



BRIEFING PAPER

Number 8010, 22 May 2018

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

By Claire Mills

Contents:

1. Background
2. What is the Dreadnought programme?
3. Delivery of the programme



Contents

Summary	3
1. Background	5
2. What is the Dreadnought programme?	7
3. Delivery of the programme	9
3.1 A new delivery body	9
3.2 Where is the programme at?	11
3.3 Jobs and Industry	12
A wider jobs perspective	12
3.4 Costs	14
Overall acquisition and in-service costs	14
What has been spent so far?	15
Who will pay for it?	17
Comparison to other Government spending	17

Summary

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 (the Successor programme), 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 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 (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.

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. Decisions on a replacement warhead have also been deferred until 2019/2020.

Under changes introduced in the 2015 Strategic Defence and Security Review (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.

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 delivery agency

New organisational and managerial arrangements for the UK's defence nuclear enterprise as a whole, and for delivering the Dreadnought programme specifically, were outlined in SDSR15. A new team within the MOD (Director General Nuclear), headed by a commercial specialist, has subsequently been established to oversee all aspects of the nuclear enterprise.

A new Submarine Delivery Agency has also been established, which became an Executive Agency of the MOD on 23 April 2018. That agency will manage the procurement and in-service support of all current and future nuclear submarines, including Dreadnought. It will sit 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 recently formed a new commercial alliance in order to jointly deliver the programme.

Where is the programme at?

In September 2016 the programme moved forward from its assessment phase, into “risk reduction and demonstration” or what has been termed Delivery Phase 1. Construction of

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

the first submarine formally began on 5 October 2016 with the cutting of the steel for the first submarine.

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% of its supply chain will be based in the UK, potentially involving around 850 British companies.

It is unclear, however, how much of the actual value of the overall programme rests with that 85% 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 first submarine 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 costs of the design and manufacture of a class of four submarines will be £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% of the defence budget.

Approximately £4.8 billion had been allocated to the concept and assessment phases of the programme. At the start of Delivery Phase 1 two contracts worth £1.3 billion were awarded for work going forward. Contracts for Phase 2 of the build were awarded in May 2018, totalling £960 million.

In its 2017 Update to Parliament, the MOD confirmed that £4.3 billion had been spent on the design and early manufacture phase, thus far.

In order to keep the project on track, in March 2018 the Government confirmed that the MOD will have access to £600 million from the Dreadnought contingency fund during the 2018-19 financial year. This is not extra funding for the programme, however, which the Government has stated is still within its overall £31 billion forecast. The MOD has also indicated that the programme needs to be re-profiled, with a further £1.2 billion of funding identified for bringing forward in the programme.

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

1. Background

The Labour Government's 2006 White Paper, *The Future of the United Kingdom's Nuclear Deterrent* concluded that the international security environment does not justify complete UK 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 was 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 2011.¹ 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 this 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 Successor programme.²

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.³ 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 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 its 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.

This briefing paper will examine the Dreadnought programme as it advances. **It does not examine the Government's overall nuclear policies or its position on disarmament.** Nor does it set out in detail all of the arguments for and against nuclear weapons. All of these issues are examined in Library briefing paper CBP7353, [Replacing the UK's 'Trident' Nuclear Deterrent](#), July 2016.

¹ In the generic procurement cycle, Initial Gate is the first major investment point in a programme. It assesses the feasibility of the programme going forward, including making decisions on broad design parameters and ordering any long lead items that may be required. Approval by the MOD's internal Investment Approvals Board is required at this point before funds can be released for the assessment phase.

² £905 million on the feasibility and concept phase and a further £3.9 billion on the assessment phase. Not all of that assigned funding has been spent to date (*Update to Parliament 2017*)

³ [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.

Box 1: Additional Suggested Reading

- National Audit Office, [The Defence Nuclear Enterprise: a landscape review](#), HC1003, Session 2017-19, May 2018
- Stanislav Abaimov and Paul Ingram, [Hacking UK Trident: A Growing Threat](#), BASIC, June 2017
- Andrew Futter, *Cyber Threats and Nuclear Weapons*, RUSI Occasional Paper, July 2016
- Malcolm Chalmers and Cristina Varriale, *Future Nuclear Threats to the UK*, RUSI Occasional Paper, July 2016

2. What is the Dreadnought programme?

Although commonly referred to as “the renewal or replacement of Trident”, the Dreadnought programme⁴ is about the design, development and manufacture of four new Dreadnought class ballistic missile submarines (SSBN) that will maintain the UK’s posture of Continuous at Sea Deterrence (CASD).⁵

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.⁶ The 2010 Strategic Defence and Security Review (SDSR) announced that the new submarines would deploy with eight *operational* missile tubes, instead of the planned 12. However, the design of the CMC will still comprise 12 tubes, with the remaining missile tubes configured with ballast to enable the submarine to dive.

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.⁷

Decisions on a replacement warhead were deferred in the 2010 SDSR until 2019/2020.⁸ In its 2017 [Update to Parliament](#) the MOD confirmed that a decision on whether to refurbish or replace the existing warhead will be made during this Parliament and that work continues on developing replacement options, including through the UK-US Joint Technology Demonstrator project examining warhead safety, security and advanced manufacturing technologies.⁹ The MOD has not stated, however, whether this decision would be subject to a vote in the House of Commons, which some commentators have called for. When asked about this in a Parliamentary Question in January 2018, the Defence Secretary replied “work is ongoing on replacement options. I will continue to provide updates as appropriate”.¹⁰

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.¹¹ This is the third

Interesting Facts

At 152.9 metres long and with a displacement of 17,200 tonnes, the Dreadnought class will be the largest submarine ever built for the Royal Navy.

The first Royal Navy submarine to be built with separate female crew quarters, toilets and washing facilities.

130 crew members, including 3 chefs and 1 doctor.

⁴ 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).

⁵ The UK has maintained a posture of CASD (Operation Relentless) since 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 Michael Fallon stated in a speech at RUSI that a Conservative government would commit to the procurement of a 4-boat fleet. That position was reiterated in PQ6841, *Trident*, 20 July 2015

⁶ The design for the Successor submarine’s common missile compartment (CMC) is being delivered under the 1963 Polaris Sales Agreement (PSA), as amended (HL Deb 11 February 2013, c92WA)

⁷ PQ35764, *Trident*, 4 May 2016

⁸ The 2006 White Paper had included costings for a replacement warhead. However, the 2010 SDSR deferred any decision on a new warhead to 2019, given that the transition to a replacement warhead would not be required until at least the late 2030s. The MOD estimated that it will take approximately 17 years from an initial procurement decision to develop any replacement warhead for the Trident II D5 missile, and commence production (MOD, *2014 Update to Parliament*)

⁹ In answer to a Parliamentary Question on 23 January 2018 the MOD confirmed it had spent £100.7 million, to the end of March 2017, on studies to inform the decision on replacing or refurbishing the existing warhead (PQ122607)

¹⁰ PQ122610, *Trident missiles*, 24 January 2018

¹¹ Ministry of Defence, [Dreadnought submarine programme factsheet](#)

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

time the in-service life of the current Vanguard class SSBN has been extended¹² and will now result in an overall lifespan of the Vanguard class of approximately 37-38 years.¹³ The MOD has refused to be drawn on specific dates for entry into service stating that “detailed planning assumptions for Service Entry are classified”.¹⁴

¹² 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.

¹³ HMS Vanguard entered service in December 1994; while the last in class, HMS Vengeance, entered service in February 2001.

¹⁴ PQ24643, *Trident Submarines*, 1 February 2016

3. Delivery of the 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.¹⁵

3.1 A new delivery body

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,¹⁶ 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.¹⁷ 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.¹⁸

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 Successor 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.¹⁹

That position was reconfirmed by the MOD in December 2015.²⁰

The Submarine Delivery Agency

The new Submarine Delivery Agency (SDA) was established, within the MOD's Defence Equipment and Support (DE&S) organisation, on 3 April 2017.²¹

¹⁵ Ministry of Defence, [2016 Update to Parliament](#), December 2016

¹⁶ Julian Kelly was appointed Director General Nuclear in May 2017.

¹⁷ See for example: ["George Osborne issues Treasury ultimatum over Trident"](#), *The Daily Telegraph*, 12 November 2015

¹⁸ 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)

¹⁹ HC Deb 24 November 2015, c1254

²⁰ PQ HL3927, 3 December 2015

²¹ The MOD appointed Ian Booth as the Chief Executive of the SDA in August 2017

The longer-term intention was for this new body to achieve Executive Agency status, and sit alongside DE&S, from April 2018. Indeed, the SDA was officially launched on 23 April 2018.

The SDA will manage the procurement, in-service support and decommissioning of all current and future nuclear submarines,²² including Dreadnought. It will have the authority and freedom to recruit and retain the best individuals to manage the submarine enterprise and all of those personnel already working on submarine related activities within DE&S have transferred across to the new delivery body, which now employs around 1,300 people.²³

A commercial alliance

In tandem with the creation of a new delivery body, the MOD has also been working with industry on proposals to establish a new commercial alliance between the MOD and its two key industrial partners on the dreadnought programme: BAE Systems and Rolls Royce.²⁴ 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.

The 'Dreadnought Alliance' was formed on 1 April 2018. In its latest report on the Defence Nuclear Enterprise, the National Audit Office described how the Alliance will operate:

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;
- 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.²⁵

²² 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.

²³ PQ4686, *Submarine delivery body: staff*, 19 July 2017

²⁴ 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 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.

²⁵ National Audit Office, *The Defence Nuclear Enterprise: A landscape review*, HC1003, 22 May 2018

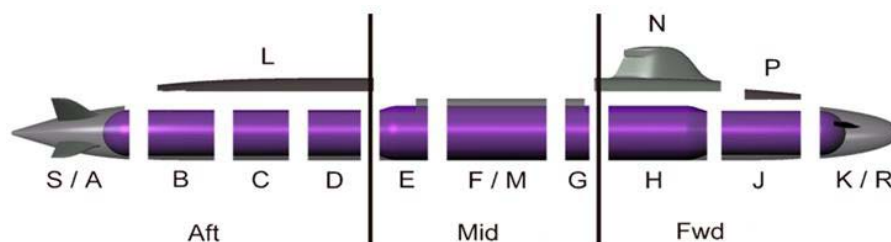
3.2 Where is the programme at?

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.²⁶ 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 had been 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.²⁷

In May 2018 the MOD signed contracts for the second phase of the build programme. Phase 2 will now 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.²⁸

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:



Source: MOD, 2016 Update to Parliament

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.²⁹

²⁶ 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 QEII aircraft carrier programme.

²⁷ HCWS206, 21 October 2016

²⁸ MOD press release, 14 May 2018

²⁹ PQ126895, *Trident submarines*, 13 February 2018

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% of its supply chain will be based in the UK, potentially involving around 850 British companies.

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.³⁰

It is unclear, however, how much of the actual value of the overall programme rests with that 85% 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 first submarine 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.³¹

The Common Missile Compartment for the submarine is also a collaborative programme with the US. 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 CMC project. That work will take place in Rosyth and secure approximately 150 jobs. Whether work on the CMC forms any part of the remaining 15% of BAE Systems supply chain, however, is also unclear.

A wider jobs perspective

In his [submission to the BASIC Trident Commission](#) in March 2012, Professor Keith Hartley assessed the industrial implications of the Trident replacement programme. He suggested

³⁰ MOD, *2016 Update to Parliament*

³¹ PQ48618, *Trident submarines: iron and steel*, 18 October 2016

that if both construction and in-service support of the nuclear deterrent are 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:

BAE at Barrow-in-Furness:	6,045
BAE suppliers:	5,017
AWE:	4,500
AWE suppliers:	4,500
Devonport:	1,590
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 Trident 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.³²

The link between jobs and replacing Trident 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.

This notion of defence diversification is also one that Labour Leader Jeremy Corbyn has promoted as part of his argument for moving toward disarmament.³³ In his plan for [Defence Diversification](#), published in August 2015, he stated:

I am committed to ensure that in transitioning away from nuclear weapons, we do so in a way that protects the jobs and skills of those who currently work on Trident, and in the defence sector more widely. This will help grow the British economy.

The Scottish GMB, however, has stated that "the successor programme going ahead is welcome as it is crucial to jobs in Scotland" and has suggested that any notions of

³² Professor Keith Hartley, *Defence Industrial Issues: Employment, Skills, Technology and Regional Impacts*, Discussion Paper No.2 of the BASIC Trident Commission, 2012

³³ [Defence Diversification](#), August 2015

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”.³⁴

3.4 Costs

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).³⁵ It also accounts for expected defence inflation over the life of the programme³⁶ and investment in new facilities at BAE Systems in Barrow, which in 2013 the MOD suggested would be “limited to the modification of existing infrastructure to accommodate the differences between the Vanguard and Successor designs”.³⁷

The estimated cost of the design and manufacture of a class of four SSBN is £31 billion, including inflation over the life of the programme.

A £10 billion contingency has also been set aside.

Investment in HM Naval Base Clyde is not part of the Dreadnought programme spend.³⁸

A contingency of £10 billion has also been set aside. This contingency represents approximately 35% 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”.³⁹ However there is no guarantee whether all of this money will be spent. If it were then it would provide an upper-end estimate of acquisition of £41 billion. Spread over the 35- year life of the programme, this represents 0.2% 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”.⁴⁰

The years of peak expenditure are expected to be principally 2018 through to the mid/late 2030s, as the programme moves into full production.

Separately the cost of the Trident II D5 Service-life Extension programme is estimated to be approximately £350 million.⁴¹

³⁴ [GMB Trident Successor Programme Conference](#), 25 February 2016

³⁵ HC Deb 4 June 2009, c627W

³⁶ Defence inflation is often one of the largest sources of additional costs on a procurement programme.

³⁷ The programme of works at Barrow is largely focused on providing capacity to accommodate the Successor submarine, which is larger than the Astute or Vanguard class and to speed up manufacturing processes (MOD, *2013 Update to Parliament*). In December 2014 £206 million of funding was announced; followed by an additional £225 million in March 2016 to ensure that “the submarines are built with maximum efficiency” (MOD press release, 3 March 2016)

³⁸ 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.

³⁹ PQ24652, *Trident Submarines: Finance*, 2 February 2016

⁴⁰ HM Government, *National Security Strategy and Strategic Defence and Security Review 2015*, Cm9161, November 2015, p.34

⁴¹ PQ121632, *Trident*, 16 January 2018

In-service costs

Once the new nuclear deterrent submarine comes into service the annual in-service costs are expected to continue at approximately 6% of the defence budget. Under the current defence budget 6% of spending equates to approximately £2.2 billion per year. As part of the 2015 CSR settlement, that figure is expected to rise to £2.38 billion by 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.⁴²

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.⁴³

In its 2016 [Update to Parliament](#) the MOD confirmed that, by the end of 2016, the Department had spent approximately £2.5 billion of its assessment phase funds. It also confirmed that, due to the long-lead nature of some of the goods and services under contract, payments for items procured during the assessment phase will continue through to 2023.

Demonstration and Manufacture phase spending

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.

Overall spend

In its 2017 [Update to Parliament](#) the MOD confirmed that the programme remains within budget and that £4.3 billion had been spent on the design and early manufacture phase, to date.

However, the MOD has not provided a breakdown of spending and therefore it is difficult to ascertain whether the MOD is still spending allocated assessment phase funds, or whether this overall figure also includes some D&M spend.

Up to the end of March 2017 the MOD had also spent £157.6 million on Trident Service-Life Extensions project, thus far.⁴⁴

⁴² A more detailed explanation of the difficulties in determining in-service costs over a 30 year period is available in in Library briefing paper CBP7353, [Replacing the UK's 'Trident' Nuclear Deterrent](#), p.48

⁴³ A full list of long lead items is discussed in Library briefing paper CBP7353, [Replacing the UK's 'Trident' Nuclear Deterrent](#), p.52-53

⁴⁴ PQ121632, *Trident*, 16 January 2018

In its January 2018 assessment of the [MOD's Equipment Plan](#), the National Audit Office raised concerns over the impact of nuclear-related projects, including Dreadnought, on the Department's overall equipment spend:

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 [...]

Nuclear-related project costs continue to grow and forecast costs are higher than those shown in the Plan. Nuclear-related projects could destabilise the Plan because of their size and complexity. Our project testing has shown that costs for the Dreadnought and Astute projects have increased by £941 million since the 2016 Plan. The Department is reviewing the reliability of forecast costs for all of its nuclear projects and expects that updated costs as a result of this exercise will be incorporated into the 2018 to 2028 Plan.⁴⁵

Indeed, in February 2018 the MOD confirmed that £300 million had been brought forward into the Dreadnought programme for the 2017-18 financial year, from elsewhere in the defence budget, in order to keep the programme on track.⁴⁶

The MOD will also have access to £600 million from the Dreadnought contingency fund during the 2018-19 financial year.⁴⁷ Again, the justification for doing so is that it will allow the MOD to drive out cost and risk later in the programme and keep the project on track.

None of this money is extra funding for the programme, however, which, on current assessments, is still within its overall £31 billion forecast.⁴⁸ As the Secretary of State commented in February:

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.⁴⁹

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

Cat Little: The DG Nuclear has concluded quite an extensive piece of assurance work on costing and is still of the view that it will not cost more than £31 billion, based on the exercise we have just completed. But it is absolutely profiled in a different way from what we think the profile of costs need to be to deliver the first boat in 2030. In the same way that we have brought forward £300 million into this financial year, we think there is a further £1.2 billion of expenditure, compared to the original profile, that needs to be brought forward.

Q82 Chair: So you are re-profiling it?

Cat Little: Yes.

⁴⁵ National Audit Office, *The Equipment Plan 2017 to 2027*, HC717, Session 2017-19

⁴⁶ This is discussed extensively in the Secretary of State's evidence to the Defence Committee on 21 February 2018

⁴⁷ HC Deb 28 March 2018, c756

⁴⁸ Public Accounts Committee, oral evidence: defence equipment plan 2017-2027, HC880, 14 March 2018, Q.81

⁴⁹ Defence Committee, [Oral evidence: departmental priorities](#), HC814, 21 February 2018. Q.78

Q83 **Chair:** But the total will stay the same?

Cat Little: The total will stay the same, but we think we need to spend more in the earlier years, mainly because we need to ensure that we are driving as much productivity as possible in our supply chain to build in the early stages, and to make sure that we fund it at the level we believe is necessary.⁵⁰

Who will pay for it?

There has been a longstanding debate over the budgetary responsibility for the nuclear deterrent.⁵¹

However, in line with convention, the Dreadnought programme will be funded from the MOD's core equipment procurement budget.

This was reiterated by the MOD in answer to a Parliamentary Question on 14 November 2017, amidst calls for spending on the Dreadnought programme to be taken out of the MOD budget as part of the Department's current review into defence capabilities:

Lord West of Spithead: To ask Her Majesty's Government whether, in their current review of defence options, they will review whether or not the Vanguard class submarine replacement programme should be dealt with outside the defence budget.

Earl Howe: The Dreadnought programme is rightly funded as part of the Ministry of Defence's budget. We remain on track to deliver this programme within the £31 billion budget, with the first in the Dreadnought class entering service in the 2030s.⁵²

The Defence Secretary, Gavin Williamson, clarified his Department's responsibility for funding the deterrent in a Written Statement on 7 December 2017,⁵³ and on 11 December a Treasury Minister confirmed "The Government has no plans to transfer the costs of upgrading or replacing the UK's nuclear deterrent from the Ministry of Defence to another Government accounting department at this time".⁵⁴

Comparison to other Government spending⁵⁵

At, potentially, £41 billion the Dreadnought programme is one of the most expensive Government projects going forward. It is a project that has around twice the budget of Crossrail, and three times the budget of the London Olympics.⁵⁶

With respect to departmental spending, the running costs of the nuclear deterrent (presently around £2.2 billion per year) is often compared to the benefits bill, or NHS spending.

In 2017/18, 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.

⁵⁰ Public Accounts Committee, Oral evidence: defence equipment plan 2017-2027, HC880, 14 March 2018, Q.81-83

⁵¹ The history of this debate is set out in Library briefing paper, CBP8166, [The costs of the UK's strategic nuclear deterrent](#)

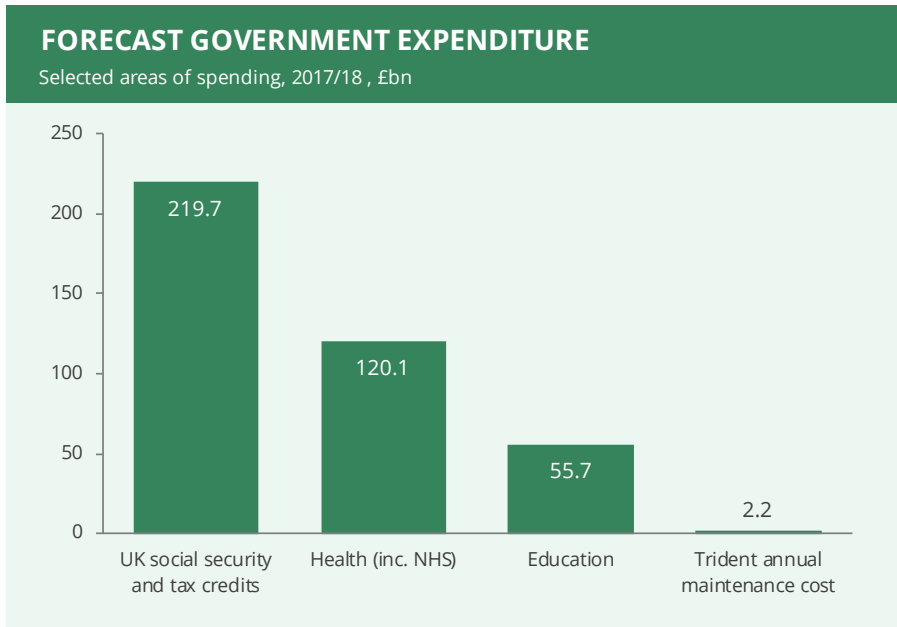
⁵² PQ HL2751, *Procurement: Trident submarines*, 14 November 2017

⁵³ HCWS328, 7 December 2017

⁵⁴ PQ116056, *Trident*, 11 December 2017

⁵⁵ With thanks to Noel Dempsey in the Social and General Statistics Section of the House of Commons Library.

⁵⁶ Michael Fallon [speech](#) to a reception of the Keep Our Future Afloat Campaign, House of Commons, 21 October 2015.



Note: Resource Departmental Expenditure Limit including depreciation. Trident maintenance cost estimated at 6% of the UK's defence budget. **Sources:** DWP, Benefit Expenditure and Caseload tables 2017; HM Treasury, Spending Review 2015, Table 1A

The £2.2bn spent on maintaining the nuclear deterrent per year is roughly equivalent to £42m per week, or around £34 per person per year.⁵⁷

Alternatively, £2.2 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 – £2.8 billion per year).⁵⁸

According to the Treasury's Spending Review 2015, the planned spend on the costs of providing health care (including the NHS) in 2017/18 is £120.1bn. This equates to around £2.3bn per week.

⁵⁷ Based on 2016 mid-year population estimate for the UK. ONS, [Population estimates 2016](#).

⁵⁸ DWP, Benefit Expenditure and Caseload tables 2017, Table 1b.

About the Library

The House of Commons Library research service provides MPs and their staff with the impartial briefing and evidence base they need to do their work in scrutinising Government, proposing legislation, and supporting constituents.

As well as providing MPs with a confidential service we publish open briefing papers, which are available on the Parliament website.

Every effort is made to ensure that the information contained in these publicly available research briefings is correct at the time of publication. Readers should be aware however that briefings are not necessarily updated or otherwise amended to reflect subsequent changes.

If you have any comments on our briefings please email papers@parliament.uk. Authors are available to discuss the content of this briefing only with Members and their staff.

If you have any general questions about the work of the House of Commons you can email hcenquiries@parliament.uk.

Disclaimer

This information is provided to Members of Parliament in support of their parliamentary duties. It is a general briefing only and should not be relied on as a substitute for specific advice. The House of Commons or the author(s) shall not be liable for any errors or omissions, or for any loss or damage of any kind arising from its use, and may remove, vary or amend any information at any time without prior notice.

The House of Commons accepts no responsibility for any references or links to, or the content of, information maintained by third parties. This information is provided subject to the [conditions of the Open Parliament Licence](#).