

SUBMISSION**ATSE's budget priority****STEM-skilled jobs
and industry-research
collaboration**

As an elite Learned Academy of leading experts, the Australian Academy of Technology and Engineering ¹ (ATSE) provides here a set of specific recommendations for the 2020-21 budget, and a set of broader recommendations for targeted Government investment in building Australia's responsive and agile sovereign industry, and growing jobs for the future.

ATSE stands ready to support the Australian Government's STEM jobs agenda by:

- Increasing uptake of STEM careers and creating career pathways for STEM graduates
- Fostering successful collaborations between industry and research to create jobs and grow Australia's innovation economy, and
- Providing expert timely advice on applied science, technology and engineering.

With Government investment, ATSE proposes to:

- Create 2000 industry internships over four years
- Launch a digital tool to support industry-research engagement
- Expand our capacity to provide timely expert advice to Government, particularly in new industries and technologies.

**DIRECT ACTION TO SUPPORT CAREER PATHWAYS,
COLLABORATION, AND EXPERT ADVICE**

Collaboration between Australia's research workforce and industry sector underpins innovation in our economy, and will be critical to support growth in onshore jobs during and following the COVID-19 pandemic. With a Fellowship that includes industry leaders, entrepreneurs and leaders in research translation, ATSE's unique convening power means it is ideally positioned to effectively support and empower this collaboration potential.

1. The Australian Academy of Technology and Engineering 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.

Industry internships and network for PhDs

ATSE proposes to build on our successful Industry Mentoring Network in STEM (IMNIS) with an integrated industry internship program to support advanced degree students and graduates to find pathways to employment – and enhance industry's capability. IMNIS is proven to increase STEM students' understanding, engagement, and networks in a huge range of potential private- and public-sector careers, as well as showing leaders in industry the value today's STEM PhD graduates bring to their organisation the Australian economy. IMNIS alumni are much more likely to find career paths in industry, compared to only about 30 per cent of PhD graduates not participating in the program. An ATSE-led industry internships program would further directly support career pathways for highly qualified researchers at a time when these skills are critical to building Australia's resilience and capacity.

INVESTMENT: \$30 MILLION

- 2000 industry internships for post-graduates over four years
- An alumni program that tracks outcomes, builds a network and provides opportunities for mentoring relationships
- Leverage the network to create a virtuous cycle of growth for the internship program
- Build capacity to create industry career pathways and catalyse innovation in the Australian economy.

Supporting industry-research engagement

ATSE's broad and unique network of Fellows – leading experts across academic, private and public sectors – have designed an industry-research engagement maturity index that is ready to be piloted in the coming year, paired with a toolkit for supporting best practice collaboration. This project has identified the core indicators of successful engagement, will highlight best practice for collaboration, and provide insights for improved engagement. With evaluation and continuous improvement built-in, the index and toolkit are designed to catalyse more engagement, successful engagement, and better understanding of engagement.

INVESTMENT: \$180,000

- National pilot of interactive digital tool for industry and research partners to self-assess their engagement maturity, free to users
- Analysis of self-assessment and bespoke advice to support collaborations to mature
- Marketing to target industry and academic collaborators who will benefit most.

Providing timely expert advice

ATSE is proud to serve Australia in providing timely, expert advice to solve our nation's complex problems. Our unique convening power brings together an extraordinary volunteer network of Australia's top experts and leaders in engineering, applied science and technology across private, public and academic sectors. This capacity to provide rapid and relevant best-available advice is facilitated in part by the HESA-HERP grant, which supports our small and agile secretariat to work with ATSE Fellowship on major sectoral and economic issues.

ATSE's expert advice this year has included coordination with Australia's other learned academies through the Chief Scientist's Rapid Research Information Forum (RRIF). ATSE's expert Fellows have contributed evidence-based advice to 25 inquiries and ministerial round-tables on energy, skills, innovation, agriculture, artificial intelligence, diversity in STEM, cybersecurity, and waste. We have convened industry with researchers to solve complex problems, consulted with industry stakeholders to build decadal plans for policy and research in Australia's technology-driven economy, and provided advice to government on bushfires, transport, water, and innovation. We have built networks between industry and research, and facilitated collaboration and dialogue.

INVESTMENT: \$400,000

- Two full time policy analysts, one dedicated to the provision of rapid responses to Cabinet and one dedicated to engaging young entrepreneurs and researchers to create the industries of tomorrow.
- Extension of ATSE's ability to activate our Fellowship and networks to provide pointed advice on technology, engineering or applied science issue relevant to the Government's work, in a format and timeline that ensures it is of most value.
- Extension of ATSE's ability to support collaboration through our networks and convening power.

Building Australian industry and jobs for the future

Investment in technology will address major challenges, support critical national capabilities, and create future growth industries following the economic disruption of the COVID-19 pandemic.

Directing such investments towards greater economic and environmental sustainability will build Australia's resilience and unlock the full potential of our future workforce, by leveraging Government's past investments in the highly educated workforce, retraining job-seekers, and promoting diversity and inclusion in technology development.

Investment in responsible technological solutions for agile and responsive modern manufacturing and supply chains, clean energy, integrated digital healthcare, and advanced data collection and analytics will provide more reliable and better equity of access to goods, services and utilities, as well as creating jobs in Australia.

Advanced manufacturing

The Australia Institute's Centre for Future Work recently set a goal for Australia to build a domestic manufacturing sector proportionate to the size of our purchases of manufactured products. The Australia Institute estimates this could generate \$180 billion per year in new manufacturing output, \$50 billion per year in new value-added manufacturing, 400,000 new direct jobs in manufacturing and over 260,000 new jobs throughout the manufacturing supply chain.

INVESTMENT: APPROX \$45 MILLION

- Create a manufacturing fund to leverage Australian investment in industry 4.0 infrastructure.
- Support packages for readily applicable and genuine R&D should encourage updates to plant and equipment.
- Use public procurement to create strong and immediate viable markets for new domestic products including vaccines, pathology testing and test kits, equipment and consumables for medical stockpile and humanitarian activities.

Investment in digitising and applying industry 4.0 principles will reduce the costs of rapid evolution in manufacturing, enhance Australia's sovereign capability, and enhance capacity to respond quickly as new needs emerge. Digitally-enabled bespoke manufacturing techniques will provide manufacturing agility, quality management systems will deliver high value manufacturing, and public support programs can create deliverables and a supply relationship.

Waste and resource recovery

ATSE's vision for the waste and resource recovery industry in 2030 includes the conversion of waste streams to income streams, with an expanding network of waste and recycling hubs, skilled jobs created in waste management and innovation, and more efficient supply chains and business opportunities in Australia's manufacturing sector. The Australian waste and resource recovery sector will be profitable, resilient and ready for the country's transition toward a more circular economy, while simultaneously supporting environmental sustainability. The economic benefits of a closed loop waste management industry include job creation – for every 10,000 tonnes of waste recycled, the Australian recycling sector creates 9.2 jobs.²

INVESTMENT: APPROX \$4 MILLION

- ATSE understands the Government is currently reviewing the *Product Stewardship Act* and urges consideration of the market forces driving the linear waste economy.
- More effective product stewardship, emphasis on design, and smarter waste management can all assist with advanced resource recovery and turn Australia toward a more closed loop economy.
- Product stewardship schemes to reinforce these principles should be implemented in the review of the Act.

2. Access Economics (2009) <http://www.environment.gov.au/system/files/resources/5cc6a848-a93e-4b3f-abf7-fc8891d21405/files/waste-and-recycling-employment.pdf>

ATSE's report will be released in late October 2020 and we would be pleased to provide a briefing on our preliminary recommendations to assist budget considerations. Australian waste processing, which requires pure waste streams, data and co-ordination, can support onshore manufacturing, regional jobs, and supply chain resilience.

Cleaner, cheaper energy

Government has an opportunity to fast-track Australia's transformation to a clean energy economy. Supporting 'clean' industries could create over 75,000 jobs in the next three years, in economic sectors and regions hardest hit by the COVID-19 downturn.³

In our [recent submission to the Australian Government's Technology Investment Roadmap Discussion Paper](#), ATSE recommended a range of measures that will support Australia to become a world leader in low emissions energy technology.

INVESTMENT: APPROX \$200 MILLION

- Continued rapid deployment of solar photovoltaic (PV) and wind generated electricity.
- Design and construction of material additions to the transmission network, and the development of zero carbon large scale storage such as pumped hydro.
- Rapid transition to technologies such as electric vehicles and electric heat pumps for air conditioning and water heating in buildings, powered by renewable electricity, through appropriately designed policy interventions and incentives.
- Development of a renewable energy-driven hydrogen production and export industry in Australia
- R&D and demonstration of all technologies that could be used to facilitate Australia's low-carbon energy transition, including reducing industry's emissions footprint.
- Education and skills development needed for the transition to a low carbon future.

Sustainable investment in the research and development workforce

Research and development and their translation into practice are essential drivers of a country's economic growth and international competitiveness. Well-targeted R&D leverages economic, environmental and social benefits well beyond the capacity of the original investment. The Cooperative Research Centre Program provides an example of how this collaboration in R&D can generate significant and enduring economic benefits.

The academic research sector is predicted to lose \$7.23b - and 4,600 jobs - over the next five years.⁴ Nearly 70% of medical researchers expect their research to be affected by COVID-19 beyond 2020.⁵

Early and mid-career researchers are particularly vulnerable to job insecurity.⁶

INVESTMENT: APPROX \$400 MILLION

- Fellowships to encourage industry and university collaboration on priority areas for Australia's economic recovery⁷
- Extend grant deadlines and other research support to allow for pandemic-driven career and research disruption
- Incentivise private sector investment in academic research, through a collaboration premium of up to 20 percent for private sector R&D collaboration investments with publicly-funded research organisations.

3. Alpha Beta (2020) <https://alphabeta.com/our-research/clean-jobs-plan/>

4. <https://campusmorningmail.com.au/news/research-funding-crisis-imminent-and-enormous/>

5. <https://researchaustralia.org/impact-of-covid-19-on-health-and-medical-researchers-one-of-australias-crucial-lines-of-defence/>

6. <https://www.biorxiv.org/content/10.1101/2020.02.19.955328v2.article-info> <https://scienceandtechnologyaustralia.org.au/scientists-sense-community-trust-in-science-is-on-the-rise-even-as-they-face-job-losses-and-pay-freezes-amid-covid-19/>, <https://www.science.org.au/news-and-events/news-and-media-releases/early-and-mid-career-researchers-fear-their-careers-are-risk>

7. The Australian Association of Medical Research Institutes (AAMRI) has already proposed a similar model: <https://aamri.org.au/resources/submissions/2020budgetsubmission/>