

Submission to the Department of Industry, Science and  
Resources

# **ATSE SUBMISSION TO THE NATIONAL QUANTUM STRATEGY – PROPOSED FRAMEWORK**

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The Australian Academy of Technological Sciences and Engineering (ATSE) is a Learned Academy of independent, non-political experts helping Australians understand and use technology to solve complex problems. Bringing together Australia’s leading thinkers in applied science, technology and engineering, ATSE provides impartial, practical and evidence-based advice on how to achieve sustainable solutions and advance prosperity.

ATSE welcomes the opportunity to respond to provide a submission on the proposed framework for the National Quantum Strategy. ATSE has previously provided a submission to the June 2022 consultation to develop the draft Strategy, focusing on the themes of research, infrastructure, talent, and the quantum start-up landscape (ATSE, 2022a). ATSE recognises that the recommendations in that submission are reflected in the proposed framework. Building on this, ATSE puts forward the following recommendations to further strengthen the National Quantum Strategy framework:

**Recommendation 1:** Elevate the development of a whole-of-pipeline quantum research funding strategy to its own objective under the Strategy.

**Recommendation 2:** Include dedicated support for collaborative research on ethical issues concerning quantum technologies.

**Recommendation 3:** Include initiatives under Objective 4 to deliver school-based programs such as work experience in STEM organisations, including programs to target under-represented groups.

**Recommendation 4:** Prioritise the development of a quantum skills taxonomy, situated within a broader effort to develop a taxonomy of in-demand STEM skills.

**Recommendation 5:** Embed diversity and inclusion requirements for funding and other support schemes for quantum technology project teams.

## Building the quantum research pipeline

Prescient past investments in basic research formed the foundation of quantum technologies that are currently being scaled and applied. The consultation draft’s objective of enhancing Australia’s global leadership in quantum research (Objective 3) incorporates comprehensive research funding, including fundamental research, as an initiative. Due to the centrality of this initiative to the success of the quantum industry into the future, it is recommended that the initiative for a research funding strategy (initiative 3.1) is elevated to its own objective, with curiosity-driven research support being its own initiative. A further initiative should be added to support research collaborations to develop knowledge on ethical applications of quantum technologies. Ethical issues could include environmental implications of quantum computing and materials, cyber-security concerns, harms caused by defence applications, and social inclusion concerns. Exploring as-yet unknown ethical issues for quantum technology has the potential to be most impactful now as the industry is in a nascent stage before any potential problems become locked in (Roberson 2021). This can feed into the development of principles and regulatory frameworks (initiative 7.3).

**Recommendation 1:** Elevate the development of a whole-of-pipeline quantum research funding strategy to its own objective under the Strategy.

**Recommendation 2:** Include dedicated support for collaborative research on ethical issues concerning quantum technologies.

### **Building the quantum workforce**

The consultation draft notes that the supply of quantum-ready graduates is not keeping pace with demand, and that the quantum workforce needs to be expanded including with improved inclusion and diversity. As articulated by ATSE's June 2022 submission, there is a need to scale up interest in and capacity to train for quantum careers and attract international talent. It is encouraging to see these recommendations reflected as initiatives under the Strategy's objective to drive skilled workforce growth (Objective 4).

School-based programs should be a focus under Objective 4 to encourage young people's capability in and excitement for STEM careers. Opportunities for school students to have positive engagement with STEM – such as work experience programs and university-based residential programs – is a long-term investment in growing the skilled quantum workforce. These programs should also be targeted to include opportunities from under-represented groups such as girls, low-socioeconomic status students, and Aboriginal and Torres Strait Islander students.

ATSE also encourages the development of a skills taxonomy for quantum professionals and mapping of adjacent occupations (initiative 4.3 in the Strategy) and modelling future quantum workforce requirements (initiative 4.4) as a priority. As found by the ATSE report [\*Our STEM Skilled Future: An Education Roadmap for an Innovative Workforce\*](#), the lack of a shared common language around skills presents a challenge for individuals, employers, and governments to understand skills supply and demand and undertake planning (ATSE, 2022b). As recommended by the report, the Federal Government should expand and define its skills vocabulary, prioritising STEM skills in urgent demand, use the skills vocabulary to map a taxonomy of roles and adjacent job families, and provide industry-specific skill demand forecast information. The newly established Jobs and Skills Australia would be the natural home for this initiative. The creation of a quantum skills taxonomy should be conducted within a broader framework of defining and mapping in-demand STEM skills.

With a deliberate effort to build up the quantum technology industry, there is an opportunity to ensure diversity and inclusion is embedded at the outset. Quantum computing talent is largely drawn from those qualified in physics, which is plagued by a leaky pipeline reducing the number of women at all levels. The most recognisable quantum computing expert, Professor Michelle Simmons AO FTSE, signals the possibility for women to excel in physics. As she recognised in her acceptance speech for 2018 Australian of the Year, the industry is male-dominated, and female scientists are often underestimated by others. To avoid reproducing the gender imbalances from the physics talent pool, it is imperative that quantum technology initiatives intentionally cultivate an inclusive workforce.

As well as initiatives to lift the participation of under-represented groups in the talent pool under Objective 4, the commercialisation initiatives under Objective 1 should include a diversity and inclusion lens. For example, projects invested in as part of the National Reconstruction Fund (initiative 1.2) could impose a gender equity requirement for the groups applying.

**Recommendation 3:** Include initiatives under Objective 4 to deliver school-based programs such as work experience in STEM organisations, including programs to target under-represented groups.

**Recommendation 4:** Prioritise the development of a quantum skills taxonomy, situated within a broader effort to develop a taxonomy of in-demand STEM skills.

**Recommendation 5:** Embed diversity and inclusion requirements for funding and other support schemes for quantum technology project teams.

## References

Australian Academy of Technological Sciences and Engineering (ATSE) 2022ba, 'ATSE submission to National Quantum Strategy Consultation', accessed from <<https://www.atse.org.au/wp-content/uploads/2022/05/SBM-2022-05-02-National-Quantum-Strategy-final-2.pdf>>

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Roberson, T 2021, 'Talking about responsible quantum: Awareness is the absolute minimum... that we need to do', accessed from <<https://arxiv.org/abs/2112.01378>>