Advanced Technology Industries Strategy Consultation Paper

University of Tasmania submission

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Introduction

The University of Tasmania welcomes the opportunity to provide feedback on the Tasmanian Government's *Advanced Technology Industries Strategy Consultation Paper*. We support the strategy's aims to foster collaboration across industries, encourage sharing of resources and expertise, and facilitate investment in critical infrastructure and the development of Tasmania's future STEM workforce.

As a leading research and education institution, we are committed to advancing Tasmania's capabilities in emerging technologies and fostering innovation across industry sectors to drive productivity, sustainability and economic growth. The University's world-leading research in agriculture, forestry, tourism, engineering, mining and earth sciences, maritime and logistics, analytical chemistry, defence, space, health, biological sciences, and the Antarctic and Southern Ocean is being enhanced by the application of advanced technologies. Advanced technologies have an important role to play in addressing global challenges and improving sustainability outcomes across these sectors by driving innovation and enabling greater resource efficiency.

We are successfully working with industry partners across the State to develop and adopt emerging technologies, and we are committed to bringing Tasmanian innovation to the world. There is an opportunity for the Strategy to be framed around Tasmanian enterprise, innovation and commercialisation plans, supporting human capital ideas focused on unique and high-value, distinctly Tasmanian opportunities with global market potential. The University of Tasmania would welcome further discussion on how we can collaboratively enable a connected Tasmanian enterprise, innovation and commercialisation system.

In developing an Advanced Technology Industries Strategy for Tasmania, the challenges to technology development and adoption need to be considered, including STEM skills and education attainment shortages, high infrastructure costs and complexities in connecting businesses, researchers and government in the right way to support innovation and commercialisation outcomes.

STEM skills and education are vital for the economic development of Tasmania and are a powerful lever to increase productivity and economic growth, preparing the future workforce with the skills, knowledge and tools to thrive in the rapidly changing digital and technological landscape. Tasmania's strategic industry sectors will need more STEM educated workers to meet projected growth and deliver on major projects, alongside more general technology and specialist IT skills to enable digital transformation across most industries. However, Tasmania already faces a shortage of people with the required STEM education and skills, and this is projected to further decline without intervention. Tasmania needs to build STEM engagement, aspiration, and skills at all levels of our education system which will require strong leadership and collaboration across industry, education, and government sectors.

Modern, fit-for-purpose STEM research and education facilities are critical, with job opportunities and growth as well as the competitiveness of existing industries dependent on science and technology developments. In a state where STEM education is in decline, contemporary learning and teaching facilities are needed to attract and engage the next generation of STEM workers, researchers and educators, providing access to modern

equipment and emerging technologies. The University's proposed STEM campus at Sandy Bay, together with significant development of the north and north-west campuses, will benefit Tasmania's advanced technology industries by establishing collaborative STEM precincts, providing opportunities for industry to co-locate with researchers, and inspiring the next generation to pursue science and technology education and careers.

Collaboration across industry, community, education sectors and government is important in developing and adopting emerging technologies and driving innovation. Cross-sectoral partnerships to support the growth of advanced technology industries is critical for bringing Tasmanian innovation to the world and will provide the basis for renewing the State's economy and driving technological progress. Enabling collaborative approaches to technology adoption, innovation, commercialisation and start-ups will lift productivity, creating new high-quality jobs and attracting private sector investment to the State.

Tasmania's Advanced Technology Industries Strategy comes at a critical time for our State, and increasing STEM skills and supporting the adoption of advanced technologies across multiple sectors will be critical for driving economic development and lifting productivity. Tasmania's productivity rate is 26% lower than the national average for Australia[i], and productivity growth is critical as the key driver of real wage growth, rising living standards and economic growth. Increasing STEM skills and capabilities within the workforce can enhance productivity and contribute to economic growth by promoting innovation, automation, and advanced technology adoption. International research highlights the correlation between STEM skills and technology adoption and productivity, with one study showing that every 1 percentage point increase in the share of high-skilled STEM workers generates a productivity gain of around 2%[ii]. It is estimated that a 1% increase in Tasmania's STEM workforce would generate a $1.2 Billion increase in Tasmanian GSP over the next 20 years[iii], and the outcomes resulting from productivity improvements would lead to higher levels of economic growth, increased income per capita and more innovation and start-up creation.

The consultation paper seeks to shape the future of advanced technology industries in Tasmania. In our response, we draw on the extensive research and teaching experience across our University community, while considering the opportunities and challenges our island State faces in developing and adopting emerging technologies.

Responses to Key Questions in the Consultation Paper

Question 1: What advanced technologies should be the focus of the strategy?

Tasmania has successfully developed and adopted advanced technologies in a range of industry sectors, and the strategy should focus on opportunities where we have existing advantages in terms of geography, expertise, or capability, prioritising technologies with direct local application. As the only university based in Tasmania, the research expertise within our institution will contribute significantly to identifying the existing capabilities and technology applications in the State. Our capabilities include:

Portable, real time, analytical sensors – our centres work with technology providers to develop and adopt cutting-edge methods for water quality monitoring, food and agricultural products, and chemical tracing for explosive detection.

Autonomous systems and vehicles – the Australian Maritime College (AMC) leads in maritime engineering and hydrodynamics, maritime autonomy, simulation, maritime logistics, and the impact of human factors on maritime operations, and houses the Autonomous Maritime Systems Laboratory for research on Autonomous Underwater Vehicles (AUVs) and Autonomous Surface Vehicles (ASVs).

Remote sensing – we use sensors on unmanned aerial and aquatic vehicles for environmental mapping and monitoring, including in extreme environments like the Antarctic and Southern Ocean, with applications in climate change studies, glaciology, vegetation studies, oceanography, forestry, and environmental management.

Climate Safe Engineering – our focus is on zero emissions engineering (renewable energy, energy efficiency and electrification), and natural hazards engineering (disaster readiness, climate-safe infrastructure and geohazards), to address global warming challenges.

Space – we combine world-class space research with specialist infrastructure and international partnerships, contributing to communications, radio astronomy, and space geodesy

Suggested technologies for the Strategy to focus on include advanced analytical sensor and monitoring technologies, advanced renewable energy and power systems, advanced robotics, artificial intelligence, autonomous systems and vehicles, digital twins, immersive reality and simulation, Internet of Things, remote sensing, position, navigation and timing applications, spacecraft tracking, space domain awareness, and 3D printing and advanced manufacturing. Environmental monitoring, conservation biology, and biosecurity could also be considered as additional technology application areas to include in the Strategy, given their relevance to Tasmania and the University's leading expertise in these fields.

We recognise that, in some cases, technologies may be best considered for adoption and integration rather than development, given the scale and pace of development in other jurisdictions. Further consideration of the social, environmental, and ethical implications of technologies for the R&D sector, government and workforce is also recommended.

We suggest cross-sectoral roundtables as an effective way to identify and document existing capabilities across the State, facilitate collaborative discussions and enable strategic planning for the integration of advanced technologies. In addition to identifying capabilities, these forums would provide an opportunity to identify partnerships and opportunities for collaboration across different sectors and between industry, education and government. Examples of such opportunities for Tasmania could include:

- Harnessing current-generation AI and Extended Reality (XR) technologies with a strategic move towards more sophisticated, human knowledge-driven advanced technology. This includes advancing generative AI capable of interpreting and utilising complex environmental and scientific data, essential for areas such as terrestrial protected areas, Antarctic and Southern Ocean research and maritime logistics.

- Human-AI collaboration and agentic workflows, enabling humans and AI systems to work together and achieve outcomes that neither could accomplish independently. By focusing on these concepts, Tasmania can strengthen its ICT and other industry sectors, drive innovation, and address specific local needs, including niche medical/human applications that involve wearable technologies beneficial for remote/extreme/edge locations for a variety of sectors.

- Advanced technologies can increase agricultural productivity, creating stronger links between agriculture and food manufacturing sectors to capture more value from primary agricultural production through food production.

- Increasing onshore processing of forest and wood products across the full value chain, by adopting advanced technologies. This would secure future forest resource for multiple economic, environmental and social benefits; achieve efficiencies in harvesting, hauling, segregating, and processing logs for maximum value adding; and develop innovative wood products from Tasmania, including engineered wood products, developing fire resistant wood coatings, and turning residue into product to create the circular economy.

- The VirtualTAS statewide LiDAR program presents an opportunity to develop a statewide digital twin, supporting applications in fire management, forestry, biodiversity conservation, urban planning, and climate adaptation.

- Leading the adoption of small sensor technology (e.g. air and water monitoring, industrial processes, animal and human health) and related mobile analytical technology (including drones and autonomous sensing technologies). An example is utilising personalised sensors (e.g. smart watches) combined with environmental sensor arrays (e.g. air quality, water quality) as a powerful basis upon which we can understand the interplay of people and environment, with impacts on health, wellbeing, and productivity.

We would welcome the opportunity to engage further with the Tasmanian Government, industry and community representatives to more deeply understand the extent of uptake of advanced technologies and level of interest and capability, to inform the identification and prioritisation of future investment and collaboration opportunities for Tasmania.

Question 2: What are Tasmania's strengths and capabilities? How can we build on these?

Tasmania has natural advantages deriving from its resources, geography, and deeply connected communities. Tasmania is home to world-class research expertise and infrastructure, including high-profile research organisations and institutes with capabilities in advanced technology development. As a gateway to Antarctica and the Southern Ocean, Tasmania provides a unique marine environment. Well-established strategic sectors such as agriculture, aquaculture, forestry and tourism, where industry, academic and government are connected and aligned, makes Tasmania well-suited for innovative advanced technology applications. Our abundant renewable energy resources are a critical strength to build on, while our geographic scale and proximity to polar, remote, and extreme environments and terrestrial and freshwater temperate ecosystems make Tasmania an ideal testbed for certain advanced technologies such as spatial technologies.

To build on these Tasmanian strengths, the Tasmanian Government should consider strategies which foster partnerships between research institutions, businesses, and global technology leaders. By investing in cutting-edge research and promoting collaboration with national and international partners, Tasmania can establish itself as a global hub for technology innovation. Securing modern, accessible research infrastructure and technical expertise within the State should be a priority, including attracting investment in dedicated research hubs for advanced technologies with opportunities for industry co-location, which would enhance collaboration and innovation.

As an example, bringing together government, research and commercial partners to create dedicated research hubs could include a Tasmanian Space Centre for space-related activities. This centre would leverage world-class facilities such as the University's Mt Pleasant and Bisdee Tier observatories, focusing on areas such as precision and large instrument engineering, space and defence applications, radio astronomy, and position, navigation, and timing applications that underpin remote sensing and climate research.

Attracting innovators to Tasmania, especially those who are small and mobile and are drawn by the lifestyle benefits, could be facilitated by the creation of these research hubs and innovation communities through investing in STEM infrastructure for education, research and industry. These investments would position Tasmania as a destination for technological advancement, innovation and research excellence.

Question 3: What advanced technology applications will have the highest impact on your organisation/industry?

From an educational perspective, Artificial Intelligence is having the greatest impact on pedagogy, teaching delivery, and student experience. Careful consideration needs to be given to AI technologies for educational outcomes, and the University would welcome the opportunity to work across Tasmania's education system on collaborative approaches and sharing knowledge for adopting and understanding AI technologies in education.

Renewable energy development (e.g. Green Hydrogen and marine renewable energy, among others) and integration will require new technological and manufacturing solutions across many industries. For example, applications of machine learning to grid automation and clean energy integration; and grid and off-grid solutions for remote locations and extreme environments. Further, our future environment under climate change will require better monitoring of natural systems (e.g. via high-resolution geospatial data) for bushfire risk assessment, flood modelling, infrastructure resilience and building predictive systems for natural hazards. Digital twin technology can enhance urban planning, disaster response, and climate adaptation, while AI-driven biodiversity and land-use monitoring supports conservation and resource management. Remote sensing can quantify environmental restoration efforts for emerging carbon and biodiversity markets.

In the maritime domain, digital twin and simulation technologies offer new opportunities for immersive training and optimisation of maritime and naval vessels, systems, logistics and operations; and trusted autonomous systems and vehicles will impact Defence, offshore industries, ocean exploration and monitoring, and transportation/logistics. Smart sensors will enhance marine environmental monitoring and aquaculture management. For defence and space, precision positioning, navigation and timing; space domain awareness; orbit determination services and spacecraft communication will impact the industry and operations significantly.

In Antarctic and Southern Ocean research, improved remote sensing and autonomous and remotely operated systems for environmental monitoring in polar environments (e.g. long range AUVs and drones); advanced sensor and monitoring technologies for data collection (e.g., hydro-chemistry, atmospheric, and seafloor mapping); innovations in engineering for extreme environments, including robust science equipment and modular laboratories; data storage and processing capabilities to handle the large volumes of data collected during polar expeditions; advanced data management systems for real-time data processing and sharing; and green energy solutions for research facilities.

In Tasmania's forestry sector, AI, remote sensing, digital twins, IoT, autonomous systems, and advanced analytical technologies will be critical to achieving the goal of increased onshore processing of forest and wood products across the full value chain.

In agriculture, advanced technologies will play a pivotal role in increasing productivity by addressing some of the sector's most pressing challenges, such as climate change and labour shortages. Advanced technology in Agriculture is more than just precision agriculture, which can mean anything from "big data" to the actual equipment that people are installing. We would encourage the Government to abandon the term precision agriculture, and to adopt terms that are more descriptive/precise to the technology being developed or adopted.

Queston 4: What are the key barriers to advanced technology adoption for your organisation/industry? How can we address these barriers?

The University of Tasmania considers the most significant barrier to advanced technology adoption across most industries and organisations within the State is the shortage of STEM skills and qualifications. Tasmania will need more STEM educated workers to meet projected growth and deliver on major projects, however, the current and projected shortage

of people with the required STEM education and skills does not position our State for achieving this. The current numbers of Tasmanian students studying STEM subjects at school, and bachelor's qualifications are too low to sustain a STEM workforce for Tasmania or grow to meet future demands.

Additional barriers to advanced technology adoption include inadequate infrastructure for prototyping, testing, calibrating, and fabricating equipment. High infrastructure maintenance and upgrade costs are also significant challenges, as is the limited local manufacturing and maintenance capacity for specialised equipment.

Interoperability issues, such as ensuring equipment and data can operate across multiple platforms, and data accessibility challenges due to regulatory and policy barriers both restrict cross-sector data sharing. Regulatory hurdles and funding constraints are additional obstacles. There is also limited access to specialised training and expertise, as well as specialised technical roles and infrastructure.

To address these barriers to adoption, the Tasmanian Government should consider targeted and ongoing incentives and funding support for advanced technology R&D, along with building partnerships with global technology leaders for knowledge transfer and co-development. Advocating for streamlined regulatory frameworks that support early innovation and adoption of advanced technologies is essential, as is supporting common standards across multiple industries to address interoperability issues. This could be achieved by establishing open-access data platforms to improve data exchange and efficiency and providing industry training programs on advanced technology applications.

Importantly, initiatives to address the barriers to advanced technology adoption will need to be applicable across multiple industry sectors and available to industry and business, education and research institutes, and government, for maximum impact and effectiveness.

Question 5: What are the major challenges to advanced technology research, development and commercialisation in Tasmania? How can we address these challenges?

The University of Tasmania's research commercialisation arm, UTAS InVent, works alongside University researchers, students and alumni, government, industry partners and investors, to bring Tasmanian led innovation to the world. UTAS InVent encourages and supports research directed towards solving real-world problems vital to Tasmania and the world, through early identification of emerging opportunities and supporting collaboration between the University, businesses, government agencies (State and Federal), and industry organisations including Research and Development Corporations (RDCs).

Some of the challenges experienced with commercialising advanced technologies are limited investment opportunities in R&D and commercialisation; limited collaboration opportunities between businesses, government and the University; and lack of commercial incentives for private sector investment.

These challenges could be addressed by introducing concessions or attracting funding to assist with development of prototypes and concepts for commercialisation. This could include limited competitive grant funds to encourage emerging opportunities alongside more

significant competitive grant funds to progress tested and proven concepts. Commitment of State Government funds to leverage co-contributions from industry and other partners is a proven approach to supporting start-ups and attracting commercialisation investment, for example the Breakthrough Victoria Fund[iv].

Support for bringing commercialisation concepts to market should also include coordinated advocacy through State and Federal bodies such as the TAS Office of the Coordinator General, TAS Trade Advocates, and Trade and Investment Commissioners (eg. Investment NSW, Invest VIC, Austrade). This could include assistance and coordinated support through a Team Tasmania approach to seeking investment opportunities from national and international entities.

Mentoring and support for inventers and entrepreneurs is important to foster a culture of innovation, development and commercialisation, including skills development in pathways to commercialisation; progressing opportunities through the TRL levels and towards market / commercial outcomes; identification of current market players and total available markets; patent / IP advice; business plan and marketing advice; legal and taxation advice; and other commercial and strategic advice.

Creating talent development and retention programs will also attract and retain skilled professionals in advanced technology fields to ensure a robust pipeline of expertise supporting innovation and commercialisation efforts. This could include collaborative training initiatives with the University, research centres, and industry; government-supported programs, such as scholarships, internships, and upskilling opportunities; and incentives to retain local talent and attract skilled professionals from outside Tasmania.

Underpinning these initiatives to supporting and attracting advanced technology research, development and commercialisation in Tasmania is the need for accessible, modern high-tech hubs to provide access to the technology and facilities needed for innovative research and development. These facilities should be equipped with shared laboratories, testing facilities and pilot production units, enabling innovators to reduce costs, collaborate effectively across sectors, and expedite the journey from concept to commercialisation.

Question 6: What infrastructure is critical to advanced technology development and adoption?

Tasmania needs modern facilities and specialised STEM infrastructure, including research facilities, to attract and support advanced technology development and adoption. Further, investing in STEM educational facilities will improve STEM participation and education outcomes in Tasmania, creating a pipeline for a highly skilled advanced technology and innovation workforce.

The critical infrastructure needed in Tasmania to support advanced technology development and adoption includes high-performance computing (HPC) systems capable of storing, processing, and analysing vast amounts of data; enhanced data networks and cloud computing for real-time environmental monitoring; high tech cluster ecosystems including establishment of Tech Hub precincts and start-up innovation hubs to provide a focal point for labour, industry and investment; advanced prototyping and simulation facilities for autonomous systems; bespoke test sites for renewable energy, autonomous marine vehicle

and sustainable marine technology; statewide digital twin infrastructure integrating LiDAR, satellite, and drone data; and facilities for testing and calibrating research equipment in controlled environments and dedicated laboratories for equipment fabrication, modification, and assembly.

Question 7: What skills and training are most needed to support the development and deployment of advanced technologies?

STEM capabilities, particularly in engineering, mathematics, and ICT/computer science, are critical to facilitate innovation and translation of ideas into viable technology solutions across multiple industries and sectors.

Increasing the ICT skills across multiple sectors, including big data management, cybersecurity, and secure cloud networking skillsets, are also required to enable technology advancement. Specialised training in next-generation AI technologies is important, focusing on areas such as developing and managing human knowledge-driven ICT systems, including responsible, XR-based human-centred programs and ethics in ICT systems and cyber securities policy development.

Increasing general ICT and technology skills across the workforce will be challenging, as low digital literacy is a significant barrier in Tasmania. An estimated 40% of the State's current agriculture workforce requires training in technology and technical skills to utilise digital technologies[v]. TAS Farm Innovation Hub, in conjunction with AgriFutures, piloted a project to understand how to develop the digital skills of Tasmanian producers. This found that the biggest challenge is in helping farmers get started on their digital literacy journey – the relative effort to move from a non-user to a foundational level of digital literacy is far higher than to progress from foundational to more confident users. This work in connecting research to end users and building capacity and confidence for on-farm practices is a good example of the collaborative research, development and extension models required to understand and leverage the benefits of advanced technology in industries.

Tasmania's strategic sectors have specific opportunities for skills and training for technology advancement.

In the maritime sector, expertise is required in maritime autonomous systems and robotics; advanced ocean engineering, marine renewable energy and power systems; and data analytics and AI application skills tailored to maritime industries and supply chain management of Tasmanian exports. In Antarctic and Southern Ocean research, expertise in autonomous systems, robotics, and advanced sensor technologies; engineering skills specific to designing equipment for extreme environments; data science and analytics for processing large datasets; and interdisciplinary training in STEM fields tailored to Antarctic research are needed. For remote sensing and spatial analytics, specialised training in geospatial AI applications, alongside increasing AI-driven spatial modelling capabilities to operate spatial systems will support technology advancement and adoption.

At the University of Tasmania we are committed to delivering education aligned with industry need and which cultivate the skills and knowledge needed for the State's future workforce.

We have the capability to design innovative, tailored offerings that consider specific learning needs of different student types. With our existing partnerships with industry, schools and Vocational Education and Training (VET), we work collaboratively to design and develop cross-sectoral education and training products to build Tasmania's workforce capacity and align skills development with the needs of Tasmania's advanced technologies future.

Question 8: What are the barriers to training, attracting and retaining skilled technology workers? How can these be addressed?

There is an extremely competitive market for skilled technology workers across Australia, and to attract, retain and train the next generation will require coordinated efforts from Government, schools, industry and the University to lift declining STEM standards, build our technology industries, and offer attractive career opportunities within Tasmania.

The national decline in STEM education across Australian schools will continue to be a major barrier in attracting skilled technology workers, and this is compounded in Tasmania. The availability and growth of STEM professionals in Tasmania is limited by the State's low STEM bachelor attainment rate. The proportion of Tasmanians with a STEM bachelor's degree is 25% less than the national level, with only 3.6% having completed a tertiary STEM qualification compared to the national average of 4.7%[vi]. Current bachelor attainment rates across STEM fields are too low to sustain the current STEM workforce, let alone grow the workforce to meet the state's future needs.

Educating the STEM workforce Tasmania needs for the future will continue to be challenging, with declining enrolment rates in pre-tertiary STEM school subjects. In Tasmania, student enrolments in pre-tertiary STEM subjects have fallen by 14% since 2018. The number of students studying STEM is at a crisis point – in 2023 in Tasmania, only 179 students in year 11 and 12 studied specialist mathematics, only 299 studied physics, and 456 studied chemistry[vii]. This impacts higher education attainment levels in the state, with fewer students completing Year 12 who are prepared and able to study STEM-related disciplines at a tertiary level.

More Tasmanians will need to be educated in STEM fields to support the State's advanced technology industries and drive innovation across multiple sectors. Additionally, Tasmania will need to attract more STEM skilled workers, educators and students to relocate to Tasmania to meet workforce needs.

Currently, Tasmanian businesses are competing with national and global organisations offering competitive salaries, modern facilities and technology, opportunities for career development and progression and a critical mass of skills and activity. Tasmanian businesses and industry need support to remain globally competitive to attract and retain skilled workers. Establishing internship, mentorship and scholarship programs to provide practical training opportunities and facilitate workforce development, including government and industry supported research fellowships, will retain and enhance Tasmanian talent. Enabling investment in STEM infrastructure and facilities in Tasmania, particularly with opportunities for cross-sector connection and co-location, will also retain and attract STEM skilled workers and provide opportunity for further education aligned to areas of workforce

need. Such co-location also establishes hubs of technology and innovation communities, creating networks and enabling professional growth across sectors.

These initiatives will enhance the global profile of Tasmania's research and innovation ecosystem, and promoting our State's unique position and distinctive strengths in areas such as Antarctic Science and Agriculture will attract national and international talent as well as industry investment.

Conclusion

The University of Tasmania welcomes the opportunity to further discuss this Strategy with government, industry, and community stakeholders to identify sector-specific and cross-sectoral opportunities and ways to work together to accelerate advanced technology development and adoption. We suggest the Strategy and resulting initiatives should focus on those areas where Tasmania has competitive advantages, expertise and capability, rather than attempting to focus on breadth, and with emphasis on sustainable development and climate action.

We look forward to contributing to a Tasmanian Advanced Technology Industries Strategy that positions Tasmania as a hub for advanced technologies, leverages our unique geographic advantages and expertise to create a sustainable and prosperous future for all Tasmanians.

[i] ABS Australian National Accounts: State Accounts
[ii] ITIF (Innovation Technology & Innovation Foundation), 2024
[iii] World Bank for Australia and ABS, 2021 Census
[iv] Breakthrough Victoria Fund, www.breakthroughvictoria.com
[v] Agricultural Training Needs for Tasmania, RMCG, 2022
[vi] ABS Census Data, 2021
[vii] TASC Course Scaling Data, 2018 – 2023