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Building Australia's AUKUS-ready nuclear workforce

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Abstract

Introducing nuclear-powered submarines will be one of the biggest workforce development challenges Australia has faced. It can be done, but it will need a new approach and there's no time to waste.[1]

Introduction

Good afternoon, everyone. I'd like to start by acknowledging the traditional owners of the land we meet on today, the Ngunnawal and Ngambri peoples, and pay my respects to their elders past and present. I'd also like to thank SIA President, Michael Fitzgerald, and the Executive Committee for allowing me to be part of this excellent conference program.

The announcement of the AUKUS partnership in September 2021 was dominated by the plan for Australia to acquire a fleet of nuclear-powered submarines. This was big news for the Institute and its members, but it was also big news for the university sector.

The challenge

Nuclear-powered submarines are some of the most complex machines human beings have ever developed. Bringing a fleet of these into service will be one of the biggest training and workforce development challenges Australia has faced. As the Defence Minister, Richard Marles, has said, AUKUS will demand a transformation in Australia's cultural relationship with science and technology.

Our AUKUS partners expect Australia to pull its own weight and develop sovereign capability to operate and maintain the fleet. This will require the integration of military, industry, government and academia to create an entirely new sector of the economy. The task goes beyond training the crews of future submarines. We can't just acquire nuclear technology without being able to provide best-practice nuclear stewardship. The challenge includes building the nuclear knowledge across all elements of the enterprise including corporate, nuclear physics, engineering, legal, policy, security and human resources across government and industry.

Australia has a strong international track record as a contributor to nuclear non-proliferation policy and a reputation as a responsible global citizen. But a fundamental uplift is required to develop the nuclear mindset required to be the custodian of this technology.

Australia has the expertise and capability. What we don't have yet is the scale to deliver the graduates and skills in the quantities required. We can do this. But it requires deliberate urgency. The time from now until

1 This is an edited version of an address given to the Submarine Institute of Australia Conference, Canberra, November 9, 2022. A similar piece appeared in the *ANU Reporter*. Reprinted with permission.

the first submarine is ready to enter service gives us a window of opportunity to scale up our capacity. But decisive action needs to be taken now so that we can be where we need to be in a decade's time.

I was heartened by the Minister's comments acknowledging that even though the entry into service of Australia's first nuclear-powered submarine seems a long way off, he understands there is no time to waste. This challenge can't be left to Defence alone. It will need a whole-of-government commitment to identify the skills and resources required. It will need a new approach to partnering with the universities who will deliver the training.

STEM pipelines

In Defence circles there is often talk about solving capability gaps in the transition from one system to another. That is obviously a critical issue for Vice Admiral Mead and his team to deal with. But I'm here to tell you today that whatever submarine design ends up being chosen, we won't be able to build and operate it locally unless we address the fundamental issue of Australia's workforce capability gap. We all know how hard it is to recruit and retain skills in science, technology, engineering and mathematics, or STEM.

Recently, General Campbell and Secretary Moriarty announced a series of expanded employment benefits that are needed for Defence to remain competitive as an employer in an increasingly tight labour market.[2] This is consistent across all sectors that rely on these skills and Defence is no different.

The outlook is concerning. Only nine per cent of Australian year-12 students are currently taking higher mathematics and only another 17 per cent are taking intermediate mathematics. This is foundational knowledge needed for success in STEM fields. Compounding this, the Productivity Commission recently found the Job Ready Graduates program — the funding scheme that allocates Commonwealth funding for university degrees — creates flawed incentives and reduces the return to universities for offering STEM places. The strained labour market conditions we face in 2022 will cripple us in 2032 if we don't take urgent action now to grow our sovereign capability.

Our nuclear workforce will need to include not just engineers and physicists, but also lawyers, regulatory experts, specialist medical staff, naval architects and policy advisers to decision-makers.

There is opportunity within the challenge too. The scale of our skills needs means there is no longer any excuse for women remaining such a small minority of the STEM workforce. According to the Chief Scientist, women still comprise only 29 per cent of university STEM qualifications. The same can be said with students from disadvantaged backgrounds.

While the HELP system provides broad access to university, support for students from disadvantaged backgrounds is so low that most have no choice but to go to the university closest to home, not the one that best caters for their skills and interests. Capable students, whoever they are, need to be identified and incentivised to pursue careers in AUKUS fields. Many of these roles will require years of training and

2 The ADF workforce was about 77,000 at the beginning of 2022–23, 5.4% below what was required. [Ed.]

experience. As Vice-Admiral Mead noted recently in *The Australian*, starting today we need to set a 14-year-old schoolgirl on a path to be captain of Australia's first nuclear-powered submarine.

Let me illustrate how this plays out. To get undergraduates to study nuclear physics, we will typically bring them to campus at the end of year 10 for a summer science program. If we did one (which we are not) tailored for the AUKUS workforce requirements, this would deliver a new set of undergraduates starting their degrees in 2025. These students would finish their undergraduate degrees in 2029, but many would require at least a Master's degree (completed by 2030), or PhD (completed by 2033).

That schoolgirl will probably get her nuclear science education here in Canberra at The Australian National University. Why ANU? To start with, because the only practising experimental nuclear physicists at Australia's universities are at ANU. But more broadly, because this is what the ANU was established to do.

Recommendations

How can we build the AUKUS workforce? At ANU we have identified three things government should do now that will enable us to meet this challenge.

First, in order to build a national nuclear enterprise, government should establish and define nuclear stewardship as a Sovereign Industrial Capability Priority, or SICP, to provide investment certainty. These priorities are intended to ensure access to essential skills, technology, intellectual property, financial resources and infrastructure in critical areas to the Defence mission. Just like industry, universities require planning certainty to make investments in capability and course offerings.

ANU runs the only comprehensive nuclear physics program in the country. But scaling up that program will require upfront investments in infrastructure, facilities and academic recruitment that ANU cannot afford right now, and indeed no university in Australia can afford this. There must be a program of support; the de facto alternative — waiting for international student fees to return to previous levels — is unthinkable.

A formalised SICP for nuclear stewardship would signal the priority being placed on developing sovereign capability in nuclear education and research. It would support the universities who will need to play a central role in building the skills and knowledge base to make the investments required to produce the graduates required.

Second, government should consider establishing an AUKUS career pathways program to harness high-achieving school-age students and provide long-term development and career progression in critical skills. AUKUS will demand a stronger pipeline of students choosing to undertake university study in key fields.

Nuclear science should clearly be the first cab off the rank for this program, but this approach will also be necessary across the broader advanced capabilities of AUKUS including in cyber and computing, engineering, space and quantum physics.

An AUKUS pathways program, jointly developed with Defence, could feature a portfolio of tailored degree programs providing a pathway for students to gain qualifications in an AUKUS-related field and then progress to a position in Defence working on AUKUS programs.

Such a program could include:

1. Courses in strategic defence studies and national security being incorporated into STEM degrees to instil a strong understanding of the strategic drivers and applications of technical skills.
2. Assigned mentors from Defence and regular exposure to Defence leadership, to establish a connection to AUKUS programs from an early stage.
3. Processing security clearances for students while they are studying to enable real work experience and practical placement opportunities with Defence.
4. Guaranteed placement in Defence at the conclusion of the program, bypassing existing Defence graduate programs.
5. Interstate field trips and international exchanges with our US and UK partner universities to reinforce the trilateral partnership.
6. Guaranteed accommodation at a university hall of residence to overcome the barriers that exist for students relocating to study.

Degree programs with some of these features, tailored specifically for AUKUS priorities, will also assist the government as it begins the task of rebuilding the technical capability of the public sector. A pipeline of qualified recruits will support Defence to provide contestable advice to government. The reliance on private contractors will be reduced, delivering greater value for money over the long term.

Third — and this goes to the concept of this being a national mission, rather than just a task for Defence — government should remove the barriers it has created through funding rules that prevent universities from being more dynamic in meeting national capability priorities. The new government's Australian Universities Accord process presents an opportunity to look at how universities and government can work together to tackle the challenges we face as a nation.

Conclusion

To conclude, the introduction of nuclear-powered submarines will require substantial development of Australia's scientific and engineering capacity. We cannot afford to drag our feet on this. Building the sovereign, nuclear-literate workforce we need will require a pipeline of academic staff to deliver education and research at scale, and credible pathways to an AUKUS career that attract the best students from across the country. This is a huge workforce development challenge. It is one we can meet but it requires government to invest in, and partner with our universities now to build the capacity we need in the future.

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