HL3927, 3 December 2015
The Submarine Delivery Agency

The new Submarine Delivery Agency (SDA) was initially established within the MOD’s Defence Equipment and Support (DE&S) organisation on 3 April 2017. The long-term intention was for this new body to achieve Executive Agency status, and sit alongside DE&S. The SDA subsequently achieved Executive Agency status on 1 April 2018.19

The SDA will manage the procurement, in-service support and decommissioning of all current and future nuclear submarines, including Dreadnought.20 It will have the authority and freedom to recruit and retain the best individuals to manage the submarine enterprise. The SDA currently employs around 1,450 people, both civilian and military.21

The MOD appointed Ian Booth as the Chief Executive of the SDA in August 2017. The CEO is supported in programme delivery by the Director Submarines Acquisition (DSMA) and the Director Submarines Support (DSMS):

- DSMA will be responsible for the delivery and future in-service support of Dreadnought, Astute and the Maritime Underwater Future Capability. They also lead the relationship with BAE Systems.

- DSMS will be responsible for in-service submarines, including the current SSBN delivering continuous at sea deterrence. They will also lead the relationship with Babcock for the Maritime Support Delivery Framework and submarine support, and Rolls Royce for nuclear propulsion.22

A commercial alliance

In tandem with the creation of a new delivery body, in April 2018 the MOD also established a new commercial alliance with its two key industrial partners on the Dreadnought programme: BAE Systems and Rolls Royce.23 The intention of a joint management team approach is to improve collective performance on the programme, provide greater assurance of progress, with supporting risk and reward arrangements.

In its report on the Defence Nuclear Enterprise, the National Audit Office described how the ‘Dreadnought alliance’ will operate going forward:

The arrangements have evolved and differ from the Department’s initial aspiration. The new ways of working, effective from April 2018, consist of:

- the SDA continuing to agree bilateral contracts with contractors;

- a managing director, supported by a management committee, responsible for the day-to-day running of the alliance and accountable for delivering Dreadnought. They will set cost and schedule baselines, authorise under/overspends, challenge contractor performance and develop a procurement strategy;

- a leadership board, involving all three organisations, to govern the alliance on behalf of all the parties and hold the managing director to account;

19 A copy of the SDA Framework Document, outlining the governance structure of the SDA is available online.

20 Including the in-service fleet of Trafalgar, Astute and Vanguard class submarines and the ongoing Astute and Dreadnought procurement programmes. The Maritime Underwater Future Concept (MUFC) project will also fall under the remit of the SDA.


22 Ibid

23 A Heads of Agreement was signed by the Secretary of State for Defence and the CEOs of BAE Systems and Rolls Royce in November 2016 outlining the intent to establish an Alliance to deliver the Dreadnought programme. This approach was also adopted in relation to the Queen Elizabeth II aircraft carrier project with the creation of the Aircraft Carrier Alliance, which is a partnership between the MOD and BAE Systems, Thales UK and Babcock.
• a shared cost model; schedule and breakdown of work; and reporting arrangements; and
• an incentive scheme, linked to an agreed percentage profit variation, weighted to achieving milestones where two or more members need to work together.

The Department believes these arrangements will improve information-gathering, cost control and contractor performance. It hopes to move towards a more integrated model as the Dreadnought programme matures.24

On 1 September 2018 Sir Peter Gershon was appointed as the Independent Chair of the Alliance Leadership Board.

3.2 Where is the programme at?

In addition to changes in governance, SDSR15 also announced that “due to the scale and complexity” new commercial arrangements would be established between Government and industry that will see the programme subject to several stages of investment, with multiple control points, instead of the traditional single “Main gate” approach.25 Adopting such an approach will allow the MOD to more effectively regulate and control programme funding and achieve delivery targets.

Following the vote in the House of Commons in July 2016 the programme moved forward from its assessment phase, into “risk reduction and demonstration”, or what was termed Delivery Phase 1. That phase officially began on 9 September 2016; and construction of the first submarine formally began on 5 October 2016 with the cutting of the steel for the first submarine.26 With the Dreadnought class entering the build phase, the UK is now manufacturing two classes of submarine simultaneously for the first time since the 1990s.27

In May 2018 the MOD signed contracts for the second phase of the build programme, Delivery Phase 2, which was expected to run until March 2021. Under the management of the Dreadnought Alliance, DP2 will continue the design and build of the first Dreadnought submarine and commence the build of the second,28 including furthering the design and manufacture of the nuclear propulsion power plant.29

The submarines will be built in 16 units, grouped into three “mega units” (Aft, Mid and Forward) in order to shorten the overall build timeframe:

![Diagram of submarines](source: MOD, 2016 Update to Parliament)

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24 National Audit Office, The Defence Nuclear Enterprise: A landscape review, HC1003, 22 May 2018
25 The procurement of defence equipment in the UK is largely conducted in accordance with the generic CADMID cycle, which comprises six phases in a project and two main investment decision points, or ‘gates’: Concept and feasibility phase followed by Initial Gate; an assessment phase followed by Main Gate; demonstration; manufacture; in-service and disposal. This new staged approach was also adopted in the QEll aircraft carrier programme.
26 HCWS206, 21 October 2016
27 The other being the Astute class SSN. MOD, Submarine Delivery Agency Corporate Plan 2018/19
28 Construction work on HMS Valiant officially started in September 2019.
29 MOD press release, 14 May 2018
Contracts for the third Delivery Phase had been expected in 2021. However, due to uncertainty caused by the Covid-19 pandemic and “the short to medium term uncertainty in industrial partners and supply chains”, Delivery Phase 2 will now continue for a further year, until March 2022. The MOD estimates that the current work rate on the Dreadnought programme is around 95% of pre-Covid-19 output. It also acknowledges, however, that the “full impact [of the pandemic] has yet to be fully quantified”.\(^{30}\)

Despite this, the MOD has stated that the Dreadnought programme “continues to remain within overall budget and on track for the first of class to enter service in the early 2030s”.\(^{31}\) However, as David Cullen of the Nuclear Information Service has argued “the MoD’s insistence on using the “early 2030s” formulation meant it was impossible to tell the exact impact of the delay”.\(^{32}\)

At present there is no indication of how many stages of investment there will be overall, or when they might be implemented. In answer to a Parliamentary Question in February 2018 the MOD stated:

> The number of investment stages throughout the 20 year acquisition programme will be defined as the build progresses.

> The phases of Dreadnought construction comprise: major steelwork being formed into units; installing and outfitting of systems and plant; integration and testing of systems; and sea trials culminating in acceptance into service.\(^{33}\)

In order to keep the programme on track in the longer term, however, contingency funding has been made available in the earlier years, in order to reduce risk and achieve efficiencies (see below).

In its 2019 Annual Report the Government’s [Infrastructure and Projects Authority](https://ipa.gov.uk/) (IPA) changed its confidence assessment of the Dreadnought programme from Amber/Red\(^{34}\) to Amber. This is a categorisation which the programme has kept in the IPA’s [2020 annual report](https://ipa.gov.uk/wp-content/uploads/2020/10/Annual-Report-2019-2020.pdf). The IPA thus considers the successful delivery of the project to be feasible, but that significant issues remain.

Indeed, in January 2021 the [US Government Accountability Office](https://www.gao.gov/) published a report on the progress of the US Columbia class SSBN programme, in which it expressed concerns over the ability to deliver the Common Missile Compartment (CMC) on time after significant delays to the project.\(^{35}\) The GAO report concluded that:

> the schedule for the common missile compartment has less than 1 month of margin remaining for on-time delivery. Moreover, according to Electric Boat and program briefing documents, the repair and delivery schedules for defective tubes continue to deteriorate at both suppliers, and the [US] Navy expects this will further reduce schedule margin. As a result, there is increasing risk that the common missile compartment will not be available for final outfitting and assembly in July 2024 as planned.\(^{36}\)


\(^{31}\) ibid

\(^{32}\) “Trident nuclear submarine replacement delayed by another year”, *The Guardian*, 4 February 2021

\(^{33}\) PQ126895, *Trident submarines*, 13 February 2018

\(^{34}\) Successful delivery of the project is in doubt, with major risks or issues apparent in a number of key areas. Urgent action is needed to address these problems and/or assess whether resolution is feasible (IPA *Annual Report on Major projects 2018-19*, Annex A)

\(^{35}\) In 2018 substantial weld defects were identified in a number of missile tubes from one of three tube suppliers, which resulted in checks to missile tubes from all suppliers. In April 2019 the US Government Accountability Office estimated that addressing this issue would take up 15 months of the 23-month schedule margin built into the programme. However, further weld defects at a second missile tube supplier were identified in December 2019, further delaying the programme.

The MOD acknowledged the CMC issue in its 2020 Annual Report, confirming that the first six (of twelve) missile tubes for HMS Dreadnought had been delivered by July 2020. The report went on to state that “we [the MOD] are working closely with our US counterparts to ensure future MT deliveries continue in a timely manner to support the Dreadnought submarine programme”.37

Concerns have been raised that any overall delay in bringing the Dreadnought class into service could impact on the ability to deliver continuous at sea deterrence (CASD). The Vanguard class SSBN has already had its service life extended by over a decade. The need to extend it even further would be costly and put availability of the deterrent in doubt.38

3.3 Jobs and Industry

BAE Systems, Rolls Royce and Babcock International are the Tier One industrial partners in this project.

As with previous SSBN, the submarine will be built by BAE Systems in Barrow-in-Furness and the PWR3 propulsion system will be built by Rolls Royce at Raynesway, Derby.

Although the MOD has contracted directly with BAE Systems and Rolls Royce for production, hundreds of suppliers across the UK are working on the Dreadnought programme. As the programme moves forward BAE Systems has estimated that 85 per cent of its supply chain will be based in the UK, potentially involving around 850 British companies.

In February 2020 BAE Systems awarded a £330 million contract to Thales UK for the delivery of the sonar system for all four Dreadnought submarines. That contract will secure and create over 500 jobs across the UK.

At present the number of people working directly on the programme is approximately 3,000. More than half of those are designers and engineers. The programme as a whole is expected to support up to 6,000 jobs. As the MOD has noted:

> The nuclear deterrent represents a significant national undertaking, which is drawing on cutting edge capabilities, innovation, design and engineering skills available in the UK, and is providing employment opportunities and development prospects for a substantial number of apprentices, trainees and graduates in a wide range of technical and other disciplines.39

Ensuring that a skilled workforce is available was identified as a risk by the National Audit Office in May 2018. In its report on the Defence Nuclear Enterprise, the NAO recognised:

> Having insufficient skilled staff remains a risk across the Department, and mitigating this risk is one of the Navy’s top three priorities. The Enterprise depends on civilian and military staff within the Department and industry to design, build and safely operate nuclear submarines, systems, weapons and the supporting estate. These people have a wide range of skills and expertise, including those specific to the Enterprise. Since 2014-15, the Defence Nuclear Safety Regulator has identified that sustaining sufficient civilian and military nuclear staff remains one of the Enterprise’s top strategic issues.40

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38  This concern was raised numerous times in the Commons debate on CASD on 10 April 2019. Toby Fenwick also examines the risks to CASD in his September 2018 publication, (Dis)Continuous Deterrence, BASIC, September 2018
39  MOD, 2016 Update to Parliament
40  National Audit Office, The Defence Nuclear Enterprise: A Landscape Review, HC1003, Session 2017-19, p.42
The MOD has since been undertaking work across both the defence and civil nuclear sectors to identify the skills required by the Defence Nuclear Enterprise. This work has developed into a Nuclear Enterprise Skills Strategy which will enable the Department to address critical skills shortages.

**Value of the supply chain to the UK**

It is unclear how much of the value of the overall programme will be spent with the supply chain in the UK, and how much of it will be spent overseas.

To date BAE Systems has contracted for the specialised high strength steel required for the submarines from a French supplier. The use of foreign steel in the construction of the Dreadnought class has raised many questions over whether more can be done to promote the British steel industry within MOD programmes. In answer to a Parliamentary Question in October 2016 the then Minister for Defence Procurement, Harriet Baldwin, stated:

> The management of the steel procurement process for the Successor Programme is the responsibility of the Prime Contractor, BAE Systems. The Ministry of Defence’s involvement with suppliers was limited to conducting a technical assessment during the tendering process to ensure bids met specifications.

> The tendering process was progressed and concluded by the Prime Contractor, no viable UK bid was received for this part of the Successor submarine manufacture.

> Other stages of construction will include grades of steel manufactured by British suppliers and I encourage them to take the opportunity to bid.41

As outlined above, the Common Missile Compartment for the submarine is also a collaborative programme with the United States. American company General Dynamics is the prime contractor for the CMC and is working in co-operation with BAE Systems to ensure that the design accommodates UK requirements for the Dreadnought class. In October 2016 Babcock International was awarded a contract by General Dynamics to manufacture 22 tactical missile tubes as part of the overall CMC project. That work is taking place in Rosyth, securing approximately 150 jobs. Whether this work on the CMC forms part of the 15 percent of BAE Systems’ overseas supply chain, or whether it is part of the UK supply chain spend, is unclear.

**A wider jobs perspective**

The MOD has estimated that the Dreadnought programme is underpinned by approximately 30,000 defence nuclear enterprise jobs across the whole of the UK.42

This is an estimate that Professor Keith Hartley supported in his submission to the BASIC Trident Commission in March 2012. He suggested that if both construction and in-service support of the nuclear deterrent were taken into consideration:

> A Trident replacement will support almost 26,000 jobs over its life-cycle (based on four boats and including some 1,850 Navy personnel jobs). The totals comprise the following employment numbers:

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<td>4,500</td>
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<tr>
<td>AWE suppliers</td>
<td>4,500</td>
</tr>
<tr>
<td>Devonport</td>
<td>1,590</td>
</tr>
</tbody>
</table>

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41 PQ48618, *Trident submarines: iron and steel*, 18 October 2016
42 HC Deb 1 February 2021, c675
Devonport suppliers: 1,590
Operations and support: 2,700
TOTAL 25,942

However, he went on to caution that this estimate of employment would be at the upper-end of the scale and makes no allowance for issues such as improvements in labour productivity. Equally he argued that cancelling the replacement programme would not necessarily result in an equal number of job losses as many companies would seek alternative markets or contracts, particularly in the supply chain. Direct job losses, he argued, would be more likely to affect BAE, Rolls Royce, AWE and Devonport.43

The link between jobs and replacing the nuclear deterrent has, however, been disputed by CND and the Scottish Trade Unions Congress. A 2007 report by CND Trident and employment: the UK’s industrial and technological network for nuclear weapons argued that:

Replacing Trident, at a cost to the British public of at least £76 billion over the system’s lifetime, represents a very poor rate of return in terms of generating jobs. The report finds that if you started with a blank slate and wanted to make such a multi-billion pound investment of public money to maximise employment, the last thing you would do is build nuclear weapons.

A decision not to replace Trident could be the catalyst for a stronger, diversified economy in those few localities with a residual dependency on nuclear weapons work.

This emphasis on defence diversification was also the subject of an April 2015 report by CND and the STUC entitled Trident and Jobs: the case for a Scottish Defence Diversification Agency. That report argued in favour of a Scottish Defence Diversification Agency to plan and resource the diversification of jobs away from military programmes such as Trident and promote a greener Scottish economy.

The Scottish GMB stated, however, that “the successor programme going ahead is welcome as it is crucial to jobs in Scotland” and suggested that any notions of defence diversification are “based on Alice-in-Wonderland politics promising pie in the sky alternative jobs for workers who are vital to our national security”.44

43 Professor Keith Hartley, Defence Industrial Issues: Employment, Skills, Technology and Regional Impacts, Discussion Paper No.2 of the BASIC Trident Commission, 2012
44 GMB Trident Successor Programme Conference, 25 February 2016
4. Costs

4.1 Overall acquisition and in-service costs

The 2015 SDSR confirmed that the costs of design and manufacture of a class of four submarines will be £31 billion, an increase of £6 billion on estimates set down in the programme’s Initial Gate report in 2011 (at outturn prices). This cost estimate includes all costs associated with acquisition including feasibility studies, design, assessment, demonstration and manufacture (including the US-UK Common Missile Compartment project). It also accounts for expected defence inflation over the life of the programme and investment in new facilities at BAE Systems in Barrow, which in 2013 the MOD suggested would focus on “modification of existing infrastructure to accommodate the differences between the Vanguard and Successor designs”.

A contingency of £10 billion has also been set aside. This contingency represents approximately 35 per cent of the submarine cost to completion and according to the MOD “is a prudent estimate based on past experience of large, complex projects, such as the 2012 Olympics”. However there is no guarantee whether all of this money will be spent. If it were then it would provide an upper-end acquisition estimate of £41 billion. Spread over the 35-year life of the programme, this represents 0.2 per cent of Government spending.

The MOD has stated that “the revised cost and schedule reflect the greater understanding we now have about the detailed design of the submarines and their manufacture”. The years of peak expenditure are expected to be principally 2018 through to the mid/late 2030s, as the programme moves into full production.

Investment in HM Naval Base Clyde, the Trident II D5 Service-life Extension programme, infrastructure projects related to the Atomic Weapons Establishment (AWE) and the

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45 HC Deb 4 June 2009, c627W
46 Defence inflation is often one of the largest sources of additional costs on a procurement programme.
47 The Department is building new facilities at Barrow which will allow a modular build approach for the Dreadnought submarines, which are larger than the Astute or Vanguard class. The Primary build facility programme has a current forecast cost of £240 million and is expected to be completed in 2022. The NAO also examines this programme in Managing infrastructure projects on nuclear-regulated sites.
48 PQ24652, Trident Submarines: Finance, 2 February 2016
49 HM Government, National Security Strategy and Strategic Defence and Security Review 2015, Cm9161, November 2015, p.34
50 The announcement on 31 August 2015 of £500 million of investment for HM Naval Base Clyde, over a ten-year period, is part of the MOD’s ongoing programme of work to establish a submarine centre of excellence at HM Naval Base Clyde once the entire Royal Navy submarine fleet is based there from 2020. In February 2017 a further £1.3 billion was announced for upgrades at HM Naval Base Clyde, including the waterfront, engineering support, accommodation and physical security. PQ112914 of 21 November 2017 confirmed the separate funding arrangements.
51 PQ121632, Trident, 16 January 2018
52 The projects being undertaken through the Nuclear Warhead Capability Sustainment Programme (NWCS) at AWE are covered within the annual in-service costs of the deterrent. The MENSA project is examined by the NAO in its report, Managing infrastructure projects on nuclear-regulated sites, HC19, Session 2019-20
Core Production Capability facilities at Rolls Royce, and work on the options for replacing the nuclear warhead, are not part of the Dreadnought programme spend.

**In-service costs**

Once the new nuclear deterrent submarine comes into service the annual in-service costs are expected to continue at approximately 6 per cent of the defence budget. Under the current defence budget, adjusted for the 2019 Spending Round, 6 per cent of spending equates to approximately £2.5 billion in 2020/2021.

Calculating overall in-service costs, however, is fraught with difficulty as assumptions have to be made about the state of the British economy and projected levels of defence spending over the next 50-60 years. As such this paper does not attempt to do so.

**Alternative cost estimates**

Studies by the [Nuclear Information Service](#) and the [Campaign for Nuclear Disarmament](#) have suggested that the MOD’s cost analysis for the replacement programme is vastly under-estimated and that the true cost is in the region of £172 billion or £205 billion respectively. However, these cost estimates also consider in-service costs over the 30-year life of the deterrent, and additional factors such as infrastructure investment, the Trident SLEP programme, warhead replacement and decommissioning, among other things.

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53 The MOD is funding the construction of facilities for the manufacture and testing of new nuclear reactors cores to be used across the nuclear fleet. The revised project cost has been estimated at £474 million (see NAO, Managing infrastructure projects on nuclear-regulated sites, HC19, January 2020 for further analysis of the project).

54 It is unclear at present whether the Replacement Warhead programme will be part of NWCS spending, or whether it will be funded as a separate programme. This is examined in greater detail in Library briefing, CBP8941, Replacing the UK’s nuclear deterrent: the long-awaited warhead decision.

55 A more detailed explanation of the difficulties in determining in-service costs over a 30 year period is available in Library briefing paper CBP8166, The cost of the UK’s strategic nuclear deterrent. It is also one of the reasons why so many differing cost estimates for the nuclear deterrent exist.
4.2 What has been spent so far?

Concept and Assessment Phase

Approximately £4.8 billion had been allocated to the concept and assessment phases of the programme (£905 million and £3.9 billion respectively). Several long-lead items, including the steel for the first submarine and items relating to the propulsion system, were contracted for under this phase of spending. In its 2016 Update to Parliament the MOD confirmed that payments for some of the long-lead items procured during the assessment phase would continue through to 2023.

Demonstration and Manufacture phase contracts

At the start of Delivery Phase 1 two contracts were awarded for work going forward:

- £986 million for platform construction
- £277 million for continuing design work, purchasing materials and long lead items and investing in facilities at Barrow.

As outlined above, contracts for Phase 2 of the build were awarded on 14 May 2018. BAE Systems was awarded a further £900 million to “support ongoing design and build activities, procurement of materials and investment in new and existing facilities for a further 12 months”; while a £60 million contract was awarded to Rolls Royce to further the design and begin manufacture of the nuclear propulsion power plant. Commitments made under DP2, thus far, have totalled approximately £2.5 billion.

Re-profiling of allocated resources

Concerns have been raised over the long-term affordability of the Dreadnought programme, and its impact on the MOD’s overall equipment plan. In January 2018 the National Audit Office stated:

Nuclear-related projects (the nuclear enterprise) represent around a quarter of the Plan. They are inherently complex projects and, because of their size, have the potential to destabilise the wider plan. In particular, the Dreadnought project accounts for a significant proportion of the estimated cost of buying equipment in the Plan. It is at an early stage in its life cycle and consequently forecast costs are immature and have continued to increase from the original estimation. Growth in costs in the early years of the project has created affordability pressures within the Plan. In July 2016, the Department approved costs to begin building the first Dreadnought submarine, even though it was unaffordable in the early years of the project...

To that end, in February 2018, £300 million was brought forward into the Dreadnought programme, from elsewhere in the defence budget, in order to keep the programme on track. This was not additional money for the programme, and as the Secretary of State said in evidence to the Defence Select Committee at the time:

As of 31 March 2020, £8.5 billion had been spent on the concept, assessment and delivery phases of the programme.

Money has been re-profiled into the earlier years of the programme, to reduce risks and achieve cost savings.

At the end of 2020, £1 billion of the £10 billion contingency fund had been made available by HM Treasury.

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56 A full list of long lead items is discussed in Library briefing paper CBP7353, Replacing the UK’s ‘Trident’ Nuclear Deterrent, p.52-53
57 Ministry of Defence, The United Kingdom’s Future Nuclear Deterrent, 2019 Update to Parliament, p.2
58 National Audit Office, The Equipment Plan 2017 to 2027, HC717, Session 2017-19
59 This is discussed extensively in the Secretary of State’s evidence to the Defence Committee on 21 February 2018
What is important to emphasise is that we are not talking about the whole cost of Dreadnought changing. What we are talking about is that it is important to get the profile correct for when the money flows into the system and when it is needed. At the moment it is not as we would wish it to be.60

Indeed, in March 2018, the Director General of Finance at the MOD suggested in evidence to the Public Accounts Committee that, going forward, a further £1.2 billion of expenditure would need to be brought forward in the programme.61

The need to re-profile was subsequently reflected in the allocation of an additional £1 billion to the defence budget over the next two years in the Chancellor’s Autumn 2018 budget statement. Intended to boost the UK’s cyber capabilities and support the Dreadnought programme, the MOD confirmed in December 2018 that £400 million of that additional money would be invested in the project. The move was welcomed by many commentators, including Malcolm Chalmers of RUSI who observed:

> The added Dreadnought allocation should allow the programme to proceed at a more optimal and cost-effective pace, taking advantage of opportunities for cost-saving investments when they arise while accepting new costs when judged necessary. This flexibility will shield other MOD procurement programmes from the destabilising effects which fluctuations in Dreadnought costs might otherwise have imposed on them. This is a welcome response to the dual risk that either other defence programmes would otherwise have been squeezed to pay for the deterrent, or the pace of Dreadnought construction would have had to be slowed, incurring significant additional costs in the long term.62

In 2018/19 HM Treasury also granted the MOD access to £600 million from the Dreadnought contingency fund during this period.63 Again, the justification for doing so was to allow the MOD to eliminate cost and risk from later in the programme and to keep the project on track.

### 2019 Spending Round

Further funding was allocated to the MOD in the 2019 Spending Round. HM Treasury made an additional £300 million available to the MOD in 2019/20 for priority capability programmes, followed by an additional £1.2 billion for capabilities in 2020/21. Dreadnought was identified as one of the priority programmes that will benefit from that funding, although it is unclear exactly how much will be allocated to this specific project.64 In October 2019 the MOD stated:

> This additional funding will enable our world-class Armed Forces to begin to modernise and meet the intensifying threats and risks we now face, including prioritising investment in key capabilities such as shipbuilding, offensive cyber and the nuclear deterrent. We will decide on the allocation of this funding as part of our normal financial planning and budgeting process.65

In addition to funding set out in the 2019 Spending Round, a further one-off allocation of up to £200 million for additional Dreadnought costs was made available from the contingency fund in 2020/21.66

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60 Defence Committee, *Oral evidence: departmental priorities*, HC814, 21 February 2018, Q.78
62 Malcolm Chalmers, RUSI Commentary, 30 October 2018
63 HC Deb 28 March 2018, c756
64 HM Treasury, *Spending Round 2019*, Table 2.7: Ministry of Defence
65 PQ290758, *Armed Forces: Finance*, 1 October 2019
2020 Spending settlement

On 19 November 2020 the Prime Minister announced an increase in defence spending of £24.1 billion over the next four years against the 2020/21 budget. The defence budget in 2024/25 will, therefore, be £6.4 billion higher compared to 2020/21.

The Treasury confirmed that “additional funding in this settlement” will, among other things “continue the renewal of the UK’s nuclear deterrent“. In December 2020 Baroness Goldie stated:

the financial package for Dreadnought comprises an identified budget of £31 billion and a contingency fund of £10 billion. The other elements of the deterrent will be determined in due course by the MoD in the allocation of the budget settlement.67

The Treasury has also stated that £1.3 billion of the contingency fund has been made available for 2021-2025, should it be required.68

Overall spend so far

In its 2020 Update to Parliament the MOD confirmed that the programme remained within overall budget and that £8.5 billion had been spent so far on the concept, assessment and delivery phases of the project, as of 31 March 2020.

- £1.2 billion of that total spend was in the 2017/18 Financial Year.69
- £1.5 billion was spent in the 2018/19 Financial Year.70
- £1.6 billion was spent in the 2019/20 Financial Year.

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67 HL Deb 7 December 2020, c948
68 HM Treasury, Spending Review 2020, Table 6.11
69 Ministry of Defence, The United Kingdom’s Future Nuclear Deterrent, 2018 Update to Parliament
70 Ministry of Defence, The United Kingdom’s Future Nuclear Deterrent, 2019 Update to Parliament
In December 2020 the MOD confirmed that £1 billion of the contingency fund had been made available to the Department thus far.\(^{71}\) Of that sum:

- £315 million was drawn down in the 2018/19 financial year.
- £390 million in 2019/20.\(^{72}\)

### 4.3 Who will pay for it?

There has been a longstanding debate over the budgetary responsibility for the nuclear deterrent.\(^{73}\)

The allocation of additional funding for the MOD in the Autumn 2018 budget statement and the 2019 Spending Round, in part to fund the early years of the Dreadnought programme, once again opened up the argument about which Department should be funding the nuclear deterrent.

In a similar vein to the disagreements which arose following the 2007 Comprehensive Spending Review, the allocation of additional funds was viewed by many as an indication of the Treasury’s role, and responsibility, in part-funding the capital costs of the programme. In a debate on the budget on 13 November 2018 Lord West commented:

> If the two tranches of money from the Treasury into the Dreadnought programme are an indicator that there is an acceptance that the capital cost of the new deterrent submarines should be funded outside the defence budget, I welcome it. That will make a dramatic difference to the MoD programme. This of course was the plan until changed by George Osborne in 2010. Can the Minister tell us whether it is now the plan again? I hope that it is.\(^{74}\)

In March 2020 the Chairman of the Defence Select Committee, Tobias Ellwood, also expressed his support for taking deterrent funding out of the defence budget.\(^{75}\)

More recently these arguments have been raised within the context of the forthcoming Integrated Review. In answer to a question from Lord West in early February 2021, the MOD confirmed:

> There have been no discussions on removing the capital costs of the Dreadnought submarine build programme from the defence budget. The Dreadnought programme is rightly funded as part of the Ministry of Defence’s budget, as it has always been.\(^{76}\)

This position has been reiterated by the MOD many times over the last few years.\(^{77}\)

### 4.4 Comparison to other Government spending\(^{78}\)

Assuming the entirety of the £10 billion contingency fund is spent, at a cost of potentially £41 billion, the Dreadnought programme is one of the most expensive Government

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\(^{71}\) Defence Committee, Oral evidence: MOD Annual Report and Accounts, 2019-2020, HC1051, 8 December 2020, Q.23

\(^{72}\) PQ133723, Nuclear weapons: finance 13 January 2021

\(^{73}\) The history of this debate is set out in Library briefing paper, CBP8166, The costs of the UK’s strategic nuclear deterrent

\(^{74}\) HL Deb 13 November 2018, c1819

\(^{75}\) Public Accounts Committee, Oral evidence, Defence Nuclear Infrastructure, HC86, 11 March 2020, Q.107

\(^{76}\) PQ HL12682, Nuclear submarines, 10 February 2021

\(^{77}\) For example: PQ HL2751, Procurement: Trident submarines, 14 November 2017, HCWS328, 7 December 2017, PQ116056, Trident, 11 December 2017

\(^{78}\) With thanks to Noel Dempsey in the Social and General Statistic Section of the House of Commons Library.
Replacing the UK’s strategic nuclear deterrent: progress of the Dreadnought class projects going forward. It is a project that has around twice the budget of Crossrail, and three times the budget of the London 2012 Olympics.\textsuperscript{79}

With respect to departmental spending, the running costs of the nuclear deterrent (presently around £2.5 billion per year) is often compared to the benefits bill, or NHS spending.

In 2020-21, for example, the estimated cost of maintaining the nuclear deterrent would be around 1% of total planned Government expenditure on UK social security and tax credits expenditure in that year.

\begin{figure}
\centering
\includegraphics[width=\textwidth]{government_expenditure_comparisons.png}
\caption{Government expenditure comparisons\newline Selected areas of spending in 2020-21, £ billions in 2019-20 prices}
\end{figure}

79 Michael Fallon \textit{speech} to a reception of the Keep Our Future Afloat Campaign, House of Commons, 21 October 2015.

80 DWP, Benefit Expenditure and Caseload Tables 2020, Table 1b.

The £2.5 billion spent on maintaining the nuclear deterrent per year is roughly equivalent to £50 million per week.

Alternatively, £2.5 billion a year is roughly equivalent to what is spent on Income Support, Statutory Maternity Pay, Carer’s Allowance, or Winter Fuel Payments (each of which are around £2 – £3 billion per year).\textsuperscript{80}

According the Treasury’s 2020 Spending Review, the planned spend on the costs of providing health care (including the NHS) in 2020/21 was £149.8 billion. This equates to around £2.9 billion per week.
These comparisons with other areas of Government spending have not fully taken the effects of Covid-19 into account.
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