



**ATSE** SUBMISSION

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SUBMISSION TO THE TREASURY

# Submission to the 2024-25 Pre-budget consultation

Australian Academy of Technological Sciences & Engineering

**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.**

Innovation is the fundamental source of economic and social progress and is an essential part of maintaining a strong and prosperous nation. Australia’s STEM (science, technology, engineering, and mathematics) sector provides an essential basis for our nation’s innovation. The 2024-25 Federal Budget presents an opportunity for Australia to bridge the gap for STEM skills and digital literacy advancement, enhance the resilience and sustainability of our waters, support deployment of the renewable energy of tomorrow, and build a strong and stable economy. To be at the forefront of international innovation, Australia must establish a solid foundation in world-class science and technology through the encouragement of research translation and collaboration across sectors.

In this submission, ATSE provides a series of recommendations to build Australia’s ability to respond to our nation’s challenges and harness its opportunities. Throughout, ATSE highlights opportunities to address the critical needs of the STEM sector right now, foster a strong STEM ecosystem into the future, and deploy STEM to help tackle the biggest challenge facing Australia, climate change.

Some of these recommendations require urgent action and should be implemented by the Australian Government immediately to maximise national benefit. To support the Treasury’s assessment of the urgency of these recommendations, ATSE has grouped recommendations into three categories, “Immediate Action Recommendations”, “Optimising Recommendations” and “System Recommendations”.



### **IMMEDIATE ACTION RECOMMENDATIONS**



### **OPTIMISING RECOMMENDATION**



### **SYSTEM RECOMMENDATIONS**



### IMMEDIATE ACTION RECOMMENDATIONS

Increase research and development funding to 3% of GDP.

Deliver a whole-of-government research funding strategy that covers the entire research pipeline, from curiosity-driven research to support for research application and commercialisation.

Deliver an action and investment plan for a more ambitious target of reaching net zero greenhouse gasses by 2035, in line with limiting global warming to 1.5 degrees.



### OPTIMISING RECOMMENDATIONS

Improve integration of vocational education with high schools and the university sector.

Decarbonise households by enhancing national building standards, increase incentives for energy-efficient upgrades by homeowners, and work with states to improve energy efficiency in public housing.

Support the Elevate: Boosting women in STEM program to enable more diverse women and nonbinary people to enter and thrive in the STEM workforce sooner.

Prioritise economically viable large decarbonisation investments, especially clean energy hubs to catalyse value-added processing and manufacturing from Australia's natural resources.

Target manufacturing grants and incentives toward waste avoidance or minimisation and the sustainable use of recycled content.

Increase investment in energy research and development across the innovation chain; prioritise this research, and incentivise its translation by expanding commitments for low-emission technologies in high-emission sectors.



### SYSTEM RECOMMENDATIONS

Create and fund the management of a transparent national framework for greenhouse gas accounting and monitoring in infrastructure, require all new federally funded infrastructure projects to submit a publicly available greenhouse gas budget and empower Infrastructure Australia to assess these budgets.

Develop, invest in and implement a comprehensive AI education program in Australian classrooms in consultation with industry, encompassing age-appropriate AI instruction, educator training, and a strong focus on ethics and data privacy.

Fully fund the implementation of the Diversity in STEM review, including an independent office of diversity and inclusion in STEM.

Provide adequate funding to establish a professional administrative capacity for the nation's first Aboriginal and Torres Strait Islander STEM professional Network.

Secure resilient and sustainable water futures for all of Australia by fully funding an evolved National Water Initiative and investing in digital technologies for water quality and quantity monitoring, firstly in the Murray-Darling Basin, then across all economic zones.

## INCREASE R&D FUNDING TO 3% OF GDP

Current global pressures mean that now, more than ever, Australia needs to invest in building a strong diversified economy. Australia's economic complexity (93rd in the world) continues to fall and productivity growth remains at historic lows – this requires urgent attention. Research and development (R&D) are the essential foundation of these efforts. Every dollar spent on R&D brings returns of \$3.50 to the economy (CSIRO Futures 2021) and research shows that R&D funding is correlated with productivity (Alrajhi 2018). For Australia to achieve the goals of programs like the National Reconstruction Fund, the green energy transition, the National Science and Research Priorities, and improved public health, investment in research must be prioritised in this budget.

Australia is already behind our international partners like the United States, Japan, and Germany, who all spend more than 3% of their GDP on R&D. Australia's current spending sits at 1.68%, and this continues to fall with government investment in research now reaching the lowest levels in 30 years, squandering the possibility of new economic opportunities, and limiting the development of new local industries. Immediate action is needed to halt this decline and ensure Australia does not become an R&D laggard. Assuming a comparable investment from business, an annual increase of \$1.97 billion to \$2.07 billion in funding across government, industry, and higher education would bring Australia to 3% of GDP by 2035.

This investment does not have to come from the Federal Government alone, but it is the role of the Federal Government to set the required policies and incentivise investment and coordination between businesses and state governments. Estimates from ATSE have identified that if the current proportion of funding between government, business and higher education expenditure in research remained the same, it would only require an annual increase of \$1.97 billion to \$2.07 billion in government investment, stimulating up to \$2.43 billion to \$2.56 billion from industry, to reach this goal.



A comprehensive research funding plan is needed to set the right direction for the sector, ensure funding needs are met regardless of the source, and ensure the Australian economy has a strong future going forward. This plan needs to consider funding from businesses, higher education, and governments. Commercialisation and application of research is impossible without sustained investment in fundamental

inquiry, collaboration (both domestic and international), and an engaged, equipped and qualified scientific and technical workforce.

### Immediate Action Recommendation

Increase research and development funding to 3% of GDP.

### Immediate Action Recommendation

Deliver a whole-of-government research funding strategy that covers the entire research pipeline, from curiosity-driven research to support for research application and commercialisation.

### Estimated Investment

\$2 billion increase annually from direct government funding.



## FORMULATE AN ACTION PLAN FOR REACHING NET ZERO EMISSIONS BY 2035



The Australian Government has already legislated greenhouse gas emission reduction targets, aiming to reach net zero by 2050 and a 43% reduction below 2005 levels by 2030. However, to align with the global goal of limiting warming to 1.5 degrees, a more ambitious target of reaching net zero greenhouse gas emissions by 2035 is necessary. According to Australia's emissions projections, the country is expected to achieve a 49% reduction on 2005 levels by 2035, but further measures are required to keep warming under 1.5 degrees. This goal is deliberately ambitious and will support Australia to catch up after decades of limited action, and to mitigate the most dangerous effects – and costs – of climate change.

The development of a net zero plan and more ambitious 2035 emission reduction targets will provide certainty through long-term policy, drive investments in low emissions and renewable technologies, build towards Australia's ambition to become a green energy superpower, and create important opportunities for industries and investors looking to invest in Australia's renewable energy transition. This aligns with Australia's international and domestic commitments, including the Paris Agreement, and is essential for the country to maximise the benefits of the global transition to net zero.

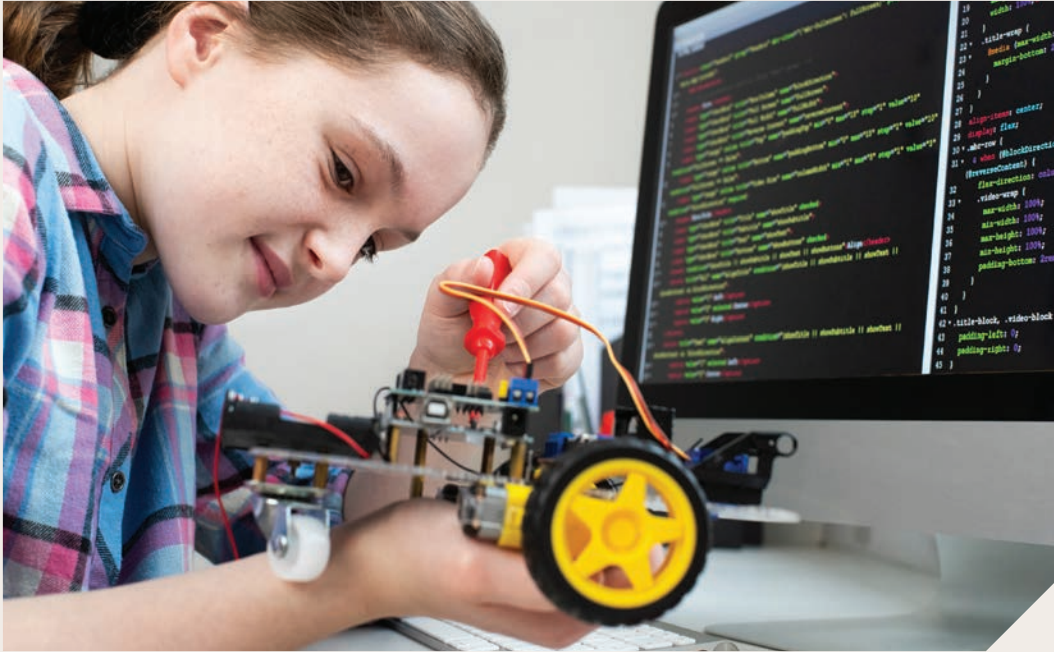
Delivering an action plan for a more ambitious emission reduction target for 2035 is also crucial for Australia to contribute to global efforts to combat climate change and ensure a sustainable future. According to experts the investment needed to achieve this is \$100 billion over the next ten years (Thurbon et al. 2023).

### Immediate Action Recommendation

Deliver an action and investment plan for a more ambitious emission reduction target for 2035, in line with limiting global warming to 1.5 degrees.

#### Expected investment

\$100 billion over ten years.



## BRIDGING THE GAP FOR STEM SKILLS AND DIGITAL LITERACY ADVANCEMENT

Better integrating vocational and higher education will modernise education and training, equipping our workforce with the skills and mobility needed for the future economy. Facilitating movement between programs and smoother transitions from senior secondary to further education, as well as close alignment between curriculum and certification with the labour market, will unlock a new level of productivity for the workforce. The Universities Accord Interim Report foreshadows the integration of vocational education and training and higher education, highlighting the need to fund these measures that will ultimately alleviate skills shortages and equip the workforce with the needed expertise.

### Optimising Recommendation

Improve integration of vocational education with high schools and the university sector.

#### Estimated Investment

This is a policy change and requires no further investment.

Over the past year, Australia has seen the rapid introduction of Artificial Intelligence (AI) into primary, secondary and tertiary education. ATSE considers that preparation for an AI-driven future should begin from the classroom to unlock the full potential of these technologies. The Australian Human Rights Commission emphasises the importance of educating students on the ethical use of AI to mitigate human rights risks, such as privacy, algorithmic bias, and digital equality (AHRC 2023). The recent release of a national framework for AI use in schools (DoE Australian Government 2023) highlights the need for a cautious yet ambitious approach to integrating AI into education, further emphasising the importance of an AI education program. To ensure Australian education systems keep up, it is essential to equip students and teachers with the necessary knowledge and skills to thrive in an AI-driven world while upholding ethical standards and safeguarding their rights.

### System Recommendation

Develop, invest in and implement a comprehensive national AI education program in Australian classrooms in consultation with industry, encompassing age-appropriate AI instruction, educator training, and a strong focus on ethics and data privacy.

#### Estimated Investment

\$6 million over the forward estimates for the next four years, starting from FY 2024-25.

## GOVERNMENT SUPPORT FOR DIVERSITY AND INCLUSION IN STEM

Fully funding the implementation of the Diversity in STEM review, including an independent office of diversity and inclusion in STEM, is crucial to model best practice action and support change so that people can access and feel they belong within STEM education and careers. This will help the Government lead and coordinate diversity policies and programs, offer advice to other organisations, and maintain accountability, oversight, and momentum of diversity in STEM initiatives. Robust financial support for these initiatives is pivotal for fostering an inclusive environment in STEM.

Building earlier investment in the Elevate: Boosting Women in STEM program will enable more diverse women and non-binary people to access STEM education at Australian universities sooner, thus supporting a greater breadth of diversity in STEM across education and career, and helping to meet Australia's urgent need for more STEM talent.

Committing to support Aboriginal and Torres Strait Islander STEM networks such as NISTEMP would further enhance a diverse and effective STEM sector. Providing assured and ongoing funding for Aboriginal and Strait Islander STEM networks and professionals will strengthen participation and support implementation of the National Science and Research Priorities. Targeted investment in supporting governance and administration is crucial for ensuring its successful establishment and sustainability.

### System Recommendation

Fully fund the implementation of the Diversity in STEM review, including an independent office of diversity and inclusion in STEM.

#### Estimated investment

\$17 million over the forward estimates for the next four years, starting from FY 2024-25.

### System Recommendation

Provide adequate funding to establish a professional administrative capacity for the nation's first Aboriginal and Torres Strait Islander STEM professional network.

#### Estimated investment

\$1.5 million over the forward estimates for the next four years, starting from FY 2024-25.

### Optimising Recommendation

Support the Elevate: Boosting Women in STEM program to enable more diverse women and non-binary people to enter and thrive in the STEM workforce sooner.





## **ENHANCING RESILIENCE AND SUSTAINABILITY OF AUSTRALIA'S WATER SUPPLY**

The Australian Government has already made significant investments in water-related initiatives, such as allocating \$1.3 billion to recover water for the environment while maintaining water for irrigation and committing to the \$2 billion in the Water for Australia Plan. Water supply sustainability remains a pressing issue for Australia's future. By investing in an evolved National Water Initiative and in digital technologies for water monitoring, the Government can further advance water security for the benefit of future Australians..

### **System Recommendation**

Secure resilient and sustainable water futures for all of Australia by fully funding an evolved National Water Initiative and investing in digital technologies for water quality and quantity monitoring, firstly in the Murray-Darling Basin, then across all economic zones.

### **Estimated Investment**

\$20 million over the forward estimates for the next four years for the next four years, starting from FY 2024-25.



## DECARBONISING AUSTRALIA'S FUTURE ENERGY LANDSCAPE

### DECARBONISING INFRASTRUCTURE

Infrastructure is responsible for 79% of all greenhouse gas emissions (Thacker S et al. 2021). To support the infrastructure sector to decarbonise, the Federal Government should lead the effort to create a greenhouse gas accounting framework. This would build on existing work in the sector and would ensure national consistency. The Government can then lead the application of the framework by requiring all federally funded projects to submit publicly available greenhouse gas budgets.

At the same time, it is critical to expand initiatives to decarbonise residential households. Building on last year's Federal Budget, the Government could now expand incentives for household energy efficiency upgrades, work with the states to invest in improving the energy efficiency of public housing and establish national green building standards.

#### Optimising Recommendation

Decarbonise households by enhancing national building standards, increase incentives for energy-efficient upgrades by homeowners, and work with states to improve energy efficiency in public housing.

##### Estimated Investment

\$10 million over the forward estimates for the next four years, starting from FY 2024-25.

#### System Recommendation

Create and fund the management of a transparent national framework for greenhouse gas accounting and monitoring in infrastructure, require all new federally funded infrastructure projects to submit a publicly available greenhouse gas budget and empower Infrastructure Australia to assess these budgets.

##### Estimated Investment

\$5 million over the forward estimates for the next four years, starting from FY 2024-25.

### MANUFACTURING AND SUSTAINABILITY

The Australian National Reconstruction Fund (NRF) is a \$15 billion initiative intended to support new and emerging industries, transition existing industries to net zero emissions and broaden the industrial base to boost regional economic development. Prioritising economically viable large decarbonisation investments through the NRF, especially clean energy hubs, can catalyse value-added processing and manufacturing from Australia's natural resources. This can lead to significant economic benefits, with the potential for \$180 billion in new sales each year and the creation of roughly 400,000 additional jobs (Leggatt 2021). Targeting manufacturing grants and incentives toward waste avoidance or minimisation and the sustainable use of recycled content is crucial for promoting sustainable practices within the manufacturing industry. Incorporating these practices enables Australian manufacturers to contribute to a sustainable ecosystem. This supports Australia's vision of becoming a high-quality, sustainable manufacturing nation, essential for economic growth, job creation, and sustainable manufacturing practices.

#### Optimising Recommendation

Prioritise economically viable large decarbonisation investments, especially clean energy hubs to catalyse value-added processing and manufacturing from Australia's natural resources.

##### Estimated Investment

This is a policy change and requires no additional investment.

#### Optimising Recommendation

Target manufacturing grants and incentives toward waste avoidance or minimisation and the sustainable use of recycled content.

##### Estimated Investment

This is a policy change and requires no additional investment.

#### Optimising Recommendation

Increase investment in energy research and development across the innovation chain; prioritise this research and incentivise its translation by expanding commitments for low-emission technologies in high-emission sectors.

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# Australian Academy of Technological Sciences & Engineering (ATSE)

## ACKNOWLEDGEMENT

The Academy acknowledges the Traditional Owners of the lands on which we meet and work and we pay our respects to Elders past and present. We recognise the deep knowledge and practices embedded in the oldest continuous culture on the planet. Australia's history of engineering, technology and applied science spans more than 60,000 years.

## ATSE is Australia's foremost impact network for leading applied scientists, technologists and engineers.

Our Academy celebrates excellence in science, technology, engineering and mathematics (STEM) by appointing prestigious Fellows, awarding upcoming innovators and equipping the next generation with skills to build a better Australia and world.

We are an authoritative and independent voice to government and our world-class STEM career programs demonstrate how to tackle our most urgent challenges. Delivering frank, fearless and evidence-based policy advice to government and industry we help drive a technology-powered, human-driven future.

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