



SPACE  
CENTRE  
AUSTRALIA

Analysis of Synergies  
between AUKUS Pillar 1 & 2  
and Space Industry

SPACE  
CENTRE  
AUSTRALIA



## Contents

List of Figures.....	3
List of Tables.....	3
Executive Summary .....	4
The Australian Space Industry .....	6
The AUKUS Agreement .....	7
Areas for legislative and policy reform .....	9
Defence industry security considerations .....	10
United Kingdom .....	11
United States .....	12
National Technology and Industrial Base.....	12
The Space Value Chain and how it intersects with AUKUS.....	13
Export control law in the US .....	16
Proposed legislative changes.....	16
US National Industrial Security Program (NISP).....	18
US International Armaments Cooperation.....	19
Australia.....	21
Export Controls .....	21
Defence Industry .....	22
Non-nuclear submarine and Pillar II aspects in AUKUS.....	23
Pillar I – Pillar II synergies .....	23
AUKUS education, training, recruitment .....	26
Regulation of Space Activities in Australia.....	28
Complying with Australian regulations .....	28
Enforcing regulations.....	28
Complying with international space treaties .....	29
Regulation of nuclear activities in Australia .....	29
International regulatory framework.....	30
Nuclear safety.....	31
Nuclear security.....	33
Nuclear safeguards regime .....	34
Nuclear liability .....	37
Domestic regulatory framework .....	37
Nuclear safety.....	38
Australian Radiation Protection and Nuclear Safety Agency .....	38
Minister for the Environment.....	39

Australian Radioactive Waste Agency .....	39
Key issues .....	41
Nuclear security .....	44
Defence sites .....	44
Naval waters .....	44
Nuclear safeguards regime .....	45
Current state and territory prohibitions on radioactive waste management .....	46
Conclusion.....	48
About the Authors .....	49

## LIST OF FIGURES

Figure 1 - Space Industry Value Chain .....	15
Figure 2 - UK Submarine Service Marine Engineering officer career trajectory .....	27

## LIST OF TABLES

Table 1 - State and territory legislation relating to the disposal and storage of radioactive waste .....	47
-----------------------------------------------------------------------------------------------------------	----

## EXECUTIVE SUMMARY

The space industry and the AUKUS alliance (comprising Australia, the United Kingdom, and the United States) have the potential to form a powerful partnership that can yield substantial benefits for all parties involved. This executive summary outlines the key synergies between these two entities and highlights the strategic advantages that can be gained from their collaboration.

- **Technological Advancements:** The space industry is at the forefront of technological innovation, with developments in satellite technology, space exploration, and space-based infrastructure. AUKUS member nations possess significant technological capabilities, including advanced defense technologies. Collaboration between these entities can foster the cross-pollination of ideas, leading to technological advancements that benefit both space exploration and national security efforts.
- **National Security:** AUKUS was initially formed to strengthen security ties between member nations. The space industry plays a pivotal role in enhancing national security by providing satellite-based communication, surveillance, and navigation capabilities. By integrating space technology into AUKUS's defense strategies, member nations can bolster their security apparatus, including early warning systems and secure communication networks.
- **Space Situational Awareness (SSA):** Space situational awareness is crucial for both space industry operations and defense initiatives. Collaborative efforts can improve SSA capabilities, enhancing the tracking and monitoring of space debris, potential threats, and orbital activities. This shared awareness can mitigate risks and reduce the likelihood of space collisions that could impact satellite constellations and national security assets.
- **Economic Growth:** The space industry is a burgeoning economic sector, with substantial growth potential. By leveraging their combined resources, AUKUS member nations can stimulate economic growth through investments in research and development, manufacturing, and space exploration initiatives. This, in turn, can create high-tech jobs and boost local economies.
- **International Leadership:** Collaborative efforts between AUKUS and the space industry can position member nations as leaders in space exploration and technology development. This leadership can extend to setting international standards, participating in global space governance, and fostering international cooperation on space-related challenges, such as space debris mitigation and space traffic management.
- **Energy and Resources:** Space holds vast potential for resource exploration and energy generation. Collaborative space missions can enable member nations to tap into extraterrestrial resources, such as rare minerals or space-based solar power. This reduces dependency on terrestrial resources and strengthens energy security.
- **Climate Change Mitigation:** Space technology plays a vital role in monitoring and addressing climate change. AUKUS collaboration in the space sector can enhance Earth observation capabilities, aiding in climate modeling, natural disaster prediction, and environmental protection efforts.
- **Research and Development:** Joint investments in research and development can lead to breakthroughs in space science and technology, benefiting not only the AUKUS alliance but the broader global community. This can include advancements in propulsion systems, materials science, and space medicine.

In conclusion, the synergy between the space industry and the AUKUS alliance presents an opportunity to enhance technological capabilities, strengthen national security, promote economic growth, and position member nations as leaders in the global space arena. By strategically aligning their efforts, these entities can create a mutually beneficial partnership that fosters innovation and addresses pressing challenges in space exploration and security.

Copyright - Space Centre Australia 2023

## The Australian Space Industry

Australia's growing satellite industry faces a looming crisis: a shortage of accessible launch facilities to put its technology into orbit. If left unaddressed, this crisis will add cost and delay to Australian commercial and Defence ambitions. Satellite applications boost productivity and efficiency across many sectors including agriculture, mining, telecommunications, climate, and meteorology, as well as Defence and location-based services. The Government, universities and businesses are identifying more ways to use satellites for national security, research, and economic growth, but these services can only be accessed after the satellites have launched and are orbiting. Australia presents a number of unique benefits – geography, launch inclinations, regional political stability, advanced education systems, industrial and research maturity – for developing a thriving launch industry to service a global market. Launch underpins enabling the whole gamut of space innovation to be advanced through smart payloads and data. Globally, space innovation is considered a key driver of the fourth industrial revolution. While different jurisdictions prioritise commercial space differently, Defence operations and Defence innovation in space is a high priority across all allied collaboration.

In May 2023, Prime Minister Anthony Albanese and US President Joe Biden announced that text has been agreed in-principle on a Technology Safeguards Agreement (TSA) during the sidelines of the G7 Summit in Japan. The TSA will allow for the transfer of US space technology, including rockets and satellites, to be launched from Australia. As the leaders' statement between Prime Minister Albanese and President Biden said, "space collaboration is a rich opportunity to build high-skilled, well-paying jobs and increase investment between our countries."

The number of US launch providers is growing to service a growing global market. The TSA, enabling US launchers to launch from Australia, will help our domestic launch sector and spaceports to grow. This will, in turn, create jobs in developing infrastructure, servicing and testing ecosystems, satellite component and assembly requirements, research and development and advanced manufacturing ecosystems to support US launch activities. The Head of the Australian Space Agency Enrico Palermo stated this is an important milestone. "Having a TSA with the US is a vital step in continuing to grow Australia's space sector," Mr. Palermo said. "It will create commercial opportunities for our launch sector and send a signal to the global market that Australia is 'open for launch'. Australia is already a place that the world wants to launch from thanks to our geography and ability to access multiple orbits, wide open ranges, focus on responsible operations and trusted alliances to protect sensitive technologies – a TSA will cement that."

More launches in Australia are also likely to reduce the cost of access to space through commercial efficiencies and experience. This will make Australia more attractive as a global launch hub and lead to more international launches in Australia. Industries such as transport, hospitality, security, maintenance, operations, and logistics will also benefit. Particularly in rural and remote areas where most launch facilities are located. Australia and the US have worked closely together in negotiating this framework to provide the required protections for the US whilst acknowledging the commercial ambitions of Australia's developing launch sector. While text has been agreed, the TSA is subject to final domestic authorisations on both sides and is expected to come into force in 2024.

## The AUKUS Agreement

In September 2021, the Australian Government announced a new Trilateral Security Partnership between Australia, the United Kingdom, and the United States (AUKUS). The nuclear-powered submarine pathway was revealed in March 2023, but the roadmap to implement AUKUS arrangements through legislative and policy changes are yet to be announced.

Australia's geographical position in the Indo-Pacific region, in which competition and complexity between a growing number of countries has increased, necessitates a maritime capability that can operate at speed and endurance over long distances.<sup>1</sup>

In a new paradigm of Defence integration, AUKUS will drive Australia, the UK and US to commit significant diplomatic and financial capital to engage across a broad spectrum of advanced technology sharing while strengthening a collective Defence posture in the Indo-Pacific region.

For Pillar 1, the three-stage pathway for Australia to operate its nuclear-powered submarine capability includes:

- Rotations of US and UK nuclear-powered submarines (SSNs) through Australian facilities in 2027
- Introduction of interim Virginia-class submarines in the early 2030s
- Delivery of future SSN-AUKUS-class submarines, designed in the UK and deploying 'cutting edge technology' from all three countries (mostly from the US), in the late 2030s or early 2040s.

To replace the ageing Collins-class submarines, AUKUS Pillar 1 (undersea warfare) will facilitate the Royal Australian Navy (RAN) to purchase 3 US Virginia-class nuclear submarines (SSNs), and later, to build approximately 8 conventionally armed, nuclear-powered 'SSN-AUKUS' class attack submarines, based on a UK design. Australia will be the second country (after the UK in 1957) to be granted access by the US to highly sensitive nuclear propulsion capability.

Whether for the Virginia-class from the 2030s or AUKUS-class SSNs scheduled for the 2040s, AUKUS will be a part of upgrading an anti-submarine warfare (ASW) capability for the Australian Defence Force (ADF) as illustrated in the Defence Strategic Review.<sup>2</sup>

ASW capability also involves networking satellite capabilities, seabed arrays, tactical towed arrays (e.g. SURTASS-E), maritime patrol aircraft, ASW helicopters, submarines and information sharing. This will be supported by C4ISR (command, control, communications, computers, intelligence, surveillance and reconnaissance). ASW will also include upgrades for the RAAF (e.g. with the 12 P-8 Poseidon aircraft) and RAN surface fleet (Tier 1 and Tier 2 surface combatants).<sup>3</sup> These systems will

---

<sup>1</sup> A submarine arms race has been underway in the region for more than 10 years. In 2019, 75% of the world's non-US submarines operated in the Indo-Pacific region. It is estimated that China will expand its 66 submarines in the present to 76 by 2030.

<sup>2</sup> This will in part address RAN's limited maritime strike capability, cost blowouts of the Hunter-class frigates, and the vulnerability of the lightly armed planned Arafura-class offshore patrol vessels.

<sup>3</sup> Jennifer Parker, 'National defence and the navy', *The Strategist*, ASPI, 1 May 2023.

be deployed in strategic areas such as the Luzon Strait, while also participating in international exercises, conducting regular patrols and related tasks and performing Indo-Pacific Endeavour.

Both AUKUS Pillar I and II, implicitly, will require space-based integration. To support an effective nuclear powered submarine capability under AUKUS Pillar I, advanced and resilient space-based monitoring and communications systems directly enable integrated projected command, control and responsiveness.

AUKUS Pillar II (advanced technology) will see the trilateral development of joint military technology to improve interoperability and interchangeability between AUKUS forces and enhance arms exports and technology sharing between the partners. Pillar II includes new advanced technologies, such as cyber capabilities, electronic warfare, quantum technology, hypersonics, artificial intelligence and autonomous military capabilities. As the world's fourth largest arms importer, Australia has primarily relied on other countries for manufacturing of high technology Defence products for several decades. As Australia is starting a nuclear propulsion program from scratch, Pillars I and II place huge pressures on the Australian Defence industry.

Ultimately, to achieve AUKUS objectives including the transfer and operation of US nuclear-powered submarines and other associated US-origin capabilities, and the timely completion of the co-designed AUKUS SSNs, closer cooperation between the three countries will be required.

Conversely, the Heavy Launch industry draws parallels with AUKUS objectives and highlights deficiencies in current legislation and treaty alignments such as nuclear non-proliferation and alliance with informal political understanding instruments such as the Missile Technology Control Regime.

In general, change and reform should be concentrated in the following key sectors and areas:

- An expanded **legislative, regulatory and policy framework**, to further strengthen the existing Australian Space Activities Regulations, Register of Space Objects and Safety standards.
- Harmonisation or recognition of space regulation, security and safety requirements across the US, UK and Australia.
- A **sustainable workforce capability** that can recruit, train, and sustain blue- and white-collar workers capable of working within the Australian Space Industry.
- A capability that can undertake **resource and capacity sharing** across Defence, Space, and complimentary industries.
- An expanded **legislative, regulatory and policy framework**, to provide a roadmap, including space support, for the submarine enterprise to succeed without undue delay.
- **Industrial and skills expansion** that will involve the **revitalisation of Australian manufacturing** across sectors and levels of government and industry at a scale surpassing Australia's post-war manufacturing and energy schemes.



- **An effective workforce strategy**, to recruit, train and educate a highly skilled workforce across the SSN acquisition and sustainment life cycle. This includes a sizeable cadre of civilian engineers for construction and shoreside support tasks.<sup>4</sup>
- **Mechanisms to enable the transfer and incorporation of defence articles and technology**, highly classified materials, expanded intellectual property, and shared supply chains for the benefit of the partners involved.
- Incentivisation of **private sector investment** into the AUKUS and Space Capabilities.

## Areas for legislative and policy reform

In the April 2022 review in the AUKUS partnership, several milestones were achieved:

- the Exchange of Naval Nuclear Propulsion Information Agreement (ENNPIA), to enable trilateral sharing of naval nuclear propulsion information.
- an Australian commitment to establish a new naval base in eastern Australia.
- expansion of Pillar II to include space technologies and infrastructure, hypersonics, counter-hypersonics, and electronic warfare.
- identification of ways to more rapidly integrate commercial technologies to solve warfighting needs.
- an agreement to combine emerging quantum technologies in trials and experimentation over the next three years.

In Australia, to meet the Pillar I technical requirements, timelines and innovation challenges set out in the *Defence Strategic Review*, it will be necessary to:

- recognise gaps and needs in Australian industry, identify incompatibility and imbalances in differential systems of AUKUS partners, and ensure adequate departmental resourcing, funding, leadership, subject matter experts (SMEs)<sup>5</sup>
- identify risks and entrenched barriers - technical, bureaucratic, budgetary, cultural, regulatory, political, and strategic<sup>6</sup>
- ensure technology and knowledge-transfer partner arrangements to allow Australian engineers and facilities and their counterparts in the UK and US to adapt existing methods to design and manufacture systems specific to the Indo-Pacific region.

<sup>4</sup> Roland Stephens, 'Rebooting Australia's defence industry policy: establishing the principles', *The Strategist*, ASPI, 15 August 2023.

<sup>5</sup> The Australian Embassy in Washington includes 10 to 15 people to liaise with the Department of Defense (DoD) on AUKUS. In Canberra, the Office of the Prime Minister and Cabinet, Defence, and Foreign Affairs and Trade all have Band 3-level (deputy secretary) oversight and task forces dedicated to AUKUS. Between the three countries there are three appointed groups: Senior Officials Group, Joint Steering Group and seventeen Working Groups. There is also the US Congressional AUKUS Working Group and Friends of Australia Congressional Caucus and in Australia, the US-Australia Parliamentary Friendship Group.

<sup>6</sup> For example, the SMART method (specific, measurable, actionable, results-oriented, time-bound) requires objectives and clear metrics for thorough monitoring and evaluation to ensure progress in decision-making, innovation and cooperation.

## DEFENCE INDUSTRY SECURITY CONSIDERATIONS

Under the AUKUS arrangements, 'legislation will be required to underpin the nuclear enterprise and its regulation'.

In July 2023, the Department of Defence (DoD) released 2 heavily redacted documents under the *Freedom of Information Act 1982*, in response to a request for AUKUS related information and 'analysis of likely/necessary legislative change associated with the AUKUS program'.

The first document showed the DoD received advice from the Australian Government Solicitor (AGS) on the scope of domestic legal issues that would allow the Royal Australian Navy (RAN) to operate nuclear-powered submarines. The document, dated March 2022, underlined the 'likely scale and complexity of legislative change required' but further details were redacted and the 106-page AGS Scoping Brief was not included.

The second document relates to the DoD's review into reforming Defence legislation which was announced on 9 March 2023. The FOI document notes the 'sensitivity' around public commentary associating 'the proposed reforms with other high-profile initiatives, including decisions surrounding nuclear-powered submarines and other AUKUS advanced capabilities...'. The document stated that while the 'reforms will support and enable other Australian Government initiatives, the call for public submission will not seek views on defence matters beyond the scope of the proposed legislative reforms' referenced in the public consultation paper.

It is widely understood that defence legislation will be needed to implement AUKUS arrangements. However, the consultation paper does not explicitly reference AUKUS initiatives, and only acknowledges that legislative reform is 'necessary in a changing strategic environment' as Defence:

... requires an agile, scalable, and future-focused legal framework to effectively shape Australia's strategic environment, deter actions against the national interest and, when required, respond swiftly with military force. The Defence Act [1903] and related legislation need to be modernised to keep pace with advanced and emerging capabilities and new technologies and respond to current and future challenges. A range of factors are impacting the effectiveness of existing laws (p. 5).

AUKUS is a tripartite arrangement which will require changes to policy and legislation in all 3 countries. Future considerations for policy and legislative change will need to factor in the security arrangements required by AUKUS governments allowing defence industry to transfer technology among participating nations across all complementary areas including space.

In March 2022, the RAND Corporation speculated:

AUKUS success depends upon the development of a new legislative framework in the U.S., the commitment of organizational resources, empowering the working groups tasked with governing AUKUS, ensuring access to the requisite expertise, the ability to identify and manage barriers to success, and the employment of measurable indicators of success. These are not easy tasks, and each carries some risk.

An unprecedented U.S. legislative framework would include not only information sharing agreements on nuclear propulsion, but also on much broader areas in key sectors. Such a framework could allow for innovation to flourish, particularly as AUKUS looks for opportunities in artificial intelligence, quantum, and other key Defence technologies. **The role of the private sector, and the complications therein, is an under analysed aspect to AUKUS.** For example, Lockheed Martin was going to provide Australia with the weapons systems for its recently terminated French submarine contract; now the company may well be the supplier of the weapons systems for newly planned Australian nuclear submarine. And yet, just two days after the announcement of AUKUS, BAE and Rolls Royce won the contract to design a new nuclear-powered submarine for the UK, which may have implications for Australia's new submarine, and Lockheed, too. The involvement of Defence industry will also raise issues regarding commercial data sensitivities and intellectual property issues—both of which should be studied, as they may require additional legislative attention.

Each AUKUS nation has a defence industry security program (noted below) which are likely to require policy changes to align with the new policy of integration between partners and subsequent legislative changes. These programs aim to protect the defence supply chain from vulnerabilities.

## United Kingdom

The Security Industry Authority (SIA) within the UK, which runs the Industry Security Assurance Centre that is very similar to Australia's Defence Industry Security Program (DISP), also allows accredited DISP members to process and store UK Official-Sensitive information on company ICT systems and networks. These arrangements are subject to change at any time the UK Ministry of Defence wishes to 'impose additional measures to protect information under contracts with DISP members, through documents such as 'Security Aspect letters'(SALs). A SAL provides a contractual means of ensuring that security is addressed in the work that a Contractor is undertaking.

In March 2021 the UK Government released its *Defence and Security Industrial Strategy* which included the following information on the US National Technology and Industrial Base (NTIB):

- In 2017, the United States, in recognition of the high degree of defence cooperation with Australia, Canada, and the UK, expanded the legal definition of the U.S. National Technology and Industrial Base (NTIB) to include Australia and the UK – in addition to Canada, which had been included previously. This legislation mandates that the Department of Defence works to **reduce barriers to defence industrial integration** between the four countries (including their respective industrial bases) that make up the NTIB.
- In order to facilitate such integration of the NTIB, the US Department of Defence and its NTIB partners, the Department of Defence of Australia, the Department of National Defence of Canada, and the UK MOD, working with other US government departments and agencies, are cooperating in practical areas related to our respective defence industrial bases. Such cooperation is intended to provide better **support to the warfighter,**

**strengthen and build resilience in our respective industrial bases, and enhance innovation to facilitate greater integration** of the NTIB including on:

- Eliminating barriers to the flow of knowledge, goods, and services between the governments, industry, and academic and research institutions of the United States, Australia, Canada, and the United Kingdom.
- Consultation and information-sharing for technology and industrial base policies.
- Promoting increased coordination on export control, technology, and industrial base planning issues; and
- Continued regular engagement through bilateral and multilateral engagement pathways.

The Strategy also highlighted measures shared under the NTIB on security screening of Foreign Direct Investments (FDI):

... supported the exemption of Australia, Canada, and the UK from the US Foreign Investment Risk Review Modernization Act (FIRRMA) FDI legislation under the Committee on Foreign Investment in the United States (CFIUS). In addition, companies from NTIB nations operating under a Special Security Agreement are no longer required to obtain National Interest Determination (NID) waivers for certain types of proscribed information, removing a key barrier for trusted and secure companies.

## United States

### National Technology and Industrial Base

The US National Technology and Industrial Base (NTIB) was established under US legislation (10 U.S.C. §4801) to:

... support national security objectives of the United States, including **supplying military operations; conducting advanced R&D and systems development to ensure technological superiority of the U.S. Armed Forces; securing reliable sources of critical materials; and developing industrial preparedness to support operations** in wartime or during a national emergency.

The NTIB involves security and dual-use research and development, production, maintenance and other related activities by the US, Canada, the UK, Australia and New Zealand. In its March 2023 Primer on the NTIB, the Congressional Research Service noted:

Some officials from the United States and other NTIB member countries have stated that, while increased cooperation continues to be a priority of NTIB members, **the industrial bases are not meaningfully unified, and falls short of the aspiration of seamless integration** called for in the FY2017 NDAA [National Defence Authorization Act].

There have been calls for greater integration of the NTIB by overhauling related legislation and regulations. For instance, many:

... reform proposals have advocated changing or modifying **provisions of the ITAR to extend the Canadian licensing exemptions to all NTIB members**—particularly given the scale of defense-industrial cooperation necessary for implementation of the Australia-United Kingdom-United States (AUKUS) security pact. Others have argued for **tightening these policies to promote domestic industry**.

## The Space Value Chain and how it intersects with AUKUS

Launch activity is a key enabler in the space value chain, linking the ground-based manufacturing and development of satellites to space-based delivery of applications to customers. Pre-launch activities occur separately for launch vehicles and payloads and include research and development, component development and manufacturing, and satellite applications. Each component is developed across a global supply chain, where the satellite, launch vehicle and bus operator could all be in separate countries. The global distribution of the supply chain means that once ready each component must be transported from its manufacturing location to the launch location, at significant cost. As a result, manufacturers prefer to be located close to launch locations to reduce cost. This means that a space port can attract and enable investment in, and development of manufacturing, satellite mission control and other space related downstream industries.

Once each component arrives at the launch location, teams will commence work assembling, integrating, and testing to ensure that each component is ready for launch. Depending on the size of the rocket and payload this can take up to 9 months to get the payload ready for launch. Following launch, when the payload has reached its orbit, the mission is handed to the operator of the satellite, where it will begin to provide applications for its intended customer, such as Defence, government, or broader society. Enabling large and small launches in Australia through a Sovereign facility could lower costs for satellite manufacturers both in Australia and Asia, helping to further catalyze growth within the industry and supporting Australia's modern manufacturing initiative.

The technology enablers identified in AUKUS Pillars I and II draw comparison to the Space Industry and can potentially translate meaning resources and capability can be shared across industries. Moreover, the goal of Pillar II is to collaborate on advanced capabilities that will involve broad technology and information sharing, in order to keep up with increasing geopolitical competition. It aims to boost development and interoperability across cutting-edge technologies like robotic and autonomous underwater vehicles, quantum technology, artificial intelligence (AI), advanced cyber capabilities, hypersonics, and electronic warfare. This will span the entire research and development process, from design to deployment. Pillar II has already made notable progress. For example, military and civilian personnel from all three countries participated in a trial for aerial and ground vehicles that saw the first interchange of AI models between nations and AI-enabled assets operating in a swarm to detect and track targets. Most recently, the Biden administration announced that it is pursuing interim executive branch actions and proposing legislative changes to facilitate defense trade between the AUKUS partner nations in order to accelerate progress.

However, establishing a resilient and robust space industry ecosystem is an enormous, complex task requiring a significant degree of international collaboration on sensitive technologies—making AUKUS a prime medium for elevating such cooperation. The United States increasingly recognizes

the need to support and scale international allies and their space capabilities as to deepen interoperable architectures and build resilient space systems.

Previously the sole preserve of a few governments, the space industry is now heavily dependent on commercial operators. SpaceX operates approximately one-half of all satellites in orbit, followed by OneWeb Satellites and Planet Labs. The proliferation of satellites and access to space is largely due to improvements led by the commercial launch sector over the past decade. In 2020, the global space industry's value reached an estimated \$424 billion, expanding 70% since 2010.

The technology centric trilateral AUKUS agreement could elevate space cooperation and build mutually beneficial space capabilities. One can already see space-related momentum in agreements on complementary technologies such as quantum computing, artificial intelligence, and hypersonics. For the United Kingdom, space cooperation and improving interoperability via AUKUS would support its recent designation of space as part of its Critical National Infrastructure. The 2022 UK Defense Space Strategy underscored Britain's desire to be "at the heart of Allied space efforts." The United States would profit from shared uplift in capabilities of the United Kingdom and Australia, which could for example become capable of reconstituting mutually beneficial space-based assets in the event of a crisis. This includes global navigation satellite systems that provide vital position, navigation, and timing services used for all forms of transportation, the finance industry, agriculture, emergency management and more. Additionally, via AUKUS, these partners can investigate opportunities to improve and streamline space "innovation cycles and co-development processes" for building mutually reinforcing capabilities in times of crises. These could include common satellite technologies.

AUKUS may be able to take steps to boost space resilience against military or natural crises by ensuring that the countries maintain minimum viable capabilities across key elements of the space industry supply chain. This could include focusing on elements required to reconstitute vital space-based assets, as well as systems for disaggregating and complementing existing capabilities. This process should include AUKUS governments working together to incorporate new and emerging technology firms into the space industry supply chain.

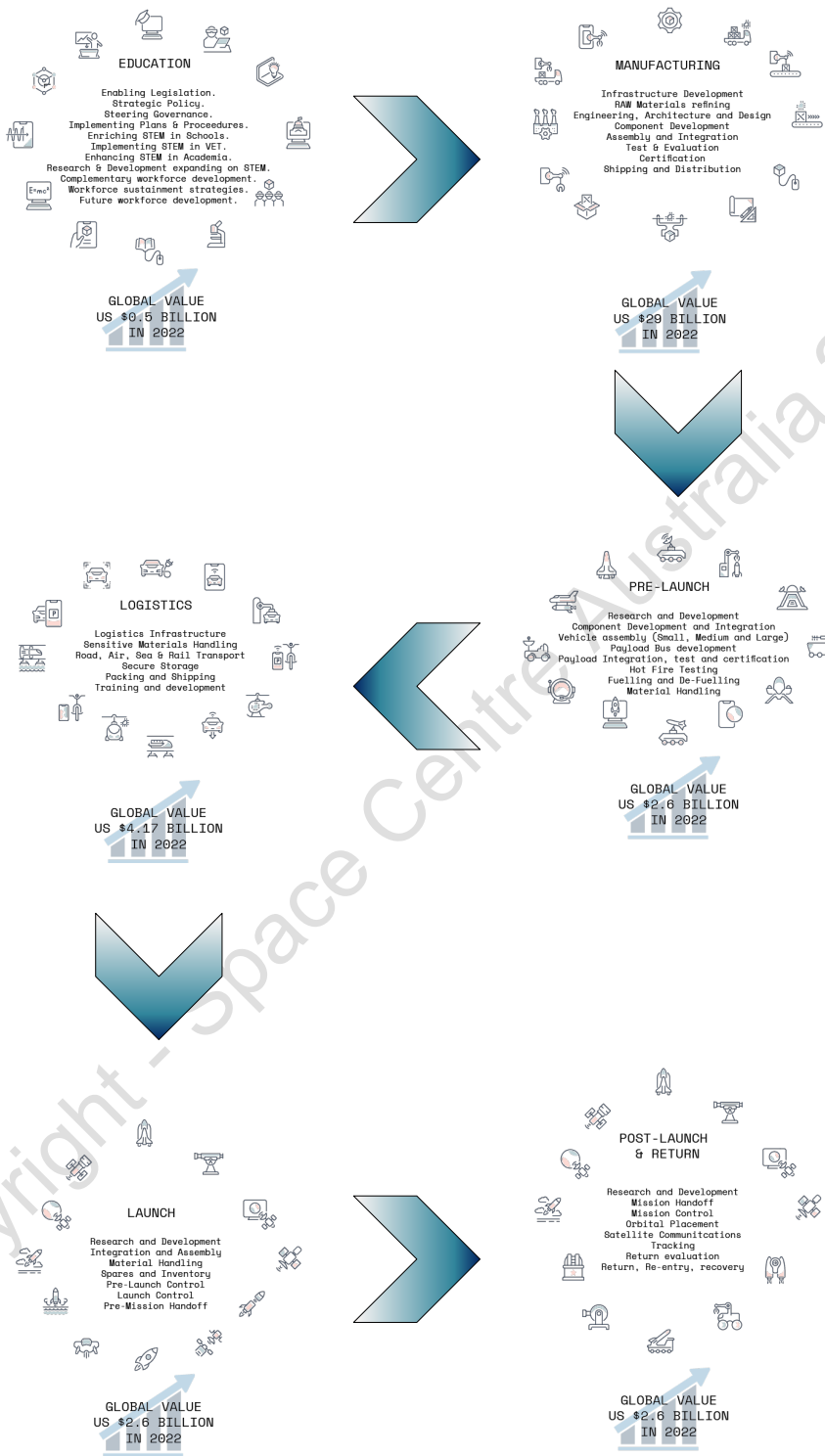


Figure 1 - Space Industry Value Chain

## Export control law in the US

Strict US trade control restrictions on military items that come under the AUKUS agreement are spelled out in the United States's International Traffic of Arms Regulations (ITAR) which implement the US Arms Export Control Act (AECA).<sup>7</sup>

As part of the *Arms Export Control Act of 1976 (AECA)*, ITAR prohibits the export of 'defense services', 'defense articles' and/or 'technical data' to foreign persons without authorisation. The ITAR, as currently enacted, enforces the retention of US intellectual property and control over which countries can gain access to sensitive information and technology that is central to the US warfighting capability.

Additionally, the establishment of the Technology Safeguards Agreement (TSA) between the US and Australia, noting the US and UK already have a TSA in place, explicitly addresses the transfer of US launch technology to Australia and the UK providing the required assurances to support each country's international obligations towards non-proliferation under the Missile Technology Control Regime. However, the TSA does not address the necessary and desired Defence collaboration on ITAR export controlled, advanced technology required to support the AUKUS ambitions.

In March 2023, a State Department official reported that the Department did 'not anticipate any challenges in implementing AUKUS due to US export control regulations'.

However, in May 2023, Dr Mara E. Karlin, Assistant Defense Secretary for Strategies, Plans, and Capabilities, identified two major changes in the US system to enable AUKUS:

1. improving the US industrial base
2. reforming export control laws.

### Proposed legislative changes

A number of US think tanks, export control experts and senators have called for changes to US legislative requirements to ensure timely implementation of Pillar I.<sup>8</sup>

In March 2023, the US House of Representatives passed a bill requiring the State Department and Pentagon to provide lawmakers with information about the approvals needed for AUKUS.

In late May 2023, US President Joe Biden in a joint statement with Prime Minister Anthony Albanese, announced the US would amend its laws to streamline technology sharing with Australia under the AUKUS agreement. Supporters of fast-track ITAR exemptions for Australia in the US Congress include Rep. Joe Courtney, D-Conn., who wrote an op-ed on ITAR exemption for Australia.

---

<sup>7</sup> William Greenwalt, Tom Corby, 'Breaking the barriers: Reforming US export controls to realise the potential of AUKUS', United States Studies Centre, 16 May 2023.

<sup>8</sup> Lauren Sanders, 'AUKUS is supposed to allow for robust technology sharing. The US will need to change its onerous laws first', *The Conversation*, May 2023.



In May, Dr Karlin stated that Secretary of Defense Lloyd Austin, as an interim measure, has directed Pentagon officials to create a series of 'sprint teams' aimed at facilitating 'seamless and secure information sharing and capability cooperation with AUKUS partners'.

Similarly, Assistant Secretary of State for Political-Military Affairs Jessica Lewis said in testimony to the House Committee on Foreign Affairs that the top priority of the Department of Defense was to adopt 'new and open ways' to 'increase technology sharing' between the AUKUS partners.

Lewis supported an interim trade authorisation mechanism which involved 'new exemptions to licensing requirements' and unrestricted transfer of unclassified and classified US Defence articles and services between the AUKUS countries without needing authorisation and would not be subject to case-by-case reviews. To facilitate the degree of integration required, Lewis further stated that AUKUS partners would need to establish 'shared standards for secure Defence trade involving defense information and materials'. The House Committee on Foreign Affairs, chaired by Rep. Michael McCaul, R-Texas, is currently engaged with the proposed trade authorisation mechanism. Representative McCaul indicated that the Committee would consult with the US Armed Services Committee as well. In late July, the US Senate adopted more than 50 non-controversial amendments in the 2024 Defense Authorization Bill. One amendment allows for rapid prototyping authority for the military services to be used in rapid response to emerging threats at a cost of under US\$300 million. A different amendment specifies criteria for when Australia can be certified to receive Virginia-class submarines from the U.S. Navy as per the AUKUS alliance.<sup>9</sup>

As these initiatives may take time to be passed and implemented, a report by experts from the United States Studies Centre (USSC) states:

Antiquated legal and regulatory settings and a mindset that discounts the value of allied inputs into collective strategies threaten the realisation of the AUKUS agenda to its fullest potential.... Current US export control processes are undermining AUKUS nations to build, operate and maintain adequate numbers of existing weapons systems and platforms, as well as to develop new ones.

The AUKUS and Defence industrial-relevant legislative amendments in US Congress (some of which have now been passed) include:

- Australia and the UK to be listed as 'domestic sources' for the purposes of Title III of the Defence Production Act of 1950, alongside Canada, which is granted access to US assistance in the form of loans, loan guarantees, purchase commitments, the provision of equipment, and related measures' without meeting ITAR requirements.
- The TORPEDO Act (Truncating Onerous Regulations for Partners and Enhancing Deterrence Operations Act 2023), alongside adding Australia and the UK as 'domestic sources', would also ease restrictions and fast-track acquisition. Methods available to the Australian DoD include via the Foreign Military Sales (FMS), Direct Commercial Sales (DCS), and government-to-government cooperation agreements and cooperative programs.

---

<sup>9</sup> Tony Bertuca, 'Senate adopts new weapons amendments in defense bill', *Inside Defense*, 19 July 2023.

These methods were also covered in the legislation passed by the US Congress in July 2023 known as the AUKUS Trade Authorization Mechanism (ATAM).

- The AUKUS Undersea Defence Act, which follows the above two Bills, was introduced into Congress by US Congress Representatives Joe Courtney, Gregory Meeks, and Ami Bera in June 2023. It is to facilitate the authorisation and transfer of Virginia-class nuclear submarines from the US to Australia and the training of Australian personnel on the vessels, as well as proposing other exemptions. Under the Act, approving Australia's exemptions from ITAR would be contingent upon its export control system meeting US standards. According to Piper Alderman:
  - Section 3 of the Bill permits the transfer of 2 Virginia-Class submarines from the US Navy's inventory, with Australia being required to reimburse the United States for any costs incurred in doing so.<sup>10</sup>
  - Section 5 of the Bill would permit the transfer or export to the Australian Government of 'defence services' (e.g. furnishing assistance, technical data and training to foreign persons), as broadly defined under section 120.9 of ITAR, which may also be directly exported to Australian private-sector personnel, to support the development of the Australian submarines and associated industrial base.
  - Section 4 in the Bill, if enacted, would allow for the US to accept monetary contributions from Australia.

In all of the above reform activities, it is important for Australia to ensure that a broad spectrum of technology and services, including space technologies and space launch, is included in order to effectively support AUKUS implementation in full and without friction.

## US National Industrial Security Program (NISP)

Similarly to Australia and the UK, the US National Industrial Security Program Oversight was:

... established by Executive Order 12829 to ensure that cleared U.S. defence industry safeguards the classified information in their possession while performing work on contracts, programs, bids, or research and development efforts.

DCSA [Defence Counterintelligence and Security Agency] administers the NISP on behalf of the Department of Defence and 34 other federal agencies. There are approximately 12,500 contractor facilities are cleared for access to classified information under DCSA's security oversight responsibilities. DCSA provides field personnel, Government Contracting Activities (GCAs) and cleared contractors with timely, consistent policy guidance and to provide effective interpretation of the NISP.

---

<sup>10</sup> Provisions to enable this are made in section 21 of the AECA, and also under the *Atomic Energy Act of 1954*.

## US International Armaments Cooperation

US International Armaments Cooperation activities are underpinned by a legal and policy framework that covers 'research, development, testing and evaluation (RDT&E), procurement, and sustainment partnerships between the US Department of Defense (DOD) and foreign governments, militaries, or commercial entities'. IAC projects are often bilateral or multilateral MoU arrangements. As the Congressional Research Service (CRS) describes:

Unlike Foreign Military Sales (FMS), IAC activities are not structured around a buyer-seller relationship. Instead, all participants typically provide resources (i.e., funds, personnel, facilities, or information) in return for a share of the project's outcomes (e.g., new or improved technologies).

As such, it is likely the AUKUS arrangements (Pillar I and Pillar II) will involve extensive IAC activities. The CRS noted:

Congress may consider the extent to which dedicated oversight and additional appropriations may be necessary, both to support the efficacy of AUKUS efforts and to limit negative impacts on U.S. readiness (particularly given current capacity limitations of the U.S. submarine industrial base) or other congressional priorities.

As noted by several commentators, US export control law and International Traffic in Arms Regulations (ITAR) may impede the export and transfer of technologies, which may be military and dual-use, and the information required to build them, to Australia.

As noted by the CRS, IAC activities as part of AUKUS involving the US export control regime, in particular the ITAR, may be impeded. Members of Congress have argued that:

... existing restrictions impede IAC efforts by delaying project development and execution, creating administrative burdens, and deterring U.S. and partner organizations from initiating projects. On the other hand, proponents of current export restrictions argue that they protect critical technology and prevent defence transfers that could harm U.S. interests. At least two bills have been introduced in the 118th Congress that aim to modify defence export controls by relaxing legal and administrative requirements for certain security cooperation activities (H.R. 1093 and S. 1471).

Some practical examples include where Australian companies seeking to obtain a license to import US technologies on the ITAR list may face time delays caused by compliance requirements including security vetting, limited information or technology access, and monitoring and reporting.

For example, ITAR regulations may be triggered to protect commercial data and intellectual property agreements, which may prevent Australian companies from incorporating these technologies into other items and exporting them to other countries.

Moreover, where Australian engineers must 'remilitarise' commercial items and technologies which are transferred from the US to Australia, further delays may be incurred in maintenance programs for key US-origin capabilities (e.g. US aircraft used by the Australian military).<sup>11</sup>

Many Australian firms (e.g. small to medium-size companies) are also concerned that US constituents may 'hoover up' partners' niche technologies rather than foster genuine collaboration. This can cause 'defense articles' with Australian foundational intellectual property which are incorporated into the US military with State Department licenses to be prevented from re-transfer or re-export by US export control processes.<sup>12</sup> Failure to meet US ITAR obligations may expose users to US criminal law.

Moreover, there are ongoing concerns in the Australian Defence industry that Australian firms may be hampered in their ability to create a sovereign industrial capability and resilient supply chains due to a perceived 'imbalance' in the number and scale of contracts being issued to multinational firms. In particular relation to Pillar II, Australian firms may seek intellectual property protections and incentives for Australian (ITAR-free) products in autonomous systems, quantum computing, space-based surveillance, and advanced radars already in existence or in rapid development.<sup>13</sup> This may include permitting commercial derivative ITAR-free products using US-origin technology to be incorporated into autonomous undersea capabilities (e.g. drones).

The authors of the USSC report called for a two-step approach. The first would be a US presidential executive order to ensure Australia is granted a blanket ITAR exemption as a priority to enable export of AUKUS-related military technology. To avoid vacillation in Congress, a follow-up step would cement the interim reforms to US export controls, which would be 'essential to achieving the nature and scale of US export control reforms required to make AUKUS a reality'.

A further potential impediment involves the capacity in the production and maintenance at both Royal Navy and US Navy shipyards. As the AUKUS program will put additional pressure on US and UK submarine programs, it will exacerbate pre-existing backlogs and increase operational pressures on other SSNs available for deployment.

The Federation of American Scientists (FAS) finds that the US plans two SSN force profiles: either a minimum of 46 boats in FY2030 and 60, 69, or 63 boats by FY2053; or 66 boats in FY2049 and 69 boats by FY2053. The Australian Strategic Policy Institute (ASPI) estimates a US SSN force of as many as 72–78 boats by the 2040s. This is separate from the priority program to replace 14 Ohio-class SSBNs (nuclear-powered and nuclear-armed ballistic missile submarines) with 12 new Columbia-class SSBNs.

---

<sup>11</sup> Due to technology transfer delays, the United Kingdom has considered withdrawing from the F-35 Joint Strike Fighter program in 2005 licences for technologies (e.g. radars, software, paint) have caused cost overruns; development restrictions; and supply chain additions. In the case of maintenance of British submarines, delays have been caused by lagging approvals for State Department export licences to new contractors working on UK Navy piers.

<sup>12</sup> During the Iraq and Afghanistan conflicts in the 1990s and 2000s, Australia and the UK were adversely affected by the lack of capacity in the US industrial base and US export control restrictions. Canada's prior arrangements with the US allowed streamlined production of Defence articles, as compared to the UK and several other allies. The UK, Australia among other countries, transferred counter-improvised explosive (IED) technology to the US with no strings attached, only for this technology to be tainted by ITAR export contamination despite the majority of the intellectual property being of foreign origin. This prohibited the retransfer to these same allies without a State Department license.

<sup>13</sup> These include the Ghost Shark extra-large autonomous underwater vehicle (Anduril Australia), passive Low Earth Orbit (LEO) space radars developed (Silentium Defence), among other products created by Australian companies. Lockheed Martin's development of Australia's Joint Air Battle Management System and Boeing Australia's Ghost Bat unmanned aerial vehicle (UAV) are both being developed without ITAR. Some Australian companies are withholding their technologies from US military services due to ITAR and intellectual property control issues.

Considering the current production delays in the US program for attack SSNs, 23 Republican Senators, including Republican Senate leader Mitch McConnell, wrote a letter to US President Joe Biden in July 2023 identifying the risk posed by AUKUS to US Navy efforts to grow and maintain its own submarine fleet for Asia-Pacific deterrence against potential adversaries. As Congress still needs to approve the sale of the Virginia-class submarines to Australia, the signatories are proposing that it only do so without compromising their own national capabilities. Australia could be committing significant resources to a deal that has yet to be finalised.

Moreover, Kurt Campbell, the White House Indo-Pacific coordinator, told the Center for Strategic and International Studies (CSIS) in June 2023:

When submarines are provided from the United States to Australia, it's not like they're lost. They will just be deployed by the closest possible allied force.

In short, the use of Australia's sovereign conventionally armed nuclear attack submarine capability will be strongly and primarily influenced by defence and deterrence objectives of the United States in the Indo-Pacific region.

## Australia

### Export Controls

The Australian Defence industry could significantly benefit in the way of mutual trade in the pre-approved list of equipment and technologies with the US, the UK (and possibly Canada).

Despite the AUKUS agreement, Australian firms would still not be allowed to trade in pre-approved equipment or technologies with countries beyond the AUKUS partners, however, and security vetting and data protection requirements would remain in force.

As Piper Alderman find, any further transfer of the relevant 'defense services' would also still be subject to the AECA's restrictions; meaning that ITAR would still apply for the re-transfer of 'defense services' between the Australian Government and persons not directly exported to from the United States.

Under the AUKUS agreement Australia's own export laws will also remain in effect. In Australia, licenses are required to allow items or information on the Defence and Strategic Goods List to be supplied, published or brokered for sale to another country.

Unlike the US, which requires end-use monitoring of such equipment via ITAR obligations, Australia does not seek to retain control over re-sales of equipment containing Australian controlled technology to third countries. Nor does Australia have country-specific bans for the trade of Defence items, and it manages each export application on a case-by-case basis. This approach currently contravenes US ITAR requirements and, therefore, Australia would need to review and formalize a framework similar to the US, or define an alternative mutually agreed approach, in order for the US to permit US modification of ITAR and AECA restrictions for Australia.

Currently, Australia is drafting updates to its Defence Trade Controls Act (2012) to amend its export control system, including the incorporation of artificial intelligence for undersea warfare. These amendments will demonstrate how Australia balances US expectations for compatibility in Defence control systems, and Australia's interests in a sovereign Defence industry and its own trade

partnerships. Australia needs to use this opportunity to draft updates to ensure complementary sectors, such as space and space launch, are fully addressed to provide a workable base for AUKUS Pillar II technologies.

The USSC report notes that the Australian government could leverage or withhold niche technology advantages or other alliance-relevant assets, including aspects of the Australia-US force posture initiatives, to put it in a better position to bargain for US export control reforms.

The USSC report further advocates that an Australian-developed ITAR-free system could mean that Defence articles can be directly exported to any country Australia approves without first getting permission from the United States – the reverse scenario of which would be unthinkable.

## Defence Industry

To support the AUKUS program, Australia may need to reform its policy and legislative framework to expand Australia's industrial base.

As stated in the *2020 Defence Strategic Update*, Australia is undergoing a step-change in its ability to shore up its regional capability advantage and its desire to increase investment in sovereign Defence capabilities. However, Australia's broader industry policy apparatus and manufacturing industry has withered as compared to better supported counterparts in other countries.<sup>14</sup>

Defence's industry policy development capabilities are limited, and reforms to scale up industry to meet the demands of AUKUS are required. Scaling up requires finance, which can only be assured through a combination of investor-return and strategic government objectives.

Historical examples of rapid industrial development models have typically involved government-driven industrial planning and direct investment through controlled lines of credit. Beyond short-term profitability, state-determined preferential treatment of targeted firms in specific sectors, and scaled-up production of identified technical capabilities, may support rapid industrial development in Australia.

Alongside a reformed taxation policy (raising taxes or cancelling the promised stage three tax cuts), the Economic section of the USSC recommended that the Australian government seek the support of Australia's \$4 trillion private investment sector and domestic banks. Rather than government signaling demand to industry and relying on acquisition-based grants and contracts, the USSC notes that Defence could adopt the Pentagon model of drawing loans from a large national network of

---

<sup>14</sup> Such preferential treatment has been given to industries and firms that demonstrate export success. Germany in the 1930s, the United States in the 1940s, Japan in the 1950s and South Korea in the 1970s. South Korea, for example, which had a GDP equivalent to Guatemala in the 1970s, has attained greater technological advances and productivity gains than Australia through careful economic planning and well-designed and consistently delivered industry policies. It is now in the top ten weapons exporting nations in the world (as also indicative of its Land 400 Phase 3 project in Australia and rumoured potential acquisition of AUSTAL).

funds to incentivise public-private partnerships. In doing so, Australia could avoid a politically unpopular austerity policy while overcoming significant barriers to the AUKUS program.<sup>15</sup>

Part of this is already identified in the Integrated Investment Program (IIP) which is intended for publication in late 2024, which is further explained in relation to AUKUS Pillar I and II in the 'Defence' Budget Review 2023.

## NON-NUCLEAR SUBMARINE AND PILLAR II ASPECTS IN AUKUS

Beyond specific requirements of nuclear propulsion technology, the AUKUS program requires the maintenance and operation of other sensitive technologies that are installed on the nuclear-powered submarines or support their regional coordination and operations projection.

Pre-existing US-Australia co-development projects (e.g. Mk48 torpedo and Boeing Australia's Ghost Bat UAV to the US Air Force), and Australia's Guided Weapons and Explosive Ordnance (GWEO) enterprise, all require technology sharing between the two countries. The USSC report states that agreements with European munitions manufacturers have established technology transfer programs with production lines within much shorter time frames than the US.

### Pillar I – Pillar II synergies

Pillar II exceeds the scope of traditional defence capability sharing and requires buy-in from commercial industry, supply chains and broader society to enable its success. It involves shared bureaucratic, legal, and practical infrastructure to identify skills gaps and supply chains. And it must support sustained advanced technology sharing across critical technologies as exemplified in the AUKUS Innovation Initiatives program - all of which are at various stages of development.<sup>16</sup> Commentators have noted the lack of publicly available information about Pillar II. A Centre for Strategic and International Studies publication notes that:

Yet despite the significance of Pillar Two—and in contrast to Pillar One—little information has been released to date on its content and progress beyond lists of topics and names of working groups. Pillar Two was not even mentioned during the AUKUS leaders' announcement in March.<sup>17</sup>

---

<sup>15</sup> For example, the Defence Export Strategy based on recommendations from the Joint Standing Committee on Foreign Affairs, Trade and Security, utilised Australia's export culture and trade promotion infrastructure to grow Defence exports.

<sup>16</sup> The Pentagon has requested a \$25 million for a new-start program to drive the development of underwater drones, artificial intelligence and other emerging technologies for operations associated with AUKUS. The five projects in the program are: \$10 million to develop payloads for unmanned underwater vehicles; \$6 million to purchase commercial space data; \$5 million to support a new cloud based AUKUS AI Development Hub; \$3 million to conduct a series of engineering and architecture studies supporting the integration of existing and future AUKUS capabilities; and \$1 million for a project that will concentrate on enhanced battlespace awareness.

<sup>17</sup> J Christianson, S Monaghan and D Cooke, *AUKUS Pillar Two: Advancing the Capabilities of the United States, United Kingdom, and Australia*, Centre for Strategic and International Studies, 10 July 2023.

In the Joint Leaders statement announcing AUKUS, Pillar II was initially comprised of undersea capabilities, quantum technologies and artificial intelligence (AI). An official fact sheet released in April 2022, following the AUKUS leaders-level meeting, noted the inclusion of four additional areas in the advanced capabilities Pillar: hypersonic and counter-hypersonic capabilities; electronic warfare; innovation; and information sharing.

The most obvious synergy with the nuclear-powered submarines is undersea (and anti-submarine) capabilities, particularly developing autonomous underwater vehicles through the AUKUS Undersea Robotics Autonomous Systems (AURAS) project, which aims to begin initial trials and experimentation in 2023.

ASPI's Malcolm Davis writes about the significance of these technologies:

Winning the undersea warfare battle in coming decades isn't just about submarines, be they nuclear or conventionally powered, but instead will depend on how crewed platforms such as submarines work with networked sensors and autonomous platforms in a "system of systems".<sup>18</sup>

Australia was already developing autonomous undersea systems when AUKUS was announced, and, when developed, this will likely be integrated with AUKUS submarines. The Royal Australian Navy's RAS-AI Strategy 2040 (Robotics, Autonomous Systems and Artificial Intelligence) states that the plan supports:

Navy's contribution to Australia's trilateral cooperation on undersea capabilities, artificial intelligence and autonomy and acceleration of our innovation enterprise, including ways to more rapidly integrate commercial technologies into maritime capability.

A specific aspect of this approach was announced on 5 May 2022 by the Minister for Defence:

The Morrison Government is pursuing a new autonomous robotic undersea warfare capability for the Royal Australian Navy (RAN) to complement its submarine and surface fleet.

Defence and Anduril Australia will co-fund a program to design, develop and manufacture Extra Large Autonomous Undersea Vehicles (XLAUV) in Australia for capability assessment and prototyping.

Through the co-funded arrangement, the RAN, Defence Science and Technology Group and Anduril will produce three prototype XLAUVs over the next three years resulting in a manufacture ready XLAUV. The program will also incorporate Australian Small to Medium Enterprises (SMEs).

---

<sup>18</sup> Malcolm Davis, *AUKUS requires rapid expansion of autonomous undersea warfare systems*, The Australian, 30 October 2021.



The prototype vehicle has been named the Ghost Shark and the current Minister for Defence Industry has said that it 'could complement what we're doing with our nuclear propelled submarines and our surface fleet.'

The AUKUS Quantum arrangement is another part of Pillar II which might have an impact on the submarines:

Quantum technologies: The AUKUS Quantum Arrangement (AQuA) will accelerate investments to deliver generation-after-next quantum capabilities. It will have an initial focus on quantum technologies for positioning, navigation, and timing. Together, we will integrate emerging quantum technologies in trials and experimentation over the next three years.<sup>19</sup>

The use of quantum computing is summarised in an article from the US *National Defence* journal.

Quantum computing has the potential to solve problems that may be intractable for traditional computers and offer enhanced capabilities for a range of applications such as sensing, communication and decryption, said James Andrew Lewis, director of the strategic technologies program at the Centre for Strategic and International Studies.

Meanwhile, Australia "ranks eighth globally for quantum research impact" and "has notable strengths in its civilian quantum sector," said Jennifer Jackett, a non-resident fellow in the foreign policy and Defence program at the Australia-based United States Studies Centre.

These quantum advances in Australia's civilian sector "could be harnessed for military applications in areas like computing, cryptography, sensing and logistics management," Jackett wrote in a July 2022 analysis titled "Laying the Foundations for AUKUS: Strengthening Australia's High-Tech Ecosystem in Support of Advanced Capabilities."

The Australian military "has sought to capitalize on these strengths by growing engagement with industry and academia to provide insight into capability requirements, signal market opportunities, and support collaboration," she wrote.<sup>20</sup>

Of course, this is couched in general terms, and this is true of most things written about AUKUS and quantum or artificial intelligence. The three countries have participated in testing the use of AI in controlling a swarm of aerial drones but such cooperation is still in its earliest phase. As a recent article on the ASPI Strategist puts it:

To be sure, the AUKUS partners have yet to demonstrate proof of concept for Pillar 2. But at the very least, the testing of an AUKUS artificial intelligence and autonomy capability in the United Kingdom in April certainly demonstrated **proof** of life in the Pillar 2 enterprise.

---

<sup>19</sup> *Fact Sheet: Implementation of the Australia – United Kingdom – United States Partnership (AUKUS)*, Prime Minister's Office United Kingdom, 5 April 2022.

<sup>20</sup> J Luckenbaugh, *Special report: AUKUS Countries Team Up to Develop Key Quantum Capabilities*, *National Defence*, 17 February 2023.

Pillar II logically extends beyond AI, autonomous and quantum technologies. To fully implement AUKUS regional operations projection, space technologies and space launch capability is integral to Pillar II. Capability sharing and development in the space sectors across AUKUS partners is needed to ensure responsive and resilient support for the submarine fleet. Australian efforts to explicitly address space technologies and space launch capability should be a high priority.

## AUKUS EDUCATION, TRAINING, RECRUITMENT

To ensure Australia's safety, success and credibility as a nuclear-submarine operating nation, the development of core skills and competencies are required to maximise efficiencies in the near and longer terms. Unlike in the UK or US, which have developed nuclear and submarine industries in tandem, Australia will significantly invest in human capability to support the AUKUS program without a guaranteed life-long career pathway in a broader civil nuclear industry.

On 22 March 2023, Defence Minister Richard Marles announced that \$6 billion would be invested over the next 4 years in skills and development. In the first phase of the AUKUS project – training and capacity building – the Australian Government will develop a comprehensive AUKUS Submarine Workforce and Industry Strategy for delivery to the Australian Defence Force (ADF). The Strategy is anticipated to involve an estimated 20,000 jobs over 30 years across industry, the ADF and the Australian Public Service (APS), comprising education, training and skills in nuclear science.

There are an estimated 8,000 direct jobs in the industrial workforce dedicated to the nuclear propelled submarine fleet.<sup>21</sup> More than double the personnel required for the current Collins class submarines will be required for the new submarines. RAN is already short of submariners for its six Collins-class boats, which each require 58 crew. A major recruitment and training effort will be required for the three to five Virginia Block IV or equivalent submarines, which require a crew of 132 each, and for the future SSN AUKUS boats.

While recognising the difficulty in harnessing engineers with nuclear training and recruiting 200 subject matter experts at the requisite security levels, it has been recommended that RAN grow its Marine Engineering workforce. It is estimated that it can take at least 16 years from entry as a submarine engineering officer to a chief engineer. An engineering trainee in the UK nuclear submarine industry receives military and then employment training over several years. The US places greater demands on qualification (SQEP) at greater cost in training and crewing.

Australians have already commenced training and working on UK Royal Navy and US Navy nuclear-powered submarines which share similar reactor technology and operating procedures, in specialised courses in the UK and US which includes secondment of personnel to gain experience with BAE or with General Dynamics Electric Boat and Huntington Ingalls Industries, and in UK and US facilities and shipyards.<sup>22</sup> As outlined in *Budget paper no. 2 (2023-24, pp. 94-5)*, the Department

---

<sup>21</sup> As part of the Submarine Rotational Force-West US and UK presence in Western Australia, Australians have begun training and working on UK and US nuclear-powered submarines, and in UK and US facilities, in preparation for the arrival of Australia's Virginia class submarines. In South Australia, preparations are underway to design and build the new submarine construction yard in North Osborne, Adelaide. National engineering and technology facilities are also underway.

<sup>22</sup> In the US, House Armed Services Committee lawmakers established the Australia-U.S. Submarine Officer Pipeline Act for a 'joint training pipeline' between the US and Royal Australian navies. The program will see two RAN submariners receive

of Education (DESE) will support 4,000 additional higher education places in STEM disciplines, including at least 800 places for South Australian universities. Courses in nuclear engineering and nuclear science are now being offered at many Australian universities. And a dedicated Skills and Training Academy managed by the South Australian government will deliver specialised education, training and skills for the dedicated submarine workforce.

Further in *Budget paper no. 2* (2023-24, p. 96), the Department of Employment and Workplace Relations (DEWR) committed to building a dedicated Defence vocational skills taskforce, involving the Australian Naval Infrastructure Pty Ltd (ANI) for early-stage design and works on the North Osborne submarine construction yard. To improve recruitment and retention of generational skills of Australian submariners, while avoiding career dead-ends, 'brain drain' and wasted investment, clear career portfolio pathways have been recommended (e.g. increased flexibility, cross-industry training and re-training, and multiple career pathways).

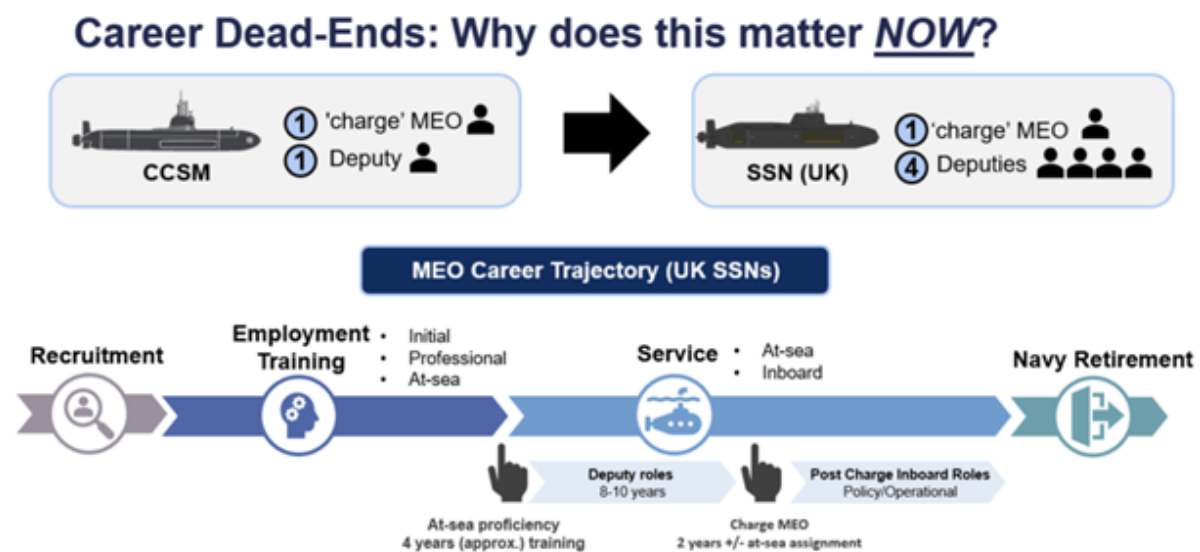


Figure 2 - UK Submarine Service Marine Engineering officer career trajectory

Source: Alan Rose, 'Viewpoint: AUKUS submarines and the challenges of having enough skilled people', *Asia-Pacific Defence Reporter*, 15 March 2023. Pillar II advanced technologies and support ecosystems for resilient and responsive operations of the nuclear submarine fleet require detailed consideration for complementary and interleaved education, training, and significant workforce development. This is required across all complementary ecosystems including AI, quantum, cyber, advanced communications, advanced manufacturing and space technologies and launch.

---

education and training in the Submarine Officer Basic Course at the US Navy's submarine school each year, to maximise efficiency for future exercises on shared submarines.

# REGULATION OF SPACE ACTIVITIES IN AUSTRALIA

The Space (Launches and Returns) Act 2018 (the Act) establishes a system for regulating space activities in Australia or by Australian nationals outside Australia. The following activities need approval under the Act:

- launching a space object from Australia
- returning a space object to Australia
- launching a space object overseas (for Australian nationals with an ownership interest)
- returning a space object overseas (for Australian nationals with an ownership interest)
- operating a launch facility in Australia
- launching a high-power rocket from Australia.

## Complying with Australian regulations

Three sets of rules support the Act. The rules include application requirements for space and high-power rocket activity approvals:

- Space (Launches and Returns) (General) Rules 2019
- Space (Launches and Returns) (High Power Rocket) Rules 2019
- Space (Launches and Returns) (Insurance) Rules 2019.

The rules refer to these documents:

- Flight Safety Code
- Maximum Probable Loss Methodology.

## Enforcing regulations

The Act includes civil penalties for offences such as:

- not holding a licence, permit, authorisation or authorisation certificate in certain circumstances
- breaching a condition associated with a licence, permit, authorisation or authorisation certificate.

## Complying with international space treaties

Australia has ratified all 5 space treaties:

- **Convention on International Liability for Damage Caused by Space Objects**
- **Convention on Registration of Objects Launched into Outer Space**
- **Treaty on Principles Governing the Activities of States in the Exploration and Use of Outer Space, including the Moon and other Celestial Bodies**
- **Agreement Governing the Activities of States on the Moon and other Celestial Bodies**
- **Agreement on the Rescue of Astronauts, the Return of Astronauts, and the Return of Objects Launched into Outer Space.**

## REGULATION OF NUCLEAR ACTIVITIES IN AUSTRALIA

The current Commonwealth regulatory framework for nuclear activities is complex, with different aspects managed or regulated by different departments and agencies, and with specific activities approved by different Ministers or designated persons. Importantly however, the regulatory framework is designed to support Australia's civil nuclear industry which is focused on medical, agriculture and industrial applications, and the mining of uranium for export for peaceful purposes (including remediation of mining sites).

In the May 2023–24 Budget, the government provided:

- **\$87.2 million over two years** from 2023–24 to support **initial regulatory activities and the development of regulatory standards and frameworks**, and non-proliferation safeguards arrangements for the nuclear-powered submarine program, including:
  - \$25.2 million over two years from 2023–24 for the Australian Radiation Protection and Nuclear Safety Agency [ARPANSA] to conduct **nuclear licensing activities** and provide advice and services
  - \$21.9 million over two years from 2023–24 for the Australian Safeguards and Non-Proliferation Office to support the establishment of non-proliferation and safeguards arrangements with the International Atomic Energy Agency
  - \$16.3 million over two years for the Australian Nuclear Science and Technology Organisation [ANSTO] to support **radiological baselining and monitoring**, and provide advice on the safe implementation of nuclear technology
  - **\$7.9 million in 2023–24** for the [newly established Australian Submarine] Agency to support the establishment of the **Australian Nuclear-Powered Submarine Safety Regulator** and **develop associated nuclear regulatory standards and frameworks**
  - \$7.6 million over two years from 2023–24 for the Department of Climate Change, Energy, the Environment and Water [DCCEE] to conduct the

environmental regulation and assessments required under relevant environmental legislation

- \$5.2 million over two years from 2023–24 for the Australian Radioactive Waste Agency [ARWA] within the Department of Industry, Science and Resources to support the development of radioactive waste management, storage and disposal arrangements with the Department of Defence and the Agency
- \$3.1 million over two years from 2023–24 for the Department of Health and Aged Care to provide radiation health and safety advice and **support the review of national regulatory arrangements**.<sup>23</sup> [hyperlinks added]

The government also provided \$2.4 million over two years from 2023–24 for the Attorney-General's Department to provide **legal and policy advice** for the nuclear-powered submarine program, including for the development of relevant treaties and international agreements.

In evidence to a recent Senate Inquiry, the CEO of the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) indicated that 'it can take anywhere from three to five years to do a significant review of regulations in Australia'.<sup>24</sup>

A key component of any such review would be the extent to which the international regulatory framework and corresponding domestic regulatory framework applies to nuclear activities undertaken for military 'non-peaceful purposes'.

## International regulatory framework

The International Atomic Energy Agency (IAEA) is an agency of the United Nations established by Statute agreed at the Conference on the Statute of the International Atomic Energy Agency in October 1956. The Statute came into force on 29 July 1957. The objectives of the IAEA are as follows:

The Agency shall seek to accelerate and enlarge the contribution of atomic energy to peace, health and prosperity throughout the world. It shall ensure, so far as it is able, that assistance provided by it or at its request or under its supervision or control is **not used in such a way as to further any military purpose**.<sup>25</sup> [emphasis added]

Article III sets out the functions of the IAEA, including:

5. To establish and administer safeguards designed to ensure that **special fissionable and other materials**, services, equipment, facilities, and information made available by

---

<sup>23</sup>. Australian Government, *Budget measures: Budget paper no. 2, 2023–24*, 95.

<sup>24</sup>. Dr Jillian Hirth (CEO, ARPANSA), Evidence to Senate Environment and Communications Legislation Committee, Inquiry into the Environment and Other Legislation Amendment (Removing Nuclear Energy Prohibitions) Bill 2022 [Provisions], Proof Committee Hansard, 15 May 2023, 54.

<sup>25</sup>. *Statute*, Article II.

the Agency or at its request or under its supervision or control are **not used in such a way as to further any military purpose**; and to **apply safeguards, at the request of the parties, to any bilateral or multilateral arrangement**, or at the request of a State, to any of that State's activities in the field of atomic energy.<sup>26</sup> [emphasis added]

The Director General of the IAEA, Rafael Mariano Grossi, recently wrote:

A new nuclear power program is a major undertaking requiring **careful planning, preparation and investment in time, institutions and human resources**. A decision to start a nuclear power program should be based on a commitment to use nuclear power **safely, securely and peacefully**. The commitment includes joining all the relevant international legal instruments; this being a normative expectation of IAEA Member States. The **international legal frameworks establish minimum obligations and provide a means of assurance of safety and security**. Current new-build experience shows the importance of developing a sound national nuclear infrastructure, including **a comprehensive and effective legislative and regulatory framework**. It is **important that the legal frameworks be robust to ensure that level so safety or security remain high**.<sup>27</sup> [emphasis added]

The international nuclear law framework comprises conventions, codes and declarations addressing four main 'pillars' – **safety, security, safeguards and liability**.<sup>28</sup> While some international conventions impose legally-binding obligations on Contracting Parties, the framework also includes 'legally non-binding instruments and standards of conduct which have a powerful norm-creating effect'.<sup>29</sup>

## Nuclear safety

Numerous international conventions, codes and declarations have been agreed relating to nuclear safety. These include:

- Convention on Early Notification of a Nuclear Accident.<sup>30</sup> The Convention 'establishes a notification system for nuclear accidents from which a release of radioactive material occurs or is likely to occur and which has resulted or may result in an international transboundary release that could be of radiological safety significance for another State'. Reporting of incidents, including relating to 'any nuclear reactor wherever located', are mandatory,<sup>31</sup> while notification of 'other nuclear accidents' is optional.<sup>32</sup>

---

<sup>26</sup>. *Statute*, Article III.5.

<sup>27</sup>. Rafael Mariano Grossi, 'Nuclear Law: The Global Debate', Chapter 1 in IAEA, *Nuclear Law: The Global Debate*, (Vienna, Austria: IAEA), 2022, 47.

<sup>28</sup>. Rafael Mariano Grossi, 'Nuclear Law: The Global Debate', 2.

<sup>29</sup>. Rafael Mariano Grossi, 'Nuclear Law: The Global Debate', 5.

<sup>30</sup>. ATS [1987] 14 (entered into force for Australia 23 October 1987).

<sup>31</sup>. Articles 1–2.

<sup>32</sup>. Article 3.

- Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency.<sup>33</sup> The Convention sets out a framework for cooperation to facilitate prompt assistance and support in the event of nuclear accidents or radiological emergencies. States are required to 'notify the IAEA of their available experts, equipment and materials for providing assistance'.
- Convention on Nuclear Safety.<sup>34</sup> The scope of the Convention is limited to land-based civil **nuclear installations** (nuclear power plants and associated infrastructure until such time as a decommissioning plan has been approved by the relevant regulatory authority).<sup>35</sup> The Convention requires Contracting Parties to establish domestic legislative, regulatory or administrative measures to implement the matters referred to in the Convention, including the establishment of a regulatory body and a regulatory framework focused on nuclear safety (from siting, design and construction, operation, radiation protection, to assessment and verification of safety). The Convention also requires Contracting Parties to provide regular reports on their implementation of obligations under the Convention. The Convention recognises and respects that certain relevant information may be protected due to industrial or commercial confidentiality or national security.
- Vienna Declaration on Nuclear Safety.<sup>36</sup> Agreed in 2015 following the Fukushima Daiichi nuclear disaster, the *Vienna Declaration* adopted principles to guide the implementation of the objective of the Convention on Nuclear Safety, namely, to prevent accidents with radiological consequences and to mitigate those consequences. Among other matters, the Declaration calls for 'comprehensive and systematic safety assessments to be carried out periodically and regularly' and for adherence to relevant IAEA Safety Standards, with national reports under the *Convention on Nuclear Safety* to demonstrate compliance.
- *Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management (Joint Convention)*.<sup>37</sup>

The [Joint] Convention applies to spent nuclear fuel resulting from the operation of civilian nuclear reactors and to radioactive waste resulting from civilian applications. It also applies to spent fuel and radioactive waste from military or Defence programs if such materials are transferred permanently to and managed within exclusively civilian programs, or when declared as spent fuel or radioactive waste for the purposes of the Convention by the Contracting Party concerned.<sup>38</sup>

---

<sup>33</sup>. ATS [1987] 15 (entered into force for Australia 23 October 1987).

<sup>34</sup>. ATS [1997] 5 (entered into force for Australia 24 March 1997).

<sup>35</sup>. Article 2(i).

<sup>36</sup>. *Vienna Declaration on Nuclear Safety on principles for the implementation of the objective of the Convention on Nuclear Safety to prevent accidents and mitigate radiological consequences*, agreed at the Diplomatic Conference to consider a proposal to amend the Convention on Nuclear Safety, Vienna: Austria, 9 February 2015.

<sup>37</sup>. ATS [2003] 21 (entered into force for Australia 3 November 2003).

<sup>38</sup>. 'Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management', IAEA. See Article 3(3).



The Preamble to the *Joint Convention* states:

*Recognising that **spent fuel and radioactive waste** excluded from the present Convention because they are within **military or Defence programs** should be managed in accordance with the objectives stated in this Convention.*<sup>39</sup>

The *Joint Convention* requires Contracting Parties to establish and maintain a legislative and regulatory framework to govern the safety of spent fuel and radioactive waste management.<sup>40</sup> It also requires Contracting Parties to 'take the appropriate steps' to establish and implement procedures for the siting, design and construction, safety assessment (including environmental impact assessment), operation (including under license) of spent fuel facilities and radioactive waste management facilities. The aims of the *Joint Convention* include avoiding the imposition of undue burdens of future generations (for the management of spent fuel and radioactive waste).<sup>41</sup> The *Joint Convention* also requires the submission of regular reports for 'peer review'.<sup>42</sup>

## Nuclear security

Numerous international conventions and codes have been agreed relating to nuclear security. These include:

- Convention on the Physical Protection of Nuclear Material.<sup>43</sup> The Convention (as amended in 2005, with effect from 2016) aims to 'achieve and maintain worldwide effective physical protection of nuclear material for peaceful purposes and of nuclear facilities used for peaceful purposes; to prevent and combat offences relating to such material and facilities worldwide; as well as to facilitate co-operation among States Parties to those ends'.<sup>44</sup> The Convention applies to 'nuclear material used for peaceful purposes in use, storage and transport and to nuclear facilities used for peaceful purposes'.<sup>45</sup>

Article 2(5) provides 'the Convention **does not apply to nuclear material used or retained for military purposes or to a nuclear facility containing such material**'. The Convention provides that States may determine that certain material does not fall within the scope of the Convention, wherein such material is to be 'protected in accordance with prudent management practice'.<sup>46</sup>

- International Convention for the Suppression of Acts of Nuclear Terrorism.<sup>47</sup> The Convention 'provides for a definition of nuclear terrorism', requires alleged offenders to be either extradited or prosecuted, and encourages States to cooperate in preventing terrorist attacks. The definition of

---

<sup>39</sup>. *Joint Convention*, Preamble (viii).

<sup>40</sup>. Article 19.

<sup>41</sup>. Article 4(vii).

<sup>42</sup>. Article 32.

<sup>43</sup>. ATS [1987] 16, (entered into force for Australia 22 October 1987). *Amendment to the Convention on the Physical Protection of Nuclear Material*, done on 8 July 2005, ATS [2016] 22 (entered into force for Australia 8 May 2016).

<sup>44</sup>. Article 1A (as added by the 2005 Amendment).

<sup>45</sup>. Article 2 (as replaced by the 2005 Amendment).

<sup>46</sup>. Article 2A(4)(b) (as added by the 2005 Amendment).

<sup>47</sup>. ATS [2012] 13 (entered into force for Australia on 15 April 2012).

‘nuclear facility’ extends to reactors installed on vessels, however, the Convention does not apply to the activities of armed forces during armed conflict.<sup>48</sup>

- *Code of Conduct on the Safety and Security of Radioactive Sources of 2003 (and its two supplementary Guidance documents, Supplementary Guidance on the Import and Export of Radioactive Sources and Supplementary Guidance on the Management of Disused Radioactive Sources)*.<sup>49</sup> The *Code of Conduct* seeks to ensure that national policies, laws and regulations – supported by international co-operation – achieve and maintain a high level of safety and security of radioactive sources and prevent unauthorised access or damage to, and loss, theft or unauthorised transfer of, radioactive sources, so as to reduce the likelihood of accidental harmful exposure or malicious use of such sources. The *Code of Conduct* sets out normative standards for domestic regulatory systems.

The *Code of Conduct* however does not apply to radioactive sources within military or Defence programs or to nuclear material as defined in the *Convention on the Physical Protection of Nuclear Material*, except for sources incorporating plutonium-239.<sup>50</sup>

## Nuclear safeguards regime<sup>51</sup>

Under Pillar I of the AUKUS agreement, Australia would be the first Non-Nuclear Weapons State (NNWS) party to the 1970 Treaty on the Non-Proliferation of Nuclear Weapons<sup>52</sup> (NPT) to acquire weapons-grade fissionable material<sup>53</sup> and naval nuclear propulsion reactors outside of safeguards for the military purpose – albeit non-explosive – of operating nuclear-powered submarines. It is also the first time since the 1958 UK-US Mutual Defence Agreement that the US has agreed to transfer its naval nuclear reactor technology to another country.<sup>54</sup>

According to the IAEA, nuclear-powered submarines, their reactors, fuel, technology and inherent infrastructure and activities, are for military or non-peaceful activities – ‘non-peaceful use’.<sup>55</sup> The Australian Government has emphasised that it will continue to comply with the provisions of the NPT and the IAEA framework and that it has no intention of possessing nuclear weapons. The Government has also assured that it will not equip nuclear submarines with nuclear weapons.<sup>56</sup> All

---

<sup>48</sup>. Article 1(3)(a) and Article 4(2).

<sup>49</sup>. Australia has submitted a statement of political commitment to the Code of Conduct and the two Supplementary Guidance documents.

<sup>50</sup>. *Code of Conduct*, 4.

<sup>51</sup>. The material in this section draws on Emily Gibson and Adam Broinowski, ‘Defence Legislation Amendment (Naval Nuclear Propulsion) Bill 2023’, *Bills Digest*, 81, 2022–23, (Canberra: Parliamentary Library, 2023).

<sup>52</sup>. *Treaty on the Non-Proliferation of Nuclear Weapons*, ATS [1973] 3 (entered into force for Australia 23 January 1973). At the time of writing there are 93 Signatory States and 191 States Parties to the Treaty.

<sup>53</sup>. Victor Bragin, John Carlson and Russell Leslie, ‘The Categorisation of Nuclear Material in the Context of Integrated Safeguards’, Australian Safeguards and Non-Proliferation Office, (Canberra: DFAT, 2014). ‘Weapons-grade uranium usually refers to pure uranium metal at very high enrichment levels, produced in enrichment plants designed and operated for this purpose (... WGU comprises 93% or more U-235)’: p. 1.

<sup>54</sup>. Claire Mills, *UK-US Mutual Defence Agreement*, Standard Note, (London: House of Commons Library, 2014).

<sup>55</sup>. Director General, ‘IAEA safeguards in relation to AUKUS – Report by the Director General’, IAEA Board of Governors, 9 September 2022.

<sup>56</sup>. Richard Sadleir, Resident Representative of Australia to the IAEA, ‘IAEA Board of Governors Meeting, Agenda Item 5: Transfer of Nuclear Materials in the context of AUKUS and its safeguards in all aspects under the NPT’, 29 September 2021; Penny Wong, ‘AUKUS won’t undermine Australia’s stance against nuclear weapons’, *Guardian*, 23 January 2023.

Three-Party States to the AUKUS agreement have committed to ensuring that the highest non-proliferation standards are met, and that they would negotiate from their respective positions on IAEA safeguards.<sup>57</sup>

The NPT is based on the three pillars, with Pillar I as the primary aim and Pillars II and III intended to serve Pillar I. The pillars are: nuclear non-proliferation (Pillar I), nuclear disarmament (Pillar II), and the right to peacefully use nuclear energy (Pillar III).

**Articles I to IV** of the NPT are of most relevance to naval nuclear propulsion.

**Articles I and II** seek to prevent the proliferation of nuclear weapons beyond the existing signatory Nuclear Weapons States (NWS) by prohibiting a NWS from aiding the acquisition or supply of nuclear weapons to any other entity and prohibiting a Non-Nuclear Weapons State (NNWS) from acquiring nuclear weapons or their supporting technologies.

**Article III** sets out the requirements for a comprehensive safeguards and verification regime 'with a view to preventing diversion of nuclear energy from peaceful uses to nuclear weapons or other nuclear explosive devices'. It applies to 'all source or special fissionable material' and 'in all peaceful nuclear activities within the territory of such State, under its jurisdiction, or carried out under its control anywhere' (emphasis added).<sup>58</sup>

Under **Article III** of the NPT, the IAEA is entrusted with key responsibilities as the international safeguards inspectorate. As stipulated in the IAEA Statute, Article II (Objectives), the IAEA is prohibited from being involved to 'further any military purpose'.<sup>59</sup> The IAEA has a specific verification role in accordance with legally binding agreements between the IAEA and State Parties. For the Agency to draw conclusions that all nuclear material remained in peaceful nuclear activities,<sup>60</sup> it must verify the non-diversion of declared nuclear material and also provide assurances as to the absence of undeclared nuclear material and activities in a State. Verification includes monitoring using a register of nuclear material and facilities, containment and surveillance mechanisms, and on-site inspections and visits.

---

57. U.S. Mission UNVie, 'Non-Paper on Nuclear Propulsion Cooperation under AUKUS', U.S. Mission to International Organizations in Vienna, 26 November 2021.

58. Key terms are defined as: 'Nuclear material' means: any source or any special fissionable material as defined in Article XX of the Statute of the IAEA. The term source material shall not be interpreted as applying to ore or ore residue. Any determination by the Board under Article XX of the Statute after the entry into force of this Agreement which adds to the materials considered to be source material or special fissionable material shall have effect under this Agreement only upon acceptance by the State; and 'Facility' means: (a) a reactor, a critical facility, a conversion plant, a fabrication plant, a reprocessing plant, an isotope separation plant or a separate storage installation; or (b) any location where nuclear material in amounts greater than one effective kilogram is customarily use.

59. 'The Statute of the IAEA', IAEA, Article II Objectives, 5.

60. 'Drawing safeguards conclusions', IAEA.

Australia's safeguards agreements are:

- Agreement between Australia and the International Atomic Energy Agency for the Application of Safeguards in connection with the Treaty on the Non-Proliferation of Nuclear Weapons (1974)<sup>61</sup> (Comprehensive Safeguards Agreement (CSA), based on INF/CIRC153 1972)
- Protocol Additional to the Agreement between Australia and the International Atomic Energy Agency for the Application of Safeguards in connection with the Treaty on Non-Proliferation of nuclear weapons (1997)<sup>62</sup> (Additional Protocol (AP), based on INFCIRC/540 1997).

**Article III** does not require the imposition of safeguards in the transfer or withdrawal of nuclear material for a 'non-proscribed, non-peaceful nuclear activity' as stipulated in the safeguards agreement intended as complementary to Article III, in Paragraph 14 of INFCIRC/153 (Corr.) and in the equivalent Article 14 of INFCIRC/271 for Australia's safeguards agreement (CSA).

**Article IV** permits all Parties to the *NPT* to have the right to develop research, production and use of nuclear energy for peaceful purposes, and have the right to exchange equipment, materials and scientific and technological information for the peaceful uses of nuclear energy. *NPT* parties have the responsibility to implement **Article IV** in a way that also 'ensures against abuse of the right to develop peaceful uses of nuclear energy' and the Treaty establishes no right to receive any particular nuclear technology from other States Party – and most especially, 'no right to receive technologies that pose a significant proliferation risk'.

A range of concerns have been raised about Australia's acquisition of nuclear-powered submarines. In particular there has been discussion of how to safeguard the transfer of military-grade nuclear reactors, highly sensitive nuclear propulsion technology,<sup>63</sup> and the Highly Enriched Uranium (HEU) (which is defined as special fissionable material within the terms of the *NPT*),<sup>64</sup> as well as their dismantling and disposal process.<sup>65</sup> These issues were explored in a recent Bills Digest.

The Director General of the IAEA issued a statement in March 2023 in which he indicated:

Article 14 of Australia's CSA allows Australia to use nuclear material which is required to be safeguarded under the CSA in a nuclear activity, such as nuclear propulsion for

---

61. [1974] ATS 16 (entered into force for Australia 10 July 1974). This is also known as the Australia-IAEA Comprehensive Safeguards Agreement (CSA). This is concluded on the basis of INF/CIRC153 1972. Today, the IAEA safeguards nuclear material and activities under agreements with more than 140 States.

62. [1997] ATS 28 (entered into force for Australia 12 December 1997). This is based on INFCIRC/540, The Model Protocol Additional to the Agreement(s) between State(s) and the International Atomic Energy Agency for the Application of Safeguards [1997].

63. The US and UK naval nuclear reactors use between 93 and 97 per cent purity of Uranium 235 for the life-of-ship cores. Australia's continuing access to HEU is dependent upon US and UK supply. As a further contingency in the AUKUS Pillar 1 agreement, nuclear expert Frank N. von Hippel indicates that the United States has until 2060 to switch its naval propulsion systems to Low Enriched Uranium (LEU) naval fuel, at which point its excess stock of HEU is projected to run out.

64. Bragin, 'The categorisation of nuclear material in the context of integrated safeguards'.

65. See, for example, 'China's Working Paper on the Nuclear Submarine Cooperation under AUKUS', IAEA Information Circular INFCIRC/1034, 12 September 2022; 'Naval Nuclear Propulsion: working paper submitted by Indonesia', 2020 Review Conference of the Parties to the Treaty on the Non-Proliferation of Nuclear Weapons, 25 July 2022. In particular, Indonesia urges IAEA member states to avoid 'the *dual use of nuclear and conventional military installations and weapon platforms* that can be armed with nuclear and conventional weapons' (emphasis added).

submarines, provided that Australia makes an arrangement with the Agency in this regard.

The required arrangement under Article 14 of Australia's CSA must be in strict conformity with the existing legal framework.<sup>66</sup>

The Director General's report indicates that Australia submitted 'preliminary design information for the planned new facilities related to its naval nuclear propulsion program' in March 2023.<sup>67</sup>

## Nuclear liability

Numerous international conventions have been agreed relating to nuclear liability. Australia is not a party to these Conventions, which typically apply to nuclear installations used for peaceful purposes and exclude 'nuclear installations' used for any means of transport. They are therefore not discussed further. These international conventions include:

- *Vienna Convention on Civil Liability for Nuclear Damage* and its *Optional Protocol*
- *Joint Protocol relating to the application of the Vienna Convention and the Paris Convention*
- *Convention on Supplementary Compensation for Nuclear Damage*.

## DOMESTIC REGULATORY FRAMEWORK

The Commonwealth regulatory framework for nuclear activities sits within, and draws from, an international framework which seeks to safeguard against the proliferation of nuclear material for non-peaceful purposes (that is, nuclear weapons and nuclear explosive devices) while supporting the development of nuclear technology for peaceful purposes, including civil nuclear energy.

Australia's domestic regulatory framework is based on a licensing and permitting system, wherein multiple licenses and permits may be required for the same or similar activities from multiple agencies covering different aspects of the nuclear fuel cycle.

Reforms to Australia's regulatory framework will need to extend across the full life cycle for nuclear-powered submarines. This means operating imported military submarine reactors from the UK which are incorporated into Australian-built submarines as permanently sealed units and which are fueled by High Enriched Uranium (up to 93%).<sup>68</sup> At the end of their operating life, the submarines may remain berthed for a prolonged period at an Australian naval port. When dismantling commences, all

---

<sup>66</sup>. Director General of IAEA, *Naval nuclear propulsion: Australia*, report by the Director General, IAEA Board of Governors, GOV/INF/2023/10, 31 May 2023, 3.

<sup>67</sup>. Director General of IAEA, *Naval nuclear propulsion: Australia*, 4.

<sup>68</sup>. Frank N von Hippel, 'U.S. shift away from HEU-fuelled naval nuclear reactors could begin in the 2040s', *Fissile Materials*, blog, 26 June 2019.

radioactive waste will be separated and graded, and then stored in repositories on Defence land in Australia.<sup>69</sup>

## Nuclear safety

### Australian Radiation Protection and Nuclear Safety Agency

The principle regulatory body responsible for radiation protection and nuclear safety in Australia is the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA), established by the *Australian Radiation Protection and Nuclear Safety Act 1998 (ARPANS Act)*. The Act aims to 'protect the health and safety of people, and to protect the environment, from the harmful effects of radiation'.<sup>70</sup>

The Act applies to *controlled persons*, defined as *Commonwealth entities* (which would include the Department of Defence), *Commonwealth contractors* and their employees, and persons in a *prescribed Commonwealth place*.<sup>71</sup> It also applies to *permitted persons*, who may be specifically authorised by the controlled person to do certain things.<sup>72</sup> It therefore does not apply to private entities or persons (other than *permitted persons*). The Act establishes a licensing system for *controlled facilities*, *controlled apparatus* and *controlled material*.<sup>73</sup> Licenses are granted by the Chief Executive Officer (CEO) of ARPANSA. Following amendments in July 2023, the CEO may issue a license that would authorise the construction or operation of a *nuclear installation* being a '**naval nuclear propulsion plant** related to use in a conventionally armed, nuclear-powered submarine'.<sup>74</sup>

The *ARPANS Act* states that the intention of Parliament is that the Act not exclude the operation of the *Nuclear Non-Proliferation (Safeguards) Act 1987* (see below) to the extent that that Act is capable of operating concurrently with the *ARPANS Act* and thus permits may be required under both Acts.<sup>75</sup> It also provides that a power, discretion, duty or function of a person may only be exercised to the extent that it is not inconsistent with Australia's obligations under the relevant international agreements.<sup>76</sup>

However, the *ARPANS Act* contains provisions that would allow the Chief of the Defence Force and the Director-General of Security to declare by legislative instrument that certain provisions of the Act do not apply in the specified circumstances.<sup>77</sup>

---

69. Richard Marles (Acting Prime Minister and Defence Minister), 'Transcript: Subjects: AUKUS', Canberra, 14 March 2023.

70. *ARPANS Act*, section 3.

71. *ARPANS Act*, sections 11 and 13.

72. *ARPANS Act*, section 11A.

73. *ARPANS Act*, sections 32 and 33.

74. *ARPANS Act*, subsection 10(1A). The Act was amended by the *Defence Legislation Amendment (Naval Nuclear Propulsion) Act 2023*, with the amendments commencing on 4 July 2023.

75. *ARPANS Act*, section 9.

76. *ARPANS Act*, section 84. Relevant international agreements are prescribed in section 85 of the Australian Radiation Protection and Nuclear Safety Regulations 2018.

77. *ARPANS Act*, sections 7 and 8.

## Minister for the Environment

The Minister for the Environment, as decision maker under the *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*, also has a role in nuclear safety. The *EPBC Act* establishes a regime for the environmental impact assessment and approval of actions (referred to as *controlled actions*) that has, will have or are likely to have a significant impact on matters of national environmental significance (MNES). *Nuclear actions* are one of the nine MNES.<sup>78</sup> It is an offence to take a nuclear action that has, will have or is likely to have a significant impact on the environment.<sup>79</sup> Nuclear actions include the establishment of a nuclear installation and the establishment of a large-scale disposal facility for radioactive waste.<sup>80</sup>

In brief, the *EPBC Act* requires a person proposing to take a nuclear action that has, will have or is likely to have a significant impact on the environment to refer the proposed action to the Minister for the Environment for consideration as to whether the action is a *controlled action*.<sup>81</sup> If the Minister decides that the action is a *controlled action*, the Minister will also determine the method by which the environmental impacts of the proposed action will be assessed.<sup>82</sup> The Minister may then make a decision to approve (or not) the action, with or without conditions.<sup>83</sup> The *EPBC Act* provides for a range of circumstances in which an approval may not be required, including exemptions for Defence and national security.<sup>84</sup>

Like the *ARPANS Act*, amendments to the *EPBC Act* in July 2023 clarify that the Minister can make a decision with respect to the *nuclear actions* involving a *nuclear installation* being a '**naval nuclear propulsion plant** related to use in a conventionally armed, nuclear powered submarine'.<sup>85</sup>

## Australian Radioactive Waste Agency

The Australian Radioactive Waste Agency (ARWA) was established by the *National Radioactive Waste Management Act 2012 (NRWM Act)* in July 2020 to manage all functions of the proposed National Radioactive Waste Management (NRWM) facility.<sup>86</sup> The NRWM facility is intended to be for the permanent disposal of low-level radioactive waste and temporary storage of intermediate-level waste, with a separate facility to permanently dispose of intermediate-level waste to also be established.<sup>87</sup>

---

78. *EPBC Act*, subsection 22(1).

79. *EPBC Act*, sections 21 and 22A.

80. *EPBC Act*, subsection 22(1).

81. *EPBC Act*, section 68.

82. *EPBC Act*, subsections 75(1) and 87(1). The Minister may also decide that the proposed action is clearly unacceptable (*EPBC Act*, section 74C) or may be taken in a particular manner (*EPBC Act*, section 77A).

83. *EPBC Act*, subsection 133(1) and paragraph 133(2)(f).

84. For example, *EPBC Act*, sections 146M, 158.

85. *EPBC Act*, subsections 37J(2), 140A(2), 146M(2), 305(2A). The Act was amended by the *Defence Legislation Amendment (Naval Nuclear Propulsion) Act 2023*, with the amendments commencing on 4 July 2023.

86. Department of Industry, Science, Energy and Resources, 'A new agency to manage radioactive waste', News, 21 July 2020.

87. 'Australian Radioactive Waste Agency', Department of Industry, Science and Resources.

That Act gives effect to Australia's obligations under the *Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management* which is concerned with civilian nuclear activities.<sup>88</sup> The *NRWM Act* adopts the definition of *controlled material* provided in the *ARPANS Act*; however, amendments to the Act in 2021 extended the application of the Act to *controlled material* that is generated as a result of activities that relate to the Defence of Australia.<sup>89</sup> The Act does not appear to apply to high-level radioactive waste.

With respect to the AUKUS program, the Department of Defence's SNN Pathway states:

... 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'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. ... All low- and intermediate-level radioactive waste will be safely stored at Defence sites in Australia.<sup>90</sup> (emphasis added)

Further:

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 is the most complex aspect of the submarine's lifecycle. It requires bespoke facilities, significant support infrastructure and a highly-experienced workforce. ...

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. ...

---

88. *Joint Convention on the Safety of Spent Fuel Management and on the Safety of Radioactive Waste Management*, [2003] ATS 21 (entered into force for Australia 3 November 2003). As outlined earlier, the Convention applies to civilian nuclear reactors and radioactive waste resulting from civilian applications and does not apply to military nuclear reactors and radioactive waste resulting from military activities unless so declared by the Contracting Party (Article 3). However, the Preamble notes an intention that the objectives of the Joint Convention should still apply.

89. *NRWM Act*, subsection 4A(3)(b).

90. Department of Defence, *The AUKUS Nuclear-Powered Submarine Pathway*, 2023, 41.



These activities will occur in a manner consistent with Australia's domestic and international legal obligations.<sup>91</sup> (emphasis added)

Following a decision of the Federal Court in July 2023 in relation to a decision of the selection of the site for the NRWM facility, the government has had to recommence work on alternative proposal for a suitable location.<sup>92</sup> It remains unclear whether the government will seek to combine the NRWM facility with a Defence facility providing permanent storage of high-level radioactive waste.

A crucial consideration in the design of a high-level radioactive waste management facility is nuclear safeguards and nuclear security (see below). The IAEA's publication, *Technological Implications of International Safeguards for Geological Disposal of Spent Fuel and Radioactive Waste*, provides more detail on continuing safeguarding of nuclear material.

## Key issues

On 6 May 2023, the Defence Minister announced the intention to establish the Australian Submarine Agency (ASA) and the Australian Nuclear-Powered Submarine Safety Regulator (ANPSSR).<sup>93</sup> The ASA (which was established on 1 July 2023) sits within the Department of Defence and is responsible for 'cradle-to-grave management' of the nuclear-powered submarines. The Minister for Defence has said 'the ASA will also enable the necessary policy, legal, non-proliferation, workforce, security and safety arrangements'.<sup>94</sup>

According to the Minister, the ANPSSR would 'have the functions and powers necessary to regulate the unique circumstances associated with nuclear safety and radiological protection across the lifecycle of Australia's nuclear-powered submarine enterprise', including associated infrastructure and facilities.<sup>95</sup> The Minister described the regulator as being 'independent of Defence and the Australian Defence Force'.<sup>96</sup> However, the media release states that both the ASA and ANPSSR will be non-corporate Commonwealth entities within the Defence portfolio and will report directly to the Minister for Defence.

The abovementioned amendments to the *ARPANS Act* [and *EPBC Act*] appear to have been intended to enable ARPANSA [and the Minister for the Environment] to 'in the short term to have a regulatory role in the area until Defence is able to establish the Defence nuclear submarine regulatory agency'.<sup>97</sup> Thus while 'ARPANSA [and the Minister for the Environment] will be part of a

---

<sup>91</sup>. Department of Defence, *The AUKUS Nuclear-Powered Submarine Pathway*, 42.

<sup>92</sup>. 'Decision on the National Radioactive Waste Management Facility (NRWMF) site', Department of Industry, Science and Resources, 23 August 2023.

<sup>93</sup>. Richard Marles, 'New agency and new regulator to deliver Australia's nuclear-powered submarine program', media release, 6 May 2023.

<sup>94</sup>. Richard Marles, 'New agency and new regulator to deliver Australia's nuclear-powered submarine program'.

<sup>95</sup>. Richard Marles, 'New agency and new regulator to deliver Australia's nuclear-powered submarine program'.

<sup>96</sup>. Richard Marles, 'New agency and new regulator to deliver Australia's nuclear-powered submarine program'.

<sup>97</sup>. Dr Gillian Hirth (Chief Executive Officer, ARPANSA), Evidence to Senate Environment and Communications Legislation Committee, Inquiry into Environment and Other Legislation Amendment (Removing Nuclear Energy Prohibitions) Bill 2022, 15 May 2023, 51.

system of regulation for the nuclear-powered submarine program', it is unclear to what extent this will remain the case once the new regulator is established.<sup>98</sup>

As noted above, the May 2023–24 budget provided funding to support the establishment of the ANPSSR. On 10 July 2023, the Department of Defence awarded EY a 12-month \$8.4 million contract 'to advise on the design of a future nuclear regulatory agency'.<sup>99</sup> The timeframe for introduction of legislation to establish the new regulator is unclear, however, a detailed analysis of any such legislation will be required with a focus on interactions between existing agencies and compliance with Australia's international obligations.

In an October 2022 letter to the CEO of ARPANSA, the Radiation Health and Safety Advisory Council (a statutory advisory Council established under the *ARPANS Act*) detailed a range of principles and attributes of an effective independent regulator for nuclear-powered submarines.

The Council stated (p. 2):

A fundamental element of an international best practice national radiation regulation framework is the operation and maintenance of a regulatory body with the legal powers and technical competence necessary. The regulatory body should be able to make decisions in line with its statutory obligations for the regulatory control of facilities and activities and be able to perform its functions without undue pressure or constraint.

Further (p. 3),

Council considers that it is crucial that any future public agency regulator of nuclear-powered submarines must have the confidence of and be trusted by the Australian public and international community. Such trust from the Australian public cannot be legislated for or earned quickly. Importantly, the trust placed in a regulator by the Australian community will enable it to respond efficiently and effectively at times of emergency and crisis. Internationally recognised capabilities of a nuclear industry regulator include:

- Clear and consistent regulation.
- Consistent and balanced decision making.
- Accountability.
- Strong organisational capability.
- Strong management systems.
- Strong leadership.
- Sufficiently qualified staff.
- Continuous improvement, peer review and international involvement.
- A risk-based approach.
- Authoritative science and science led.

---

98. Dr Gillian Hirth (Chief Executive Officer, ARPANSA), Submission to the Senate Foreign Affairs, Defence and Trade Legislation Committee inquiry into the Defence Legislation Amendment (Naval Nuclear Propulsion) Bill 2023, [Submission no. 3], May 2023, 1.

99. Matthew Knott, "'Unbelievable': Defence spends \$8.5m on consultants for AUKUS nuclear regulator', *Sydney Morning Herald*, 21 August 2023.

- Acknowledged legitimacy with the Australian public, government, and international peers; and
- Credibility, trust, and respect.

The Council also 'considers that there are challenges in Australia's federated and fragmented radiation regulatory system particularly as it relates to emergency preparedness, interstate transport, and logistics; and radioactive waste which are key aspects of any future nuclear regulatory activities' (p. 3).

The Council also noted that 'nationally integrated emergency management arrangements do not exist for large scale radiological or nuclear incidents. The infrequency of radiological or nuclear emergencies of significance within Australian jurisdictions means that the arrangements for this type of emergency have not been adequately tested, nor provided opportunity for reflection and review, limiting development and enhancement' (p. 4). The Council states Australia's emergency management arrangements 'are not fit for purpose for a future with nuclear powered submarines' (p. 4).

The UK and USA use different models for regulation of their civil and military nuclear programs. According to Westwood, Bamfield and Baily:

Australia has elected to have a single Australian Nuclear-Powered Submarine Safety Regulator (ANPSSR) to develop the tiered nuclear safety assurance model and regulatory structure essential for the management of its submarine fleet, and the build and permissioning of its new naval nuclear support facilities. This option, a separate Defence regulatory structure, which stands alone from the civil regulator, could be created as a direct copy of either the UK or US models, or a hybrid that learns from the lessons of each. Following the US Naval Reactors' model, a single regulator could be established to regulate all aspects of Defence nuclear operations along a prescriptive/standard setting approach; alternatively, a goal setting, permissioning approach could be implemented, similar to the UK's Defence Nuclear Safety Regulator (DNSR). Whichever methodology is adopted, Goals Based Regulation, Rules Based Regulation, or a combination, each will also need to consider the regulation of environmental impacts, the overlap with conventional health and safety legislation and the effect of federal and state legislation.

This single statutory nuclear regulator model, while attractive from the perspective of the regulated community (fewer regulatory personalities to manage), will bring interesting challenges. For example, regulation will be against legislation, therefore the legislation needs to be well-crafted to avoid complexity (see the first use of the UK's well-intentioned, but challenging to comply with, Radiation (Emergency Preparedness and Public Information) Regulations). In the UK, the DNSR has the ability to be more nuanced than the Office for Nuclear Regulation and can seek "outcomes as good as if legislation applied, so far as is reasonably practicable (SFAIRP)". The SFAIRP approach enables DNSR to take a pragmatic approach to regulation of the nuclear submarine enterprise, while liaising with ONR.<sup>100</sup>

---

<sup>100</sup>. Mark Westwood, Isaac Bamfield and Mike Baily, 'An evolving enterprise: setting AUKUS on the path to success', Beyond Engineering, SNC-Lavalin, n.d.

## Nuclear security

At Senate Estimates in May 2023, departmental officials indicated that current security requirements for Defence sites visited by UK and US nuclear submarines (that is, Fleet Base West at Garden Island), and on which Australia's nuclear submarines (once acquired) will be stationed, are largely adequate. However, officials indicated that 'in the longer term, ... we may consider other forms of protection required, such as increasing armed protection, we may look at legislative requirements'.<sup>101</sup>

## Defence sites

The *Defence Act 1903* sets out arrangements for the security of *Defence premises* (see Part VIA), being premises (including vessels) owned or occupied by the Commonwealth for use by the Defence Force or Department. This includes access control arrangements (such as a requirement to show identification) and offences (such as unauthorised access). Additional physical security arrangements are provided for the Woomera Prohibited Area (Part VIB of the *Defence Act*) and sites declared under the *Defence (Special Undertakings) Act 1952*.<sup>102</sup>

As noted above, the Department of Defence is consulting on reforms to Defence legislation, including these Acts (see p. 13 of the *Consultation paper*).

It is possible that amendments to existing arrangements under the *Defence Act* for the physical security of Defence sites on which nuclear-powered submarines may be constructed, sustained, stationed, and decommissioned may be necessary. Similarly, amendments may be necessary to provide for a future scenario in which high-level radioactive waste is permanently stored on a Defence site.

## Naval waters

The *Control of Naval Waters Act 1918* provides for the declaration of *waters* as *naval waters*. These are *waters* within 5 nautical miles (9.25 km) of a naval *installation* or 2 nautical miles (3.7 km) of *Defence land* on which there is not an *installation*. An *installation* includes a naval establishment, dock, dockyard, slipway, wharf or mooring owned or used by the Commonwealth.<sup>103</sup>

In March 2005, an area around HMAS Stirling, Garden Island, Western Australia, was proclaimed *naval waters* under the *Control of Naval Waters Act*.<sup>104</sup> In February 2019, areas adjacent to the

---

<sup>101</sup>. Senate Foreign Affairs, Defence and Trade Legislation Committee, Estimates, *Official Committee Hansard*, 30 May 2023, 90.

<sup>102</sup>. The *Defence (Special Undertakings) Act* appears to only apply to the Joint Defence Facility Pine Gap (see section 8A).

<sup>103</sup>. *Control of Naval Waters Act*, section 2.

<sup>104</sup>. *Control of Naval Waters Act 1918 – Proclamation*, Schedule 3, Item 2; subsequently repealed and remade as *Control of Naval Waters Act 1918 – Proclamation (14/12/2009)*, Schedule 3, Item 2 (with a revised area).

Henderson Australian Marine Complex in Western Australia and Techport Common User Facility at Osborne in South Australia were similarly proclaimed *naval waters*.<sup>105</sup>

The Act includes two strict liability offence provisions relating to the failure to comply with a direction of a superintendent in relation to *naval waters*, with the attendant penalty 10 penalty units (\$3,130).<sup>106</sup>

The Act also includes a wide-ranging regulation-making power that allows for the making of regulations relating to access or imposing conditions on vessels in, or aircraft in airspace over, proclaimed *naval waters*.<sup>107</sup> The Act limits penalties for breach of the Regulation to a fine not exceeding \$1,000 or imprisonment for 6 months.<sup>108</sup> The Control of Naval Waters Regulations 2015 contains a wide range of restrictions and associated penalties. Offences within the Regulation are specified as incurring a penalty of 5 or 10 penalty units.<sup>109</sup>

Noting interactions between the *Control of Naval Waters Act* and other Defence legislation (as outlined above), there would appear to be scope for amendments to the Act to update search, seizure and arrest powers and to increase penalties to reflect the seriousness of actions affecting the security of nuclear-powered submarines.

Consideration may also be required as to whether the current *naval waters* proclamations are adequate. Further, should an east coast submarine base be identified, it is likely that the Minister for Defence would request that the Governor-General make an appropriate proclamation of *naval waters* for that site.

## Nuclear safeguards regime

The Australian Safeguards and Non-Proliferation Office (ASNO), situated within the Department of Foreign Affairs and Trade, administers the *Nuclear Non-Proliferation (Safeguards) Act 1987* (*Safeguards Act*). The *Safeguards Act* gives effect to certain obligations under:

- *Treaty on the Non-Proliferation of nuclear weapons* (NPT)
- Australia's Comprehensive Safeguards Agreement (the *Agency Agreement*) and Additional Protocol with the IAEA
- bilateral agreements between Australia and various countries concerning the transfer of nuclear items (such as uranium ores) and cooperation in peaceful uses of nuclear energy<sup>110</sup>

---

<sup>105</sup>. Control of Naval Waters (Henderson and Osborne) Proclamation 2019, sections 5 and 6; see also Explanatory Statement, Control of Naval Waters (Henderson and Osborne) Proclamation 2019.

<sup>106</sup>. From 1 July 2023, the value of a penalty unit is \$313: Crimes (Amount of Penalty Unit) Instrument 2023.

<sup>107</sup>. *Control of Naval Waters Act*, section 4.

<sup>108</sup>. *Control of Naval Waters Act*, paragraph 4(1)(o).

<sup>109</sup>. Given the current value of a penalty unit, this would amount to \$1,565 or \$3,130, in both cases exceeding the legislative restriction on the maximum applicable penalty.

<sup>110</sup>. Also known as 'Australian Obligated Nuclear Material' (AONM). For a discussion on AONM, see, Director General Australian Safeguards and Non-Proliferation Office (ASNO), *Annual Report 2021–2022*, (Canberra: ASNO, 2022), 50.

- Amended Convention on the Physical Protection of Nuclear Material<sup>111</sup>
- International Convention for the Suppression of Acts of Nuclear Terrorism.<sup>112</sup>

Part II of the Act sets out requirements and procedures for applying for and the grant of permits for possession and transport of *nuclear material* or an *associated item*, or the establishment or decommissioning of certain facilities,<sup>113</sup> or the communication of information about *associated technology* to which the Part applies. Permits and authorities are granted by the Minister on the advice of the Director of Safeguards, although the Minister may also delegate his or her powers under the Act or regulations.<sup>114</sup>

However, Part II of the Act applies to *nuclear material* other than in respect of which a declaration under subsections 11(1) or (3) is in force, or for *nuclear material* exempted by the Nuclear Non-Proliferation (Safeguards) Regulations 1987. The Act adopts the meaning of several key terms in the Australia's *Agency Agreement* including *nuclear facility* and *nuclear material*, while defining *nuclear activities* as including the operation of a nuclear reactor.<sup>115</sup> It is possible that amendments to the Act may be necessary to adequately provide for Australia's safeguarding responsibilities under an agreement with the IAEA in relation the removal of nuclear material from safeguarding obligations in accordance with Article 14 of the Additional Protocol.<sup>116</sup> Such amendments might for example address reporting and transparency issues.

## CURRENT STATE AND TERRITORY PROHIBITIONS ON RADIOACTIVE WASTE MANAGEMENT

While the Minister for Defence has indicated that any intermediate radioactive waste would be stored 'in the current or future Defence estate', that is on Commonwealth land, it is useful to bear in mind that numerous states and territories have legislative bans on specific parts of the nuclear cycle, including radioactive waste storage, occurring within their jurisdictions.

In accordance with the *Australian Constitution*, however, the Commonwealth Parliament relevantly has the power to make laws with respect to Defence (s.51(vi)), external affairs (s.51(xxix)) and the power to acquire property on just terms (s.51(xxii)).<sup>117</sup> It also has the power to make laws in relation to a territory.<sup>118</sup> Further, when a law of a State is inconsistent with a law of the Commonwealth, the latter prevails, and the former is, to the extent of the inconsistency, invalid.<sup>119</sup>

---

<sup>111.</sup> *Amendment to the Convention on the Physical Protection of Nuclear Material*, ATS [2016] 22 (entered into force for Australia 8 May 2016); *Convention on the Physical Protection of Nuclear Material*, ATS [1987] 16 (entered into force for Australia 22 October 1987). The 1987 Convention is provided at Schedule 4 of the *Safeguards Act*.

<sup>112.</sup> *International Convention for the Suppression of Acts of Nuclear Terrorism*, ATS [2012] 13 (entered into force for Australia 15 April 2012).

<sup>113.</sup> *Safeguards Act*, paragraph 28A(1)(a) defines facilities as a nuclear facility, a facility for the carrying out of nuclear activities, or a facility for the use of associated equipment to which Part II applies.

<sup>114.</sup> The Director of Safeguards is a statutory position established by subsection 42(1).

<sup>115.</sup> *Safeguards Act*, subsection 4(1).

<sup>116.</sup> Director General of IAEA, *Naval nuclear propulsion: Australia*, report by the Director General, IAEA Board of Governors, GOV/INF/2023/10, 31 May 2023, 3.

<sup>117.</sup> See also *Lands Acquisition Act 1989*; 'Lands Acquisition Act 1989 (LAA)', Department of Finance.

<sup>118.</sup> *Australian Constitution*, section 122.

<sup>119.</sup> *Australian Constitution*, section 109.

Jurisdiction	Act and regulations
New South Wales	The <i>Uranium Mining and Nuclear Facilities (Prohibitions) Act 1986</i> prohibits the mining of uranium and construction and operation of certain nuclear facilities, including a nuclear waste storage or disposal facility. The Act specifically states that it does not prevent the construction or operation of a nuclear facility under a Commonwealth Act by ANSTO. The Act also does not prohibit the operation of a nuclear-powered vessel.
Northern Territory	The <i>Nuclear Waste Transport, Storage and Disposal (Prohibition) Act 2004</i> (NT) prohibits the construction and operation of nuclear waste storage facilities, as well as the transportation of nuclear waste for storage at a nuclear waste storage facility in the NT.
Queensland	The <i>Nuclear Facilities Prohibition Act 2007 (NFP Act)</i> prohibits the construction and operation of nuclear reactors and other facilities in the nuclear fuel cycle (except for the storage and disposal of waste from research or medical purposes). The Act does not prohibit the operation of a nuclear powered vessel.  The <i>NFP Act</i> provides for a plebiscite if the relevant Minister is satisfied that the Commonwealth is taking any step to support or allow construction of a prohibited nuclear facility in Queensland.
South Australia	The <i>Nuclear Waste Storage Facility (Prohibition) Act 2000</i> (SA) prohibits the construction or operation of a nuclear waste storage facility or the bringing into and transport of nuclear waste in South Australia (subject to exemptions). This Act also 'prohibits the government from expending public funds to encourage or finance the construction or operation of nuclear waste storage facilities'. <sup>120</sup>
Victoria	The <i>Nuclear Activities (Prohibitions) Act 1983</i> prohibits a range of activities associated with the nuclear fuel cycle, including the construction or operation of facilities for the conversion or enrichment of any nuclear material, nuclear reactors and facilities for the storage and disposal of nuclear waste from those prohibited activities. <sup>121</sup>
Western Australia	The <i>Nuclear Waste Storage and Transportation (Prohibition) Act 1999</i> (WA) also prohibits the storage, disposal or transportation in Western Australia of nuclear waste associated with a nuclear plan (e.g. nuclear reactor) or nuclear weapons. This Act also prohibits the expending of public funds for the purpose of, or to encourage or finance, the development, construction or operation of a nuclear waste storage facility or the use of any place in WA for such a facility. <sup>122</sup>

Table 1 - State and territory legislation relating to the disposal and storage of radioactive waste.

<sup>120</sup>. *Nuclear Waste Storage Facility (Prohibition) Act 2000* (SA), section 13; Government of South Australia, *Response to the Nuclear Fuel Cycle Royal Commission*, November 2016, 11 and 23.

<sup>121</sup>. *Nuclear Activities (Prohibitions) Act 1983* (VIC), sections 5, 6 and 8.

<sup>122</sup>. *Nuclear Waste Storage and Transportation (Prohibition) Act 1999* (WA), section 9.

## CONCLUSION

This is a complex and broad-ranging topic that has a multitude of components. Many questions remain unanswered due to the evolving nature of the AUKUS agreement which involves multiple partners, new technologies, security contingencies, and international political arrangements.

The approach adopted in this paper is to provide an overview of the AUKUS Pillars 1 (undersea capability) and 2 (advanced technology capability) the overlaps between them, intersects with other industries and the changes to existing legislative and policy arrangements that are implied in the AUKUS trilateral partnership. This approach also attempts to draw out specific consideration where AUKUS may intersect with the space industry.

It is clear that more work needs to be undertaken in areas of enabling and protecting governance, legislation, policy and process. Further, alignment with Commonwealth and State Legislation needs to be taken into account to ensure the AUKUS capabilities can transition smoothly into both Defence and Industry for sustainment and enhancement.

Drawing comparison between AUKUS and the Space Industry we observe there are a number of synergies between complementing technology enablers and co-dependencies between capabilities. Further, both the Space and AUKUS value chains can be seen to intersect in almost all areas. End state capability requires transportation mechanisms and in the case of AUKUS these capabilities will not be fully effective without a sustainable and viable transportation chain.

The historian Ferdinand Braudel once noted that *'transport is the necessary finishing process of production'*. Goods are not complete until they are in the hands of their ultimate users and have no value until they can get there.

In a similar sense, satellites are not complete until they are in space — the process of researching, designing, and building them is not really finished until they are launched. Further, the services they will provide — to consumers, corporations, and governments — cannot take place until the satellite is orbiting.

Launch, and ancillary services, are thus a pivotal step in the space value chain — a crucial component of the full ecosystem that makes up the space economy and further AUKUS.



## ABOUT THE AUTHORS



**James Palmer MEM, ComplEAust, EngExec**  
CEO – Space Centre Australia

As the founder of Space Centre Australia, James has over 20 years' experience as a Chartered Engineering Executive Leader. James began his career as a submariner in the Royal Australian Navy. During this time, he gained extensive experience in engineering vehicles to withstand hostile conditions, both deep underwater and in space. As Director and Owner of the Palm Branch Group, James specialises in project management, engineering, environmental science, land management, and space systems. James' educational achievements include a Master of Philosophy from the Queensland University of Technology, a Master of Business Administration from the University of South Australia, and a Master of Engineering Management from Southern Cross University.



**Karl Rodrigues**  
International Relations Director

Karl is the Director of International Relations and Investment for Space Centre Australia. Previously he was Executive Director for Engagement and Industry Growth for the Australian Space Agency where he negotiated frameworks for joint space programs and missions with International Space Agencies as well as engaging with Australian industry, start-ups, domestic agencies, research institutions and all state and territory governments to help grow the Australian space sector. Karl has over 25 years of experience in innovation, venture investment, research, development and commercialisation of technology.

Prior to the Agency, Karl was Deputy Director for CSIRO Energy responsible for the Business Unit strategy, science investment and operations. He delivered science impact, leadership and direction to the Business Unit including the creation of the Hydrogen Future Science Platform to create a new energy security and export opportunity for Australia. He also helped set up Main Sequence Ventures and was the CSIRO Representative on their Investment Committee.

Before Deputy Director, Karl held senior management roles across CSIRO including Project Director for the National Geosequestration Laboratory (NGL) where he was responsible for the successful delivery of a \$50M National Research Facility. Prior to that, he was the Executive Manager,

Licensing and Investment Management within CSIRO IP & Licensing and was responsible for managing CSIRO's spin-out initiatives from inception through to exit, including managing the CRC Engagement Office and the Australian Growth Partnership program.

Prior to CSIRO, Karl managed Intel Capital ANZ where he invested in several Australian and New Zealand companies and also enjoyed launching a number of start-up companies in Australia and South-East Asia.

Karl is passionate about innovation and start-ups and is an Adjunct Lecturer in Entrepreneurial Finance and Financing Innovation in the MBA programs for the Macquarie Graduate School of Management (MGSM) and the Sydney Business School (Sydney University).

Copyright - Space Centre Australia 2023