



THE AUKUS NUCLEAR- POWERED SUBMARINE PATHWAY

A PARTNERSHIP
FOR THE FUTURE





THE AUKUS NUCLEAR- POWERED SUBMARINE PATHWAY

A PARTNERSHIP
FOR THE FUTURE



© Crown copyright 2023

This publication is licensed under the terms of the Open Government Licence v3.0 except where otherwise stated. To view this licence, visit nationalarchives.gov.uk/doc/opengovernment-licence/version/3.

Where we have identified any third party copyright information you will need to obtain permission from the copyright holders concerned.'



TABLE OF CONTENTS

1. Foreword	3
2. Executive Summary	7
3. Strategic Rationale	13
4. Advantage of Nuclear-Powered Submarines	15
5. The Pathway to Australia's SSN Acquisition	19
6. SSN-AUKUS	23
7. Towards SSN-AUKUS	27
8. A Sovereign National Enterprise	31
9. Commitment to Non-Proliferation	33
10. Safety and Security	37
11. Radioactive Waste Management	41
12. Industry	45
13. Australian Infrastructure	49
14. Australian Workforce	53
15. Conclusion	57

1



1. Foreword

1.1 In September 2021, Australia, the United Kingdom and the United States embarked upon a profound new partnership designed to promote collaboration in a wide range of cutting edge defence capabilities. First amongst these efforts was the trilateral study to determine how Australia can acquire a conventionally-armed, nuclear-powered submarine (SSN) capability in the shortest timeframe possible. Having completed the study, we have identified an optimal pathway that will deliver on this ambitious aim and ensure that Australia will maintain a critical edge in the underwater domain for decades to come. At the centre of this is SSN-AUKUS, a trilaterally developed submarine based in the UK's next generation design.



1.2 As has been recognised in the refresh of our Integrated Review, the UK sees an increasingly contested world in the coming years. Nowhere is this more so than in the Indo-Pacific, which is gradually becoming the economic engine room of the world. A peaceful and secure Indo-Pacific is therefore critical to a peaceful and secure United Kingdom. To realise this, we need to work side-by-side with global allies and regional partners, making sure that together we have the capability and capacity to avert threats to peace and prosperity in the Indo-Pacific. AUKUS will help us achieve this goal, with the delivery of Australia's SSN capability a key component.

1.3 The UK has operated nuclear-powered submarines for over sixty years now, and throughout that period has collaborated in their development with the US. Given the extreme sensitivity of this technology, we have, until now, limited such collaboration to a bilateral exercise, representing the special relationship between our two countries. Choosing to open up this collaboration to Australia is a seismic shift and a demonstration of the UK's and US's trust in Australia as a partner and our collective desire for it to have the tools it requires to meet with the challenges ahead.

- 1.4 The optimal pathway that AUKUS partners have now agreed will deliver this capability to Australia in a phased fashion as we work together to build up the experience, skills and facilities needed to safely and securely operate SSNs. The increased visit and rotational presence of US and UK submarines and Australia's acquisition of US Virginia class submarines will build the foundations of a nuclear industry, and an understanding of nuclear stewardship, within Australia.
- 1.5 The culmination of these phases will be the SSN-AUKUS; a trilateral submarine that will be built and operated by both Australia and the UK. It is based on the UK's next-generation SSN design that incorporates technology from all three nations, including cutting edge US submarine technologies. The joint nature of this venture will create a more resilient supply chain through all three countries, vastly increase interoperability between AUKUS partners and allow us to work together to maintain peace in the Indo-Pacific. For the UK, the logic of evolving our current SSN replacement programme to SSN-AUKUS is clear. Our design, combined with US technology, will create a truly world-leading platform that the Royal Navy will use to build our capacity in the Atlantic and further the UK's objectives around the world.
- 1.6 Delivery of the optimal pathway will require the submarine delivery infrastructure of all three nations to continue to increase in capacity and capability over the coming decades. In the UK, we will work with our industry partners to ensure that we are ready to meet the additional challenge of AUKUS, building on the recent investment we have made in our submarine delivery. This will deliver thousands of jobs in the United Kingdom. In particular, I am delighted that Rolls-Royce UK will be building the nuclear reactors for all of Australia's submarines. As part of this, Australia will make a proportionate financial investment into our submarine industrial base.
- 1.7 We have been steadfast in our support of the Nuclear Non-Proliferation Treaty and, through AUKUS, want to set the highest non-proliferation standard and a strong precedent for other states seeking naval nuclear propulsion technology in the future. We have engaged regularly and constructively with the International Atomic Energy Agency throughout the course of the study, and will continue to do so in the years to come.

1.8 This report necessarily focuses on Australia and their journey to becoming a custodian of this most momentous technology. It is a journey that will take many decades and require the continued focus of the Australian Government and the Australian people. But it will be realised through the AUKUS partnership, and Australia can count on the continued support of the UK throughout this process. There is a lot of work to be done, and I am keen to get started.

The Rt Hon Ben Wallace MP
Secretary of State for Defence



2



2. Executive Summary

- 2.1 Australia, the United Kingdom and the United States have joined together through the AUKUS partnership, building on their historic relationships, to support a stable, secure and prosperous Indo-Pacific region.
- 2.2 The first major initiative of the AUKUS partnership is the delivery of a conventionally-armed, nuclear-powered submarine (SSN) capability for Australia. This will result in Australia having a more capable and potent submarine force, strengthening interoperability among the AUKUS partners, and enhancing our individual and collective ability to deter threats to the security and stability of the Indo-Pacific region.
- 2.3 Australia's acquisition of SSN capabilities will be a complex, multi-decade undertaking. AUKUS partners intend to take a phased approach, informed by a clear-eyed understanding of the gravity, scale and promise of this endeavour, and underpinned by strong commitments by each nation to meet agreed-to readiness thresholds.
- 2.4 Australia's future SSNs will be a state-of-the-art platform designed to leverage the best conventionally-armed, nuclear-powered submarine technology from all three nations – referred to as 'SSN-AUKUS'. SSN-AUKUS will be a trilaterally-developed SSN based on the UK's next generation design that incorporates technology from all three nations, including cutting edge US submarine technologies. Australia and the UK will both operate SSN-AUKUS. The SSN-AUKUS program will create a stronger, more resilient trilateral industrial base, supporting submarine production and maintenance in all three countries.
- 2.5 The first SSN-AUKUS for the UK Royal Navy will commence construction in Barrow-in-Furness, UK, as early as the late 2020s and is expected to be operational as early as the late 2030s. Australia will begin building its first SSN-AUKUS in Adelaide, South Australia, by the end of this decade, and is expected to be delivered in the early 2040s.

- 2.6 Work begins now to implement the Pathway and to contribute collectively to regional stability by bolstering deterrence and increasing trilateral presence in the Indo-Pacific. From 2023 and 2026 respectively, US and UK SSNs plan to make longer and more frequent visits to Australia. This initiative builds on the longstanding and successful record of UK and US SSN visits to Australian ports, which have occurred regularly since 1960. These enhanced visits will lay the groundwork for the rotational presence of UK and US SSNs at HMAS *Stirling*, in Western Australia, from as early as 2027, through an initiative called Submarine Rotational Force-West (SRF-West). Together, enhanced visits and the SRF-West initiative will accelerate Australia's ability to become 'sovereign ready' to operate and own SSNs as soon as possible and contribute to security in the Indo-Pacific region.
- 2.7 Australia is a global leader on nuclear non-proliferation. Australia's acquisition of SSNs will occur in full compliance with its domestic and international obligations, including under the Treaty on the Non-Proliferation of Nuclear Weapons, and the South Pacific Nuclear Free Zone Treaty (Treaty of Rarotonga). Naval nuclear propulsion is consistent with Australia's obligations under the Treaty of Rarotonga, and the rotational presence of UK and US SSNs will be conducted in accordance with Australia's longstanding obligations under the Treaty. AUKUS partners understand and recognise Australia's obligations under international law, including the Treaty of Rarotonga.
- 2.8 To ensure there is no capability gap while SSN-AUKUS is being completed, the US intends to sell Australia three Virginia class SSNs pending approval from the US Congress, with the potential to sell up to two more if needed. The first Virginia class SSN is planned to be delivered to Australia in the early 2030s, once Australia has met the necessary conditions to safely operate and steward these submarines. Acquiring Virginia class SSNs will enable Australia to deploy a sovereign conventionally-armed, nuclear-powered submarine capability as early as the 2030s. This will allow the three countries to work together more effectively in the undersea domain to contribute to regional security and stability.
- 2.9 Delivering the SSN-AUKUS program will strengthen the industrial capability and capacity of Australia, the UK and the US, bringing thousands of new, high-quality jobs to all three nations. In Australia, acquiring SSNs will involve a whole-of-nation undertaking, creating opportunities for Australian industry across the country. This enterprise will be supported by significant investment in Australia's domestic industrial capacity and infrastructure.

Nuclear stewardship and the ‘sovereign ready’ milestone

What is ‘nuclear stewardship’?

‘Nuclear stewardship’ describes the responsible planning, operation, application and management of nuclear material, technology and facilities. As Australia will be a non-nuclear weapon state with a naval nuclear propulsion capability, stewardship will also include the implementation of appropriate safeguard arrangements as agreed between Australia and the International Atomic Energy Agency, in consultation with AUKUS partners. Australia’s SSN capability will consist of the submarine platform, associated infrastructure, industrial base, technical base and qualified workforce – military and civilian – necessary to generate an SSN capability that meets government requirements. Australia is unwavering in its commitment to safely and securely steward its nuclear-powered submarines through their entire life cycles. In doing so, Australia will build on its 70-year unblemished track record of safely operating other nuclear facilities and conducting nuclear science activities. It will also draw on the United Kingdom and United States’ decades of experience and world-leading expertise in delivering, operating and maintaining nuclear-powered submarines.

What is the ‘sovereign ready’ milestone?

AUKUS partners have carefully designed a phased Pathway that will allow Australia to systematically and carefully develop its capacity and capability to steward these submarines over time.

‘Sovereign ready’ is an important milestone on this Pathway. It refers to the point at which Australia has the ability to safely own, operate, maintain and regulate a sovereign conventionally-armed, nuclear-powered submarine capability. The UK and the US are committed to supporting Australia to achieve this milestone before it receives conventionally-armed, nuclear-powered submarines. Australia’s target date for achieving the ‘sovereign ready’ milestone is the early 2030s, enabling it to acquire its first Virginia class SSN from the US in the early 2030s.

- 2.10 This plan elevates all three nations' industrial capacity to produce and sustain advanced and interoperable SSNs for decades to come. All three nations will make significant investments to uplift their respective industrial capacity. This collective investment demonstrates the shared intent of the AUKUS partners to remain dominant in the undersea domain for the future.
- 2.11 Australia will invest significantly to uplift its domestic industrial base, including expanding the Australian industrial workforce and vendor base and building state-of-the-art facilities and capability upgrades to ensure it is ready to successfully steward the technology upon the SSN's arrival on Australian shores. To realise a nuclear-powered submarine capability in the 2030s, and the first Australian-built SSN-AUKUS in the early 2040s, Australia will also make a proportionate financial investment in the UK and US industrial bases. This targeted investment will directly support the additional capacity needed to enable delivery of Australia's nuclear-powered submarines at the earliest opportunity, ensuring Australia avoids a capability gap as its existing submarines reach the end of their operational life.
- 2.12 Australia's AUKUS partners will also make significant investments to support delivery of the Optimal Pathway. The UK intends to build on the recent investment it has been making in its submarine delivery, such as the £2 billion in BAE Systems, Barrow-in-Furness and Rolls Royce, Derby, announced last year. For the US, AUKUS will mean higher demand for the cutting edge US systems that will feature in SSN-AUKUS and the sustainment and production of additional Virginia class SSNs. The US has already begun making additional investments to improve SSN production rates, starting with a decision last year to invest an additional USD \$2.4 billion in its submarine industrial base.
- 2.13 Australia will work with the UK and the US to implement the highest standards of nuclear safety and security. Australia will draw from decades of UK and US experience with safe naval nuclear propulsion, and build on Australia's record of safely and effectively operating a nuclear research reactor since 1958. A strong technical base and regulatory system will underpin the safety and security of SSNs in Australia. Implementing the highest standards of nuclear safety and security will be critical to the success of the entire nuclear-powered submarine program.

- 2.14 As the leaders of the three AUKUS countries have made clear, Australia, the UK and the US are committed to strengthening the global nuclear non-proliferation regime through this AUKUS initiative. Australia does not have and will not seek to acquire nuclear weapons. This trilateral approach will embed safeguards, best practices and set the strongest precedent for acquiring a naval nuclear propulsion capability.
- 2.15 In consultation with the International Atomic Energy Agency (IAEA), AUKUS partners are pursuing a non-proliferation approach for this initiative that will enable the IAEA to meet its technical objectives of verifying no diversion of nuclear material, no misuse of nuclear facilities and no undeclared nuclear material or activity by Australia. In doing so, AUKUS partners intend for their approach to prevent any other non-nuclear-weapon state from using naval nuclear propulsion as a cover to develop or acquire nuclear weapons.





3

3. Strategic Rationale

- 3.1 The Indo-Pacific is the epicentre of the world's economics and geopolitics. Australia, the United Kingdom and the United States each have a vital interest in promoting a region that is open, interconnected, prosperous, secure and resilient. The AUKUS partners are working together to promote this vision, contribute to deterrence and avert conflict. This can only be achieved by building the combined capabilities of the AUKUS partners.
- 3.2 In this context, Australia needs enhanced capabilities to deter threats to its national security and to the stability of the region. An Australian SSN fleet provides a unique and game-changing boost to Australia's sovereign capability and to the collective capability of the region. Australia employs its submarines to protect and defend vital trade routes, sea lines of communication and sovereign maritime approaches. For a maritime nation like Australia, similar to the UK and the US, maintaining a submarine capability advantage over potential adversaries is critical for defending itself and working with its partners. By mitigating a potential capability gap through acquiring cutting edge SSN capabilities as early as the 2030s, Australia can better secure its own national interests, cooperate more effectively with its partners and strengthen its support for the stability of the Indo-Pacific.
- 3.3 By increasing the number and capability of the submarines employed by the three nations in the Indo-Pacific, the AUKUS partners – in collaboration with other regional partners – can better support the conditions for a more stable, secure and prosperous Indo-Pacific region. This will enhance the capacity of AUKUS partners to support and contribute to a region that respects sovereignty and the rule of law, in which countries are able to make their own choices and peacefully resolve conflicts.



4

4. Advantage of Nuclear-Powered Submarines

- 4.1 In the future security environment of the Indo-Pacific, conventionally-powered submarines will be increasingly less able to meet Australia's needs. The United Kingdom Royal Navy and United States Navy retired their last conventionally-powered submarines in the early 1990s because SSNs have superior stealth, speed, manoeuvrability, survivability and endurance when compared to diesel-electric powered submarines.

Why is Australia transitioning to an SSN capability?

SSNs are a game-changing capability. The superior stealth, speed and range characteristics of SSNs better meet the maritime security needs of all three AUKUS partners in the decades ahead.



Stealth

- SSNs can operate with a significantly lower chance of being discovered by adversaries.



Speed

- SSNs are faster than diesel-electric powered submarines. Nuclear power enables submerged submarines to drive at high speeds without affecting the period they can remain at sea.



Range

- SSNs are designed to operate across vast expanses of ocean, with their range and endurance limited only by the need to replenish supplies. Australia's SSNs will not need to be refuelled during their lifetime, meaning they can patrol for longer.

Protecting and defending – the role of SSNs

SSNs can perform a diverse range of tasks, including:



Conventional deterrence

Compared to all other large, crewed military platforms, SSNs are uniquely difficult to locate. SSNs provide a persistent capability to counter adversary ships and submarines at sea and deter aggression.



Defence of national interests

The range and endurance of SSNs will keep maritime threats further away from Australia's territory and people. This will reduce the risk of adversary naval forces approaching Australia without being detected.



Contribution to regional security

Operating SSNs will allow the Australian Defence Force to make a more significant contribution to joint operations. It will enhance AUKUS partners' overall undersea capability, increasing deterrence in the Indo-Pacific region.



Protecting sea lanes, lines of communication and approaches

SSNs have the endurance and speed to continuously patrol, monitor and respond to threats in maritime zones critical to the region's continued economic prosperity and security.



Intelligence, surveillance and reconnaissance

The stealth and range of SSNs allows them to collect invaluable information on adversary capabilities, movements and intentions.



5



5. The Pathway to Australia's SSN Acquisition

- 5.1 Over the past 18 months, Australia, the United Kingdom and the United States have worked together to determine the Optimal Pathway for Australia to acquire SSNs. All three AUKUS partners have dedicated significant effort and resources to this work. A Joint Steering Group made up of senior officials from all three countries met 12 times between December 2021 and February 2023. The Joint Steering Group examined the full suite of options for Australia's SSN acquisition, assessing the opportunities, risks and requirements of each.
- 5.2 Based on the work of the Joint Steering Group, AUKUS partners have identified a phased Pathway that delivers a sovereign Australian SSN capability as early as the early 2030s. The Pathway will see the construction and delivery of SSN-AUKUS as an enduring SSN capability for Australia and the UK – incorporating technology from all three nations, including cutting edge US submarine technologies.
- 5.3 This Pathway includes:
- Beginning in 2023, Australian military and civilian personnel will embed with the UK Royal Navy, the US Navy and – subject to any necessary arrangements – with UK and US submarine industrial bases.
 - Beginning in 2023 and 2026 respectively, the US and UK will increase SSN port visits to Australia.
 - As early as 2027, UK and US SSNs plan to establish a rotational presence in Western Australia.
 - Pending US Congressional approval, from the early 2030s the US intends to sell Australia three Virginia class submarines, with the potential to sell up to two more if needed. This will ensure there is no capability gap during the retirement of Australia's existing diesel-electric submarine fleet.
- 5.4 Importantly, the Pathway includes milestones for Australia to establish the capabilities to safely operate and steward SSNs. The UK and the US will use their extensive experience in safely constructing, operating, maintaining and disposing of SSNs to assist Australia in achieving those milestones.

5.5 The Pathway will develop Australia's capacity to achieve the 'sovereign ready' milestone to safely and responsibly own, operate, maintain and regulate a sovereign SSN capability. The phases of the Pathway will enhance trilateral undersea presence in the region in the near term, and will build this 'sovereign ready' capability over time. Ultimately, the Pathway will provide Australia with the capacity to build and deliver its enduring nuclear-powered submarine capability – the SSN-AUKUS. SSN-AUKUS will be the future submarine for both Australia and the UK, with the technology developed from and integrated into this platform benefitting all AUKUS partners. Australia and the UK will begin to build SSN-AUKUS in their domestic shipyards before the end of this decade. The UK intends to deliver its first SSN-AUKUS as early as the late 2030s. Australia plans to deliver the first Australian-built SSN-AUKUS in the early 2040s.



6



6. SSN-AUKUS

- 6.1 SSN-AUKUS will be a trilaterally-developed submarine based on the United Kingdom's next-generation design that incorporates technology from all three nations, including cutting edge United States submarine technologies. It will be operated by the UK Royal Navy and Royal Australian Navy. SSN-AUKUS will be equipped for intelligence, surveillance, undersea warfare and strike missions.
- 6.2 The process undertaken through the 18-month consultation period has led the AUKUS partners to assess that SSN-AUKUS is the best option for Australia to acquire its enduring solution for a conventionally-armed, nuclear-powered submarine capability. The AUKUS partners acknowledge the level of challenge and significant work required to deliver this outcome. The main areas of work that need to come together to meet the timeframe include: development and refinement of the SSN-AUKUS design to be ready for build; development of an integrated build strategy, enhanced shipbuilding capability and trilateral supply chain; and agreement of a joint delivery model. To ensure Australia's first SSN-AUKUS is delivered in the early 2040s these elements will be progressed in parallel, brought together by joint program experts, and overseen trilaterally by senior government officials from the AUKUS partners.
- 6.3 SSN-AUKUS will incorporate US technology such as propulsion plant systems and components, a common vertical launch system and weapons. The AUKUS partners will also develop a joint combat system as an expansion of the existing US-Australian combat system. Engineers and designers in all partner countries will collaborate closely to ensure the SSN-AUKUS achieves key design milestones and meets Australian and UK delivery timeframes.
- 6.4 As a trilateral endeavour, SSN-AUKUS provides maximum interoperability among AUKUS partners. It will increase opportunities for trilateral collaboration in the industrial base, and will strengthen trilateral industrial capacity to the benefit of all three countries. A delivery model will need to be established to meet the trilateral partners' requirements. SSN-AUKUS will be delivered as a joint build program constructed in Barrow-in-Furness, UK, and Adelaide, South Australia. US industry is to deliver a number of critical and specialised technologies, including propulsion technology.



6.5 In support of developing enhanced shipbuilding capability and to ensure Australia's first SSN-AUKUS can be delivered on time, Australia will begin initial works this year at the preferred site for the future Submarine Construction Yard in Osborne, South Australia. The precise nature and locations of nuclear-related facilities at the Submarine Construction Yard are yet to be determined and will be the subject of comprehensive technical analysis and assessments, undertaken in accordance with international best practice.



7



7. Towards SSN-AUKUS

Becoming 'sovereign ready' - Increased visits and rotations of UK and US submarines

- 7.1 Australia must be 'sovereign ready' before it can operate an SSN – meaning that Australia must achieve the capacity to be the sovereign owner, operator, maintainer and regulator of this game-changing capability. A series of steps will be required throughout the next decade, with the support of the United Kingdom and United States, to achieve this as early as possible.
- 7.2 These steps will simultaneously benefit trilateral security objectives by increasing UK and US presence and flexibility in the Indo-Pacific region in the near term. As the trilateral partners work to make Australia 'sovereign ready,' they will also build stronger relationships and interoperability between their submarine forces, enabling closer cooperation in maintaining stability in the region.
- 7.3 From 2023 onwards, the US will begin to commence more frequent and longer visits of SSNs to Australia, and the UK will do likewise from 2026. This will further strengthen Australia's experience in hosting such visits and supporting a rotational SSN presence in Western Australia. Opportunities for Australian sailors on-board UK and US submarines will also build at-sea experience for Australian crews.
- 7.4 From as early as 2027, once Australia has established the necessary infrastructure and stewardship capabilities, AUKUS partners intend to have a rotational presence at HMAS Stirling, Western Australia, known as Submarine Rotational Force-West (SRF-West). SRF-West will accelerate efforts to develop Australia's capability to safely and securely operate and sustain its future nuclear-powered submarines. Australian sailors will deploy on UK and US SSNs rotating through SRF-West to develop at-sea experience with naval nuclear propulsion, while Australian maintenance personnel will support these SSNs at shore.
- 7.5 SRF-West will be a rotational presence, in line with Australia's longstanding bipartisan policy of no foreign bases on its soil. Australia will retain ownership and access to all facilities, and all activities on Australian soil will be transparently communicated and mutually determined.

PATHWAY TO AUSTRALIA'S NUCLEAR-POWERED SUBMARINE CAPABILITY

Embeds and Industrial Workforce
(From 2023)

Increasing Port
Visits (From 2023)

SRF-West
(As early as 2027)



Australia Sovereign
Ready (Early 2030s)

Australian Virginia
Class Submarines



Australian
Shipyard Design
and Construction
(From 2023)

Construction of SSN-AUKUS
(During the 2020s)

Planned Delivery of
UK's First SSN-AUKUS
(Late 2030s)

Planned Delivery of
Australia's First
SSN-AUKUS
(In early 2040s)



Collins Class Capability



2023

2033

2043

2053

Stewardship Pathway

- 7.6 Australia, the UK and the US will work closely to ensure that all activities are fully consistent with their respective domestic law and international obligations while also recognising Australia's obligations under international law, including the Treaty on the Non-Proliferation of Nuclear Weapons and South Pacific Nuclear Free Zone Treaty (Treaty of Rarotonga). US nuclear ballistic missile submarines (SSBNs) will not be part of SRF-West.
- 7.7 SRF-West is expected to consist of a rotational presence of one UK Astute class SSN and up to four US Virginia class SSNs. Each submarine will spend time away from Australia on regional operations, with periods of around three months at HMAS *Stirling* for maintenance activities. These maintenance activities will help build Australia's 'sovereign ready' capabilities. To enable the rotational presence of US SSNs, the bilateral elements of SRF-West will be implemented under the Australia-US Force Posture Agreement. UK participation in SRF-West will be enabled through separate arrangements.

Virginia class SSNs

- 7.8 In order to sustain the systematic growth of Australia's stewardship capacity and provide it with an SSN capability as soon as possible, Australia intends to acquire an existing SSN capability – the US Virginia class SSN.
- 7.9 Australia's acquisition of Virginia class SSNs will ensure there is no submarine capability gap during the retirement of Australia's existing diesel-electric submarine fleet. This will enable Australia to maintain and enhance its contributions to regional security, together with its AUKUS partners. Beginning in the early 2030s, pending approval from the US Congress, the US intends to sell Australia three Virginia class submarines, with the potential to sell up to two more if needed.
- 7.10 The acquisition of Virginia class SSNs will ensure Australia maintains a highly effective submarine capability throughout the 2030s. Australia's Virginia class SSNs will be a sovereign Australian capability, commanded by Royal Australian Navy officers under the Australian Defence Force's chain of command. Decisions on the deployment, missions and operations of Australia's Virginia class SSNs will be matters for the Australian Government, as with all of Australia's sovereign defence capabilities.
- 7.11 The Virginia class SSNs will have a high degree of commonality with the SSN-AUKUS submarines, including sharing elements of the propulsion plant, combat system and weapons. This commonality in design, components and performance will help with the transition to SSN-AUKUS, while enhancing interoperability among the AUKUS partners.



8



8. A Sovereign National Enterprise

- 8.1 Australia's acquisition of SSNs will be a national endeavour. Building, maintaining and operating SSNs will transform Australia's economy, industrial base and education sector. Australia takes seriously the responsibility to become 'sovereign ready' to employ an SSN capability, and the Optimal Pathway ensures Australia is able to build its skills, experience, capacity and capability – and ultimately achieve being 'sovereign ready' as early as possible. The willingness of the United Kingdom and the United States to share this technology represents a vote of confidence in Australia's technical capabilities and world-class navy.
- 8.2 In taking on this endeavour, each Australian involved in the SSN enterprise will need to place nuclear safety, security and stewardship at the forefront of their work. A strong culture of individual accountability and an absolute commitment to identify and manage risks are essential to the success of Australia's SSN program.



9



Then Ambassador to the United States and later Secretary (1970–74), Sir Keith Waller (centre), signing the Nuclear Non-Proliferation Treaty, Washington, 27 February 1970. Also present Deputy Director, US Arms Control and Disarmament Agency, Philip Farley (left), and US Under Secretary of State, U. Alexis Johnson. [US Department of State/Robert H McNeill]

9. Commitment to Non-Proliferation

- 9.1 AUKUS leaders are committed to setting the highest nuclear non-proliferation standard for Australia's acquisition of SSNs. Australia, the United Kingdom and the United States are champions of the global nuclear non-proliferation regime and its cornerstone, the Treaty on the Non-Proliferation of Nuclear Weapons. Over the 18-month consultation period, AUKUS partners have held numerous technical exchanges with the IAEA to develop a non-proliferation approach that sets a strong precedent for any other countries that might seek to acquire naval nuclear propulsion in the future. This approach will enable the IAEA to meet its three 'technical objectives' of verifying no diversion of nuclear material, no misuse of nuclear facilities and no undeclared nuclear material or activity in Australia.

Australia's nuclear non-proliferation record and safeguards agreements

Australia has a proud record of leadership in the international nuclear non-proliferation regime. Under the Treaty on the Non-Proliferation of Nuclear Weapons, Australia has committed to not receive, manufacture or otherwise acquire nuclear weapons. Australia has long championed nuclear weapon-free zones, and was a founding member of the South Pacific Nuclear Free Zone Treaty (Treaty of Rarotonga). Australia remains a key driving force in support of the Comprehensive Nuclear Test Ban Treaty.

Australia has outstanding non-proliferation credentials underpinned by two safeguards agreements with the IAEA. These are a Comprehensive Safeguards Agreement (CSA) and an Additional Protocol (AP). Australia has robust reporting and access obligations to the IAEA under both of these instruments.

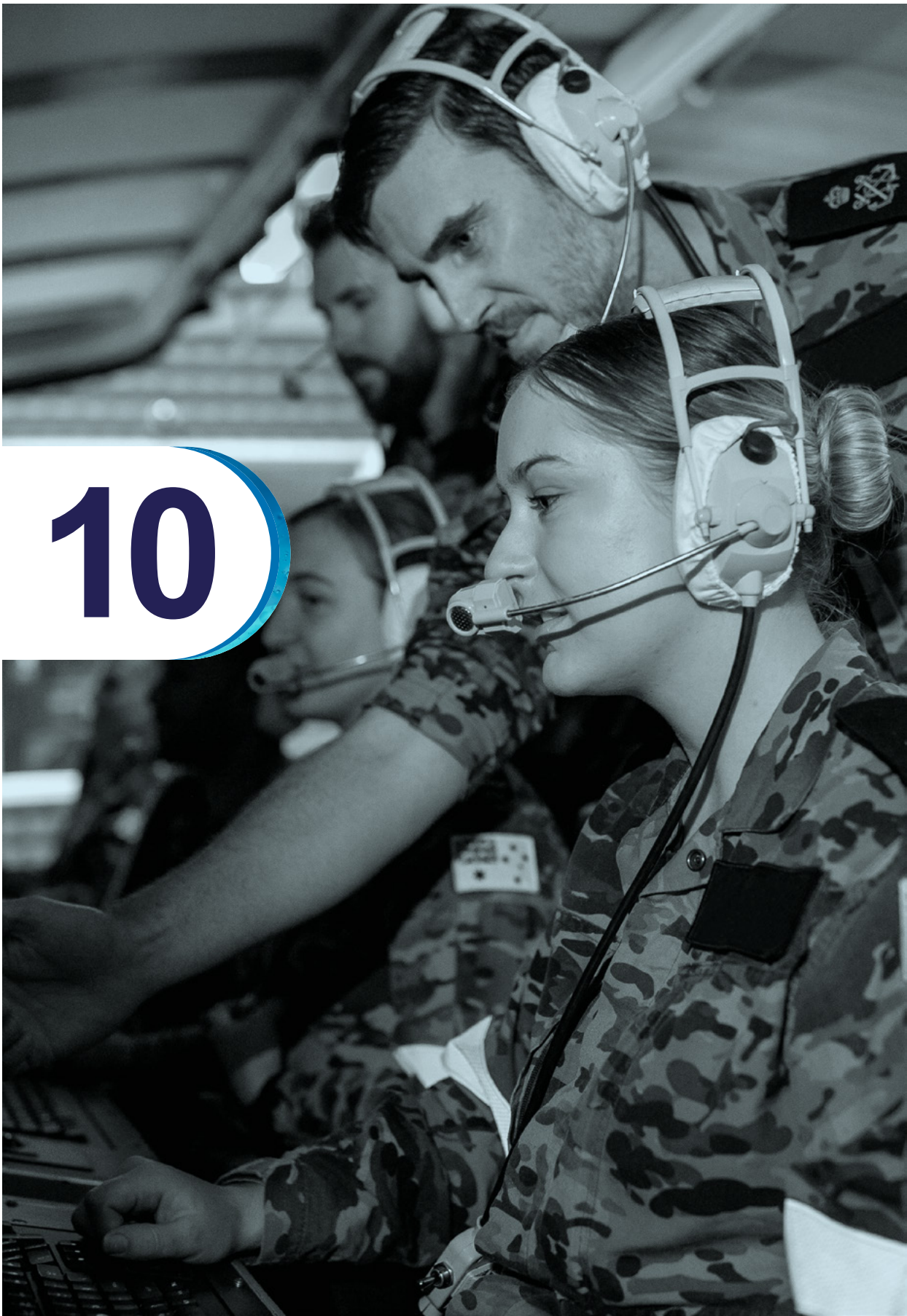
For a state with a CSA and AP, the IAEA is able to draw the 'broader conclusion' that, in effect, no nuclear material is unaccounted for and that there are no undeclared nuclear material or activities. Australia was the first state to receive this 'broader conclusion' in 2000 and has received it every year since.

- 9.2 AUKUS partners have been open and transparent in developing a nuclear non-proliferation approach for the transfer of naval nuclear propulsion technology. Since the original AUKUS announcement, the three AUKUS partners have provided the IAEA Board of Governors with regular updates.
- 9.3 The approach taken will be consistent with AUKUS partners' relevant nuclear non-proliferation obligations and commitments, including Australia's obligations under its CSA and AP, while also protecting classified and controlled information.
- 9.4 Australia has advised the IAEA that it will commence negotiation of an arrangement with the IAEA under Article 14 of Australia's CSA, as part of the non-proliferation approach for Australia's SSN program. The use of Article 14 will allow Australia to develop with the IAEA a package of robust verification measures to be applied to Australia's SSN program to ensure the IAEA can continue to meet its technical objectives throughout the submarines' lifecycle. Australia is committed to setting the strongest precedent for the use of Article 14 and to protecting classified and controlled information. Australia intends for this arrangement to be provided to the Board of Governors for appropriate action once agreed with the IAEA.



Nuclear non-proliferation approach

- As a non-nuclear-weapon state, Australia does not have and will not seek to acquire nuclear weapons.
- Australia's SSN program will occur within the framework of Australia's CSA and AP with the IAEA.
- Australia will declare all nuclear materials and activity to the IAEA as required under its CSA and AP.
- Australia intends to negotiate an arrangement with the IAEA under Article 14 of Australia's CSA.
- AUKUS partners will continue working with the IAEA to develop a suite of safeguards and verification measures that will enable the IAEA to meet its technical objectives throughout the submarines' lifecycle and provide assurance that Australia remains in compliance with its obligations under its CSA and AP.
- Australia will not enrich uranium or reprocess spent fuel as part of this program.
- To reduce the risks associated with handling nuclear fuel, and limit the possible ways in which this fuel could be misused, Australia will not produce nuclear fuel for its SSNs.
- The United Kingdom and United States intend to provide Australia with nuclear material in complete, welded nuclear power units that will not require refuelling during their lifetime. This removes the need to routinely access the fuel element, reduces the amount of spent fuel produced and avoids the need to maintain a stockpile of fresh fuel.
- Removing nuclear material from these units is highly complex – requiring specialised equipment, facilities and workforce – and doing so would render the power unit, and the submarines, inoperable.
- The nuclear fuel Australia receives cannot be used in nuclear weapons without further chemical processing, requiring facilities that Australia does not have and will not seek.



10

10. Safety and Security

Safety

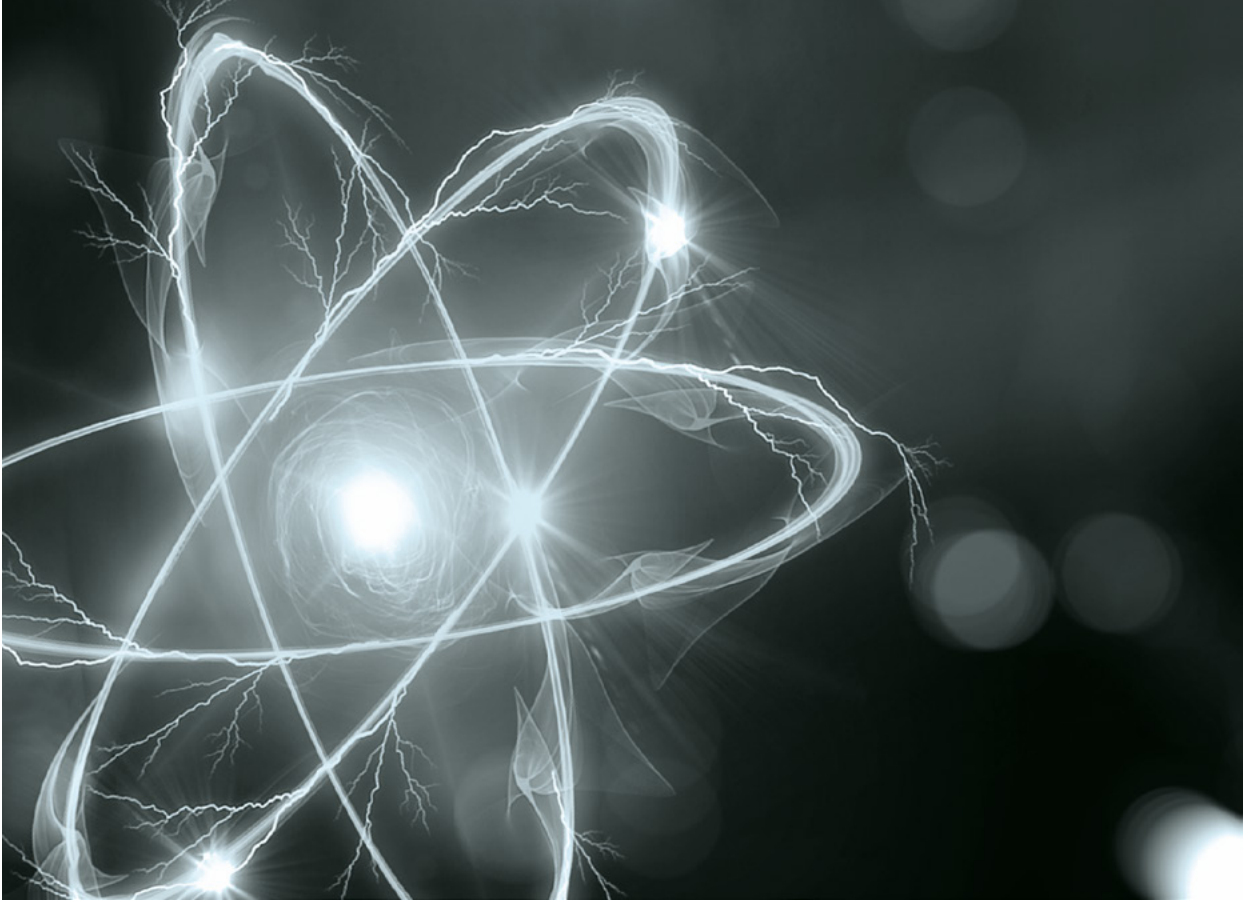
- 10.1 AUKUS partners are committed to the highest standards of nuclear safety and security. The decades of experience offered by the United Kingdom and United States' programs will support Australia in becoming a world leader in nuclear stewardship.
- 10.2 Nuclear submarine reactors are a proven and safe technology. A sophisticated security and safety architecture will surround this program, building on Australia's 70-year unblemished track record of operating nuclear facilities and conducting nuclear science, such as at Lucas Heights for nuclear research and medical production.
- 10.3 Informed by UK and US expertise, Australia will develop a comprehensive safety management system to support the safe operation of Australia's nuclear-powered submarine enterprise. This will be underpinned by a system of regulation calibrated to the unique needs of Australia's SSN capability. Regulatory oversight will occur across the nuclear aspects of the submarine platform and supporting facilities and infrastructure, and will leverage the work of existing nuclear regulators.
- 10.4 The safety and security of all Australians, as well as all people in the Indo-Pacific region, will be front of mind when establishing the supporting infrastructure and facilities required for Australia's SSNs. Australia's approach to safety will reflect its absolute commitment to ensuring the highest safety standards for submarine crew, the greater workforce, local communities and the environment.

Security

- 10.5 Building on the decades of experience that the UK and the US have in protecting sensitive and classified nuclear material, naval nuclear propulsion technology and SSN capabilities, Australia has committed to a strong security posture to deliver an uncompromised SSN program, as a responsible steward of nuclear technology. This includes meeting IAEA security requirements for nuclear material as part of Australia's safeguards agreements.
- 10.6 Australia will embed the highest security culture within its own nuclear-powered submarine enterprise, in close partnership with UK and US security and intelligence agencies, as well as defence industry and academia. The active support of these organisations will be critical to assist in delivering an uncompromised capability.



11



11. Radioactive Waste Management

- 11.1 As a responsible nuclear steward, Australia will manage all radioactive waste generated by its own Virginia class and SSN-AUKUS submarines, including radioactive waste generated through operations, maintenance and decommissioning. All waste, including spent fuel, will be managed safely, informed by international best practice, and in accordance with Australia's international and domestic legal obligations and commitments. Australia will continue to leverage decades of experience in safely and securely managing radioactive waste, and will be supported by the United Kingdom and United States, whose expertise and advice will support Australia in building this capability.

Storing and disposing of operational waste

- 11.2 Australia's nuclear-powered submarines will generate a small amount of low-level radioactive waste, such as personal protective equipment, as part of routine maintenance and operations. There could also be a small amount of intermediate-level radioactive waste generated during these activities. Australia will manage all operational waste from its own submarines, once they have been acquired in the 2030s. Developing Australia's workforce and know-how to manage radioactive waste from nuclear-powered submarines is an important part of building Australia's stewardship credentials. The rotational presence of UK and US SSNs in Western Australia as part of SRF-West will provide an opportunity to learn how these vessels and their nuclear reactors operate, including the management of low-level radioactive waste through routine maintenance. All low- and intermediate-level radioactive waste will be safely stored at Defence sites in Australia.

A pathway to manage radioactive waste following decommissioning

- 11.3 At the end of their service life, Australia will need to defuel, dismantle and recycle its nuclear-powered submarines and manage the spent fuel and radioactive reactor compartment components. This process is the most complex aspect of the submarine's lifecycle. It requires bespoke facilities, significant support infrastructure and a highly-experienced workforce. While Australia's submarines will last for many decades, Australia is already considering how it will defuel and decommission its nuclear-powered submarines and manage the radioactive waste they generate.
- 11.4 Throughout 2023, Defence – working with relevant agencies including the Australian Radioactive Waste Agency – will conduct a review to identify locations in the current or future Defence estate that could be suitable for the storage and disposal of intermediate- and high-level radioactive waste. The outcomes of the review will inform a more detailed process that will include consultation and engagement with stakeholders, including community and Indigenous groups, and consideration of wider social license and economic implications.
- 11.5 Australia is committed to ensuring the management of radioactive waste and spent nuclear fuel has minimal impact on the general public, local communities and the environment. These activities will occur in a manner consistent with Australia's domestic and international legal obligations. Radioactive waste management is a safe and proven industry which will have benefits for local communities, including jobs and business partnerships.





12

12. Industry

- 12.1 Recognising the strategic value of SSNs for Australia in the Indo-Pacific region, AUKUS partners are committed to the necessary and generational investment to increase industrial capacity and know-how while protecting classified and controlled information. This will leverage the strengths and expertise of each country to lift all three partners' industrial bases.
- 12.2 The SSN-AUKUS program will be supported by a trilateral industrial base, providing significant new opportunities for small, medium and large enterprises in all three nations. For Australia, delivering the Optimal Pathway will offer unprecedented opportunities to build and maintain complex nuclear technology, which will boost Australia's technical capabilities and provide flow-on benefits to related industries. Australian companies will be employed in the construction and maintenance of SSN-AUKUS as well as the maintenance of visiting United Kingdom and United States submarines, and are expected to contribute to AUKUS supply chains more broadly.
- 12.3 In the near term, AUKUS partners will identify specific opportunities for Australian industry to participate in the SSN supply chain. This will help ease pressure on the supply chains of the UK and the US, leverage the existing strengths of Australian suppliers and boost their capacity ahead of the commencement of Australia's build program. AUKUS partners will focus on key components where Australia has demonstrated industrial capability, such as pressure hull steel, valves, pumps, batteries, switchboards, lighting and additive manufacture.
- 12.4 In parallel and before commencement of the build of its first SSN-AUKUS, Australia will pursue the opportunity to begin manufacturing components at the future Submarine Construction Yard at Osborne, South Australia for use by UK and US production lines. These activities will allow Australia to build experience within the yard and achieve certification of the facilities and workforce.

- 12.5 SSN-AUKUS will be a complex and sophisticated system, and its success will rely heavily on the quality of its workforce – from engineers and welders to regulators and submariners. AUKUS partners are committed to expanding the base of skilled submarine and shipbuilding workers in all three nations.
- 12.6 AUKUS partners recognise the importance of all three nations developing, maintaining and retaining their respective industrial and workforce bases. The partners are committed to working together to strengthen delivery of their respective nuclear-powered submarine programs.

The Osborne Naval Shipyard is a multi-user facility at Osborne on the Lefevre Peninsula in South Australia.







13

13. Australian Infrastructure

- 13.1 The SSN-AUKUS program will generate a significant package of infrastructure works across all three partner countries. New and upgraded facilities will be required to support all stages of the Pathway for Australia's acquisition and production of nuclear-powered submarines. The scale of work required will be unlike any previous shipbuilding program in Australia's history. Constructing and upgrading this infrastructure will employ thousands of Australian workers.
- 13.2 The construction of SSN-AUKUS in Australia will be a whole-of-nation undertaking. Primary construction works will occur at Australia's future Submarine Construction Yard in Osborne, South Australia, to ensure it is ready for the SSN-AUKUS build to commence by the end of the decade. At its peak, developing the infrastructure at the Submarine Construction Yard will create up to 4,000 direct jobs. The growth of Australia's submarine delivery infrastructure will be supported and complemented by the existing infrastructure in the United Kingdom and United States, which will be vital to the delivery of this trilateral program. Australia will make a proportionate financial investment in the UK and US industrial bases in order for them to meet AUKUS requirements.
- 13.3 In-service Australian, UK and US submarine forces will be supported at HMAS *Stirling* in Western Australia. HMAS *Stirling* and other supporting facilities in Western Australia will be expanded to support the scale of infrastructure required for nuclear-powered submarines – both for visiting and rotational submarines and for Australia's own nuclear-powered submarines.



At least \$1 billion in WA infrastructure over the Forward Estimates



Around 3,500 industry jobs over the decade



More SSN port visits to begin later this year



Home to the Submarine Rotational Force-West



Uplift in skills across WA industry



Opportunities for WA local businesses



The home of Australia's next-generation submarine build



Work at Osborne begins this year



At least \$2 billion in SA infrastructure over the Forward Estimates



Almost double the workforce than the Attack class program



Uplift in skills across SA industry



Opportunities for SA local businesses



\$6 billion

INVESTED IN AUSTRALIAN INDUSTRY AND WORKFORCE OVER THE FORWARD ESTIMATES

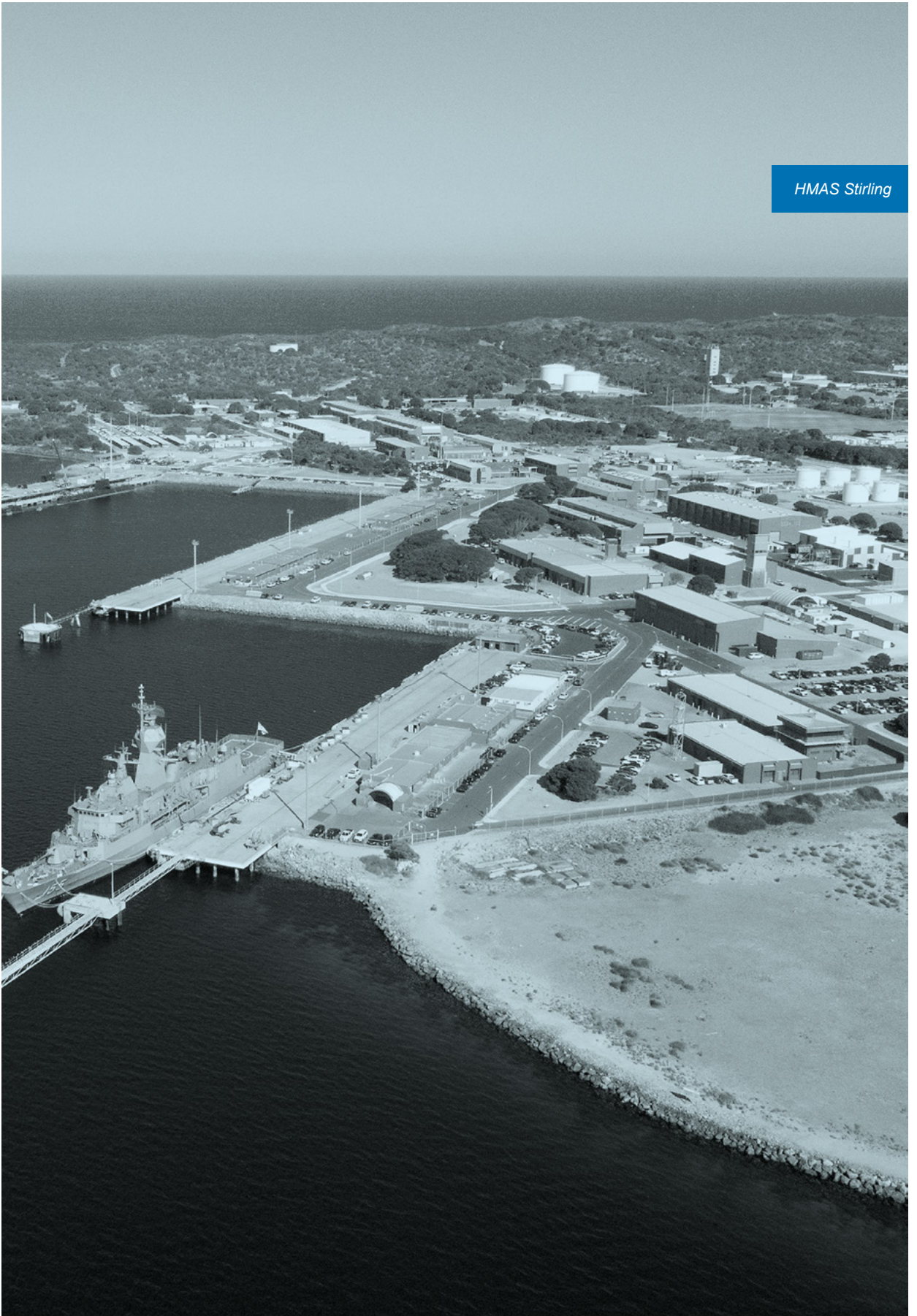


JOBS ACROSS AUSTRALIA
~20,000



AROUND OF GDP **0.15%**

HMAS Stirling





14

14. Australian Workforce

- 14.1 Australia will embark on a national endeavour to develop a suitably skilled and experienced sovereign workforce capable of building, operating and sustaining an SSN capability. Delivering this program will require the collective effort of thousands of highly-skilled Australian scientists, engineers, project managers, operators, technicians, welders, construction workers, electricians, metal fitters and builders. The SSN-AUKUS, Virginia class SSNs and SRF-West are expected to create around 20,000 jobs over the next 30 years across Australian industry, the Australian Defence Force and the Australian Public Service. Many of these jobs will demand unique functions, skills and qualifications that require years of training to obtain.
- 14.2 Australian industry will commence work to support Australia's SSN Pathway this year. Australian industrial personnel will be employed to support visiting United Kingdom and United States submarines, and to conduct intermediate-level maintenance on nuclear-powered submarines on rotation in Western Australia.
- 14.3 AUKUS partners are prioritising education and training opportunities to meet the industrial requirements for a new generation of submarines. In partnership with the UK and the US, Australia will commence a suite of initiatives to grow a sustainable workforce. These include, subject to necessary arrangements, industrial workforce exchanges to UK and US shipyards, world-class training opportunities at UK and US naval nuclear schools, and education pathways to expand Science Technology Engineering and Maths (STEM) opportunities.
- 14.4 Australia's SSN enterprise will require a significant increase in its uniformed Royal Australian Navy workforce. This includes seagoing crews, shore-based support, command and control, program management, security, intelligence, medical, engineering and logistics personnel. Australia has developed a recruitment and training plan to build this workforce. Australian officers and sailors have already begun training placements in the UK and the US, and will continue undertaking placements in UK and US nuclear power schools and on UK and US SSNs.

- 14.5 The SSN enterprise will also need to be governed and managed by a larger base of Australian Government employees. These employees will take on a wide variety of roles in the SSN program, from nuclear scientists and technical experts to policy officers and program managers.
- 14.6 Achieving this workforce growth will be challenging, particularly given the specialist nature involved in the program. Additional training, skilling and educational programs will be established to grow Australia's local submarine and shipbuilding industry beyond previous levels. Australia will also look to leverage the existing local and experienced submarine industrial workforce in South Australia and Western Australia.
- 14.7 Growing the workforce required to support SSN-AUKUS throughout its lifecycle will be a trilateral endeavour. SSN-AUKUS offers an unprecedented opportunity to further integrate and grow the UK and US SSN workforce. Thousands of skilled workers will support growing supply chains, shipyards and the technical bases in all three countries. AUKUS partners will work together to strengthen the Australian, UK and US industrial bases to meet these requirements.





15



15. Conclusion

- 15.1 18 months ago, AUKUS partners took on an ambitious task: to define an Optimal Pathway for Australia's acquisition of an SSN capability that is safe, secure and delivered at the earliest possible date, while achieving the highest standards for nuclear non-proliferation. This challenging task has been achieved. Australia, the United Kingdom and United States have developed a Pathway that will realise an Australian SSN capability in the next decade and will lift the capability and capacity of all three nations.
- 15.2 The Pathway outlined in this report – including the inception of the SSN-AUKUS program – is the product of intensive trilateral work, examining the full suite of requirements that underpin nuclear stewardship and the needs of all three partners. Implementing this Pathway will be an ambitious effort. AUKUS partners are united in their conviction that delivering an SSN capability for Australia will support a more stable, secure and prosperous Indo-Pacific region.

