

SUBMISSION

Submission to the WA Department of Jobs, Tourism, Science and Industry

# Submission to the 10-Year Science and Technology Plan

1 March 2024

**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.**

The 10-Year Science and Technology Plan is an opportunity to coalesce the Western Australian research sector behind a single coordinated mission, providing a roadmap for making Western Australia a research powerhouse within ten years. Western Australian researchers have long struggled with the disadvantages that the tyranny of distance has had on their funding opportunities and their careers. Over the last 22 years, just 6.3% of all Australian Research Council Funding has gone to Western Australia (Australian Research Council, n.d.) – well below what should be expected given the size of WA's population (10.8% of the nation's population (Australian Bureau of Statistics, 2023)). Nonetheless, as the case studies included in this submission show, Western Australian scientists, engineers and researchers are producing world-class research that needs to be supported, applied and celebrated.

This plan can develop a strategic approach, that invests in research where Western Australia has a competitive advantage or solves the state's most pressing problems. This will need to involve a scaling up of assistance throughout its development - including the "valley of death" stage between research and commercialisation – and should feed into the national Science and Research Priorities where possible. A skilled workforce will be essential to both conduct this research, and the make the most of its opportunities. Taking a lifelong learning approach, that supports workers from school through to the end of their careers, will help ensure WA has the people and skills it needs to be a science and technology powerhouse.

ATSE makes the following recommendations to build an effective science, technology and research sector that meets the needs of Western Australians:

**Recommendation 1:** Establish an independent Western Australian Science and Technology Council of experts to guide priorities, guide the implementation of the Science and Technology Plan and, where necessary, provide advice to the government on managing changing circumstances.

**Recommendation 2:** Implement a targeted Breakthrough fund, based on the Victorian model, focused on areas where Western Australia has a competitive advantage.

**Recommendation 3:** Co-fund, and provide administrative support for, the establishment of Collaborative Research Centres (CRCs) in Western Australia for identified priority areas.

**Recommendation 4:** Establish innovation hubs for identified priority research areas that co-locate industry and academic researchers.

**Recommendation 5:** Utilise purchasing power from government departments and agencies to support early adoption of emerging local technologies.

**Recommendation 6:** Support job and visa availability to attract the best and brightest to the state, including enabling research graduates to remain in Western Australia post-graduation.

**Recommendation 7:** Develop a near-miss grants scheme to help good ideas get the funding they need to continue until further grants are awarded.

**Recommendation 8:** Support diversity in the science, technology, engineering and mathematics workforce through study support for diverse students and lifelong learning through a greater variety of learning options including micro credentials.

## Embracing Western Australia's competitive advantages

There are ultimately an infinite number of potential ideas for research, and Western Australia cannot be a leader in everything. Support must therefore be strategically directed towards areas in which Western Australia is or can become a national leader. These may be areas where WA is the only natural choice (for example, Indian Ocean research and research into Western Australia's unique biodiversity), where unique circumstances mean WA can play a leadership role (e.g. mineral processing and the impacts of fly-in fly-out work schedules on human health) or where research would have the most impact on Western Australian lives (e.g. improve services for remote communities).

While ATSE does not recommend governments try to pick winners, a clear and focused direction from the WA Government will require selecting priority themes in which WA is well placed to lead. Identifying these priority areas should be done by those with expertise in science and technology, who can accurately assess the potential benefits to the state of each research priority area. Establishing an independent expert

advisory Western Australian Science and Technology Council to support the Western Australian Office of the Chief Scientist would create a body that can create, review and update these priorities to meet the changing needs of the state and provide guidance to the state government on how to foster growth in these priority areas.

One example of a program supporting focused science and research interstate is Breakthrough Victoria, the \$2 billion investment fund from the Victorian Government that provides project investments to build innovative industries of all sizes. The fund provides grants from around \$150,000 to \$15 million to get ideas off the ground and build up innovative industries (Breakthrough Victoria, n.d.). The fund focuses on five identified world challenges in advanced manufacturing, agri-food, clean economy, digital technologies and health. A similar fund in Western Australia, based around identified priority areas for the state, could not only help build WA industries directly, but act as a basis to attract additional funding and provide investment returns for the Western Australian Government.

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## Shepherding technology through the valley of death

If Western Australia is to become a science and technology powerhouse, discoveries made in WA should be supported to be transformed into products and services that improve the lives of Western Australians and others. This development should occur within WA. It requires the cooperation of researchers, industry and government, and enables the public to get the most out of the state's research. To foster this collaboration, Western Australian Government initiatives to support the commercialisation of research should target assistance to priority areas in which there are gaps not covered by national initiatives such as the Industry Growth Program (this provides advice and funding for small and medium enterprises to commercialise their products).

The national Cooperative Research Centre (CRC) model develops research and development hubs for long-term projects that stem from industry led collaborations (Department of Industry Science and Resources, 2024). These centres have been remarkably successful at producing real-world outcomes, often spinning off successful companies based on their research. Applicants are required to be able to match Federal Government funding to apply for this scheme, as well as to have already established strong industry links. State government support for these applications, either through financial contributions to the matched portion of funding or through support to build the industry connections needed to acquire that funding, would improve the competitiveness of applications from WA, attracting more federal research investment to Western Australia and helping build a culture of collaboration between industry and academia.

More broadly, co-locating industry and researchers in related fields can assist to both build vital industry connections that support commercialisation and support a two-way flow of ideas between industry and academia. Establishing innovation hubs around themes relevant to the state priorities – possible centred around a relevant CRC – could help to foster a broader flow of ideas between industry and academia. This could be supported by a state government-funded industry fellowship program supporting industry experts to spend time working with academics to build connections and foster new innovations.

Government procurement has a role to play in successfully commercialising research. Early sales can make or break emerging small and medium enterprises, providing capital at a vital stage. As a large-scale customer, government agencies and departments can create markets for Western Australian products before they are otherwise commercially viable. Crucially, these policies must understand that investing only in late-stage products that are guaranteed to succeed misses the point. There is a clear element of risk in this process by design – companies that are guaranteed to succeed do not need government support. Policies and procedures must allow for failure and support departments and agencies that take procurement risks that don't pay off. A centralised fund and clear government-wide procurement directive to reimburse department and agency budgets where they invest in emerging WA technologies may help reduce the

perceived risk and allow for increased use of procurement as a tool to support WA small and medium enterprises.

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## Ensuring WA has the STEM skills it needs

The STEM sector is still male dominated (Office of the Chief Scientist, 2020), and bringing more women, and increasing diversity more generally, into the STEM sector can help fill critical skill shortages. Greater diversity in the STEM workforce will also increase the diversity of available ideas and unique perspectives. The WA Government should seek to increase the diversity of the state's STEM workforce. This can be done by supporting diverse people to undertake STEM studies both at the start of their careers, but also mid-career. Scholarship schemes can help to support diverse people looking to get their start in STEM – for example, the federally funded and independently proven *Elevate: Boosting Women in STEM* program run by ATSE supports bringing women into STEM education. The WA Government could look to co-invest to boost the number of scholarships available exclusively to women in Western Australia. Similarly, for those looking to transition into STEM later in their career, micro credentialling and flexible learning options can make study easier and more accessible, particularly for people from lower socio-economic backgrounds or with disabilities or neurodiversities that impact their ability to undertake traditional study arrangements.

For students to consider a research career in STEM, that career path will need to be perceived as viable - with a realistic chance of them obtaining a stable job upon graduation. Most early career research roles are highly competitive short-term positions within universities that leave early career researchers in an insecure work environment, with average contracts lasting just 18 months (Professionals Australia et al., 2021). Competition for these roles is fierce, resulting in many highly trained researchers missing out or looking interstate or overseas for new opportunities. For international students, this can make staying in Western Australia a gamble following graduation. Particularly for students from low socioeconomic backgrounds, this uncertainty can make continuing in research untenable. Supporting more post-doctoral positions will help to keep talented researchers in Western Australia. This could be combined with visa support for international graduates of WA universities who remain in research (similar that provided to the construction industry through the Construction Visa Subsidy Program) and could be linked in with state government support for CRCs and other state government grant schemes.

Researchers spend significant time applying for research funding through competitive grants processes. The high volumes of applications for grants and low success rates mean that many good ideas are inevitably not funded, and the work gone into preparing grants is wasted. A state-supported “near miss” scheme that invests in high quality research that just missed out on national funding - without requiring additional applications - would enable more researchers to focus on conducting research. Additionally, providing some initial funding for “near miss” projects would put researchers in a more competitive position for future federal and philanthropic funding rounds by enabling them show conduct initial research to support their proposals.

Building Western Australia's innovation capacity will require a large number of highly skilled science, technology, engineering and mathematics (STEM) workers and experts. Ensuring the state has these skills available will require the adoption of a lifelong learning model, supporting the acquisition and retention of critical STEM skills across the length of careers.

**Recommendation 6:** Support job and visa availability to attract the best and brightest to the state, including enabling research graduates to remain in Western Australia post-graduation.

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*ATSE thanks the Department of Jobs, Tourism, Science and Industry for the opportunity to provide input into the 10-Year Science and Technology Plan. We would welcome the opportunity to connect you with any of our WA-based experts in science, technology and engineering. ATSE welcomes the opportunity to continue to support the Department and looks forward to future partnership opportunities and provide expert advice on matters relating to science and technology. Please reach out to us any time if we can be of assistance at [academypolicyteam@atse.org.au](mailto:academypolicyteam@atse.org.au).*

## References

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## Appendix: Case studies

The following case studies demonstrate how local research, supported by the Western Australia Government, can lead to real world commercial and social benefits for Western Australian, highlighting the role that the Western Australian Government might be able to play in the continuing success of these projects.

### Case Study Number 1: WA-based CRCs producing economic benefits – Coiled Tubing Drilling

For the past 5 years the WA State Government has been a participant in the testing of a new safer drilling technology for minerals exploration under barren overburden cover.

The project emerged in 2013 from a workshop in the Deep Exploration Technologies CRC. By the end of that CRC several pilot drill holes had been completed and the further work needed was identified.

It has taken another 5 years, and the formation of a new CRC (MinEx), for extensive testing and improvements and the prototype rig has proved to be significantly safer, cleaner, cheaper and faster than current technologies. The rig has recently been leased for 12 months by a dedicated drilling company (DIG CT) to undertake commercial drilling associated with the MinEx CRC national drilling initiative.

The Geological Survey of WA committed to additional drilling meterage in 2024, enabling DIG CT to demonstrate to the wider exploration industry the advantages of this technology in the under-explored areas of WA. Once the 2024 drilling is complete and assessed, the Geological Survey of WA could further increase demand-pull for this drill rig through its Exploration Incentive Scheme by announcing preferences for proposals using this new, lower footprint, safer exploration technique. It could also actively include the coiled tubing rig technology in its own drilling future programs.

### Case Study Number 2: Non-Invasive Intracranial Pressure device

Lions Eye Institute has developed a system that accurately measures elevated intracranial pressure (ICP) in 80% of patients with this condition. Raised ICP causes vision loss, headache and other problems in a number of neurological diseases. Currently, measurement of ICP requires a spinal tap or a drill hole into the head. There is a large, world-wide demand for non-invasive ICP measurement. Lions Eye Institute's new system works by applying machine learning techniques to image data derived from a contact lens device applied to the eye. It is leading the world in this technology and retaining the technology and intellectual property in WA is a significant opportunity.

Early clinical trials generated 5 scientific papers validating its use and two families of 11 patents. These became the basis of a WA state government grant in 2022 (of \$500k) to establish a spin off company, Aecona, to design, build and gain regulatory compliance for a portable device. Initial costings show these portable units, once being produced at scale, can be produced in the range of \$40-\$80k each. The software needed to interpret the results remains with Lions Eye Institute.

The next phase will be scaling up clinical trials across various ophthalmic and neurologic clinics in Western Australia to prove the system. Further clinical trials are needed to generate data to further optimize machine learning; teach and supervise clinical users; and clarify optimal clinical use. Ideally, these trials should be done in Western Australia, but this would require capital to build the equipment, meet regulatory (and other) costs and market it to the rest of the world. If WA Health positively engages in this development now and provides early demand-pull it will act like a magnet to attract capital and help pull this project forward.