Department of
Jobs, Tourism, Science and Innovation

GOVERNMENT OF WESTERN AUSTRALIA

How Today's Technology Shapes Tomorrow's Jobs

The importance of STEM education and training initiatives in preparing the workforce for these technological shifts

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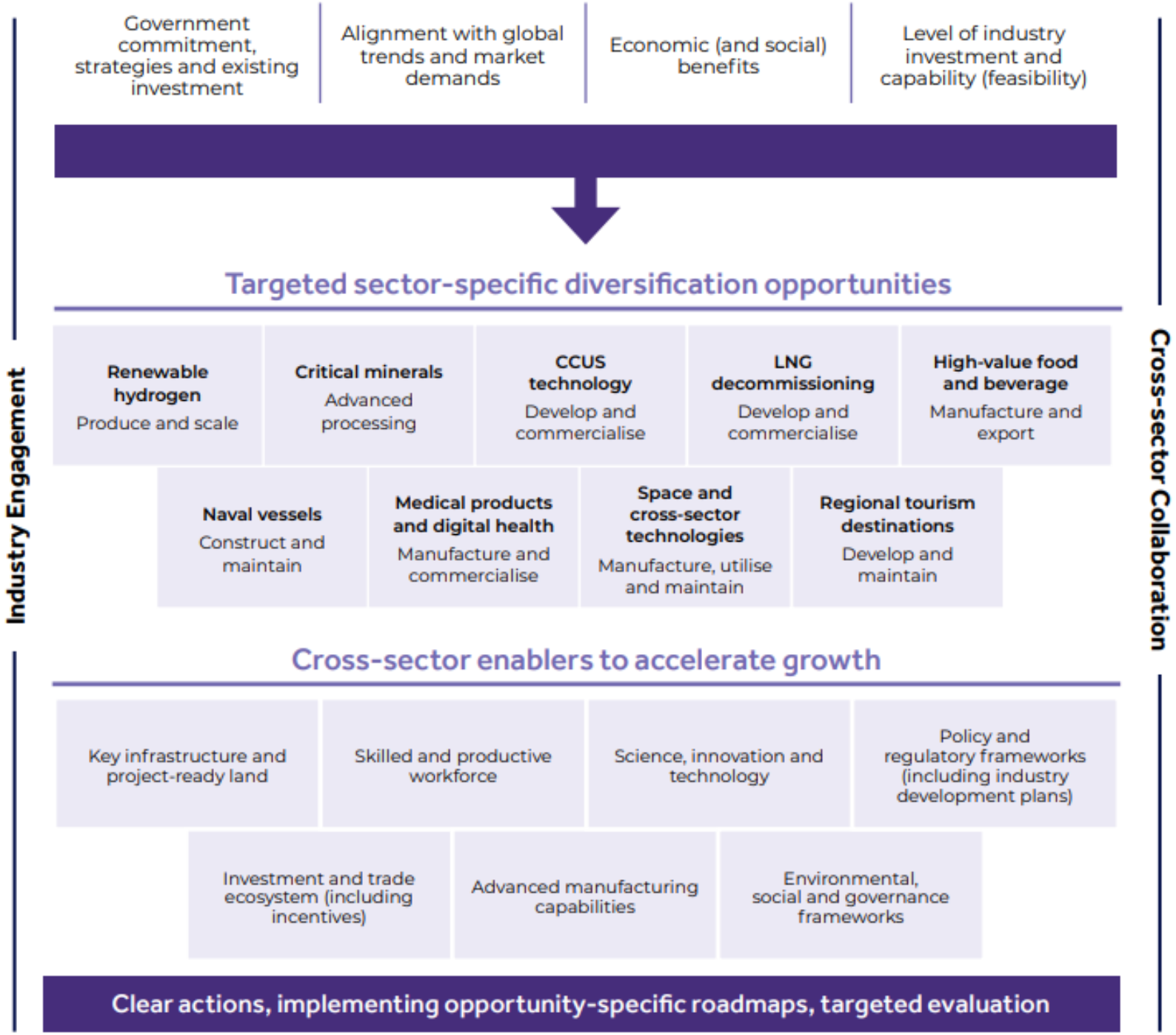
WA Education Summit – 1 August 2024

Acknowledgement of Country

The Department of Jobs, Tourism, Science and Innovation acknowledges the traditional custodians throughout Western Australia and their continuing connection to the land, waters and community. We pay our respects to all members of the Aboriginal communities and their cultures, and to Elders both past and present.

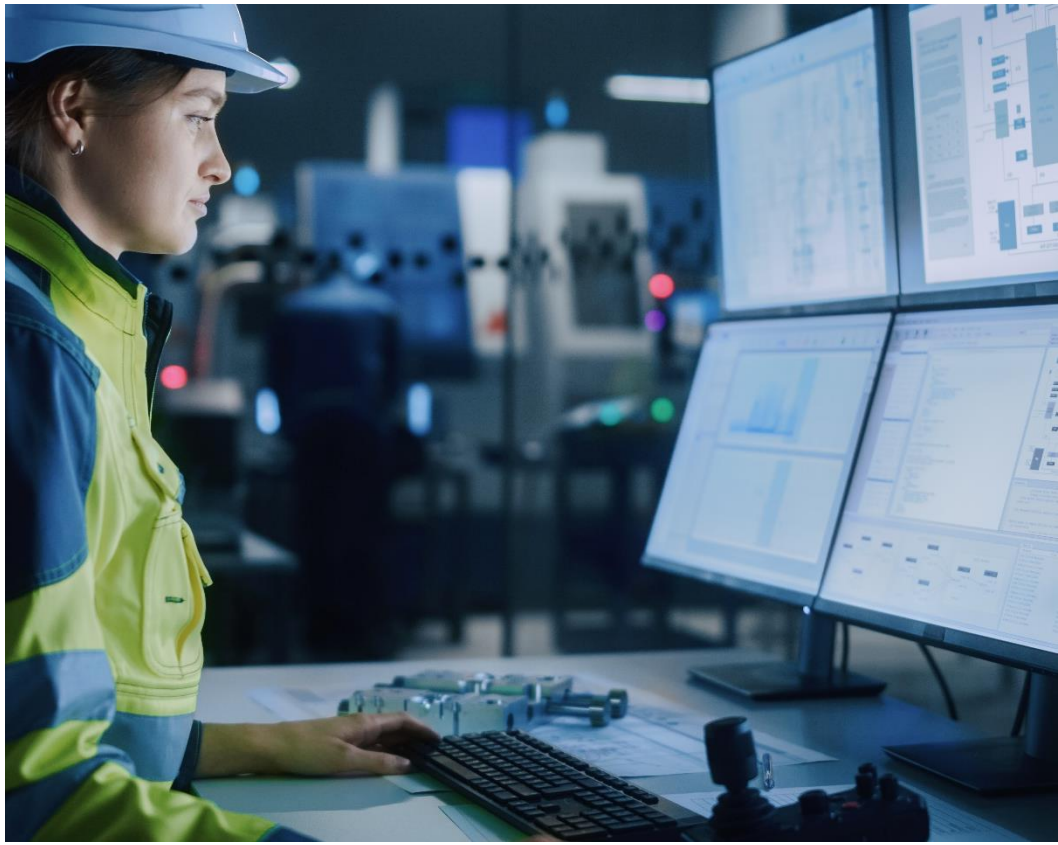
Diversify WA: Future State

- Diversify WA: Future State is critical in preparing Western Australians for, and showcasing, STEM opportunities in emerging, diversifying and/or decarbonising industries
- There are 9 targeted, sector-specific diversification opportunities and all sectors are calling for STEM skills
- Sectors including primary industries and agriculture, mining and METS, cyber, and defence industries will require a larger and more robust STEM qualified workforce.
- Key sovereign projects such as AUKUS are echoing the need for STEM skills as well.



Space and technology transfer

- The global space economy was worth US$630 billion in 2023 and is forecast to reach US$1.8 trillion by 2035.
- WA is home to over 130 international and Australian organisations involved in space and space-related services.
- WA also hosts the International Centre for Radio Astronomy Research and will co-host the Square Kilometre Array, the largest telescope in the world.
- The Australian Remote Operations for Space and Earth entity is headquartered in WA and key to technology transfer between resources and space sectors.
- The space sector is essential for environmental monitoring and sustainability and technology transfer will enhance decarbonisation activities.



Western Australia Space Infrastructure

Key

- Facilities, organisations, precincts
- Telescopes; Position, Navigation and Timing (PNT); and space situational awareness (SSA)
- Education and public outreach
- Supporting HPC infrastructure and cyber security
- Radio astronomy telescopes, research centres and supporting infrastructure
- Ground Stations
- Defence
- Start-up and SME innovation hubs
- Research centres
- Launch
- Regional calibration sites

*Under development; **Proposed

Western Australia Optical Ground Station, The University of Western Australia

- Australian Automation and Robotics Precinct
- Space Science Education Centre, Joseph Banks Secondary College
- WA Austcyber Innovation Hub
- Edith Cowan University Security Research Institute

Australian Space Automation, AI and Robotics Control Complex, operated by Fugro

Perth International Telecommunications Centre
- Inmarsat
- Telstra

CSIRO
- Australian Science Operations Centre
- Australian SKA Regional Centre
- Australian Science Processing Centre
- Space and Astronomy
- Pawsey Supercomputing Research Centre

- Scitech
- WA Museum Boola Bardip
- CERI
- CORE Innovation Hub
- DUG Technology
- Australian Remote Operations for Space and Earth (AROSE) consortium
- Space Automation, AI and Robotics Control Complex
- Perth Landing Pad – Spacecubed

Optus Earth Station

Speedcast ground station

Perth CBD

Crawley

Kensington

Bentley

Perth Observatory

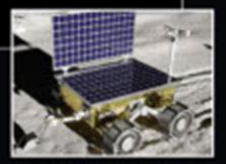
The University of Western Australia
- International Space Centre
- Western Australian Optical Ground Station
- Defence and Security Institute
- International Centre for Radio Astronomy Research
- ERDI Testlab

WA Satellite Technology and Applications Consortium Earth Station

Curtin University
- GNSS Satellite Positioning and Navigation Group
- Remote Sensing and Satellite Research Group
- Space Science and Technology Centre
- Curtin Institute for Radio Astronomy
- Data Science Innovation Hub
- Innovation Central
- Australian Space Data Analysis Facility

Australian SKA Pathfinder Telescope

Binar CubeSat Space Program, Curtin University



AROSE consortium lunar rover (Artist's impression)

- **Cocos and Keeling Islands** Indian Space Research Organisation*
- **Across WA** Geoscience Australia Continuously Operating Reference Stations (PNT)
- **Distributed nationally** Desert Fireball Network, Curtin University

Airbus Space and Defence, High Altitude Pseudo-Satellite (HAPS) flight base

Harold E Holt Communications Station (Space Surveillance Telescope; C-Band Space Surveillance Radar System)

Learmonth Solar Observatory

EOS (SSA laser-optical telescope)

- Carnarvon Space and Technology Museum and DTC dish
- COMSPOC* and ThothX LLC Earthfence Deep Space Radar
- NBN ground station
- ExoAnalytic*

Carnarvon

UWA Space Surveillance Hub – hosting:
- The University of Western Australia Zadko telescope (SSA)
- Ariane Space tracking facility (SSA telescope)
- JAXA (SSA telescope)
- Polish Space Agency (SSA telescope)
- Slingshot Aerospace (SSA telescope)
- US Air Force Pindan Falcon optical telescope (SSA)
- Gravity Discovery Centre and Observatory

Australian Square Kilometre Array Pathfinder

Murchison Widefield Array

Square Kilometre Array*

Murchison

- DUC Technology*
- MRO Support Facility
- Square Kilometre Array Engineering Operations Centre

- Australian Defence Satellite Communications Station
- Starsite

Kojarena

Geraldton

Jindalee Operational Radar Network

Mingenew Space Precinct

Mingenew Space Precinct
- CNES DORIS ground station operated by Geoscience Australia (PNT)
- NASA MOBLAS 5 Satellite Laser ranging facility (PNT)
- Swedish Space Corporation, Western Australia Space Centre (SSA)
- University of Tasmania Very Long Baseline Interferometry (PNT)
- Australian Maritime Safety Authority MEOSAR satellite ground station
- Capricorn Space Precinct – WA Teleport:
  - Leaf Space Srl
  - Infostellar
  - Planet
  - ATLAS Space Operations
  - KSAT
- Goonhilly Earth Station*

CSIRO calibration site

Starlink

European Space Agency (Deep Space Network)

Orion Satellite Systems

NBN ground station

Starlink

Cingin

Spacecubed

SEE PERTH REGION INSET

Starlink

Inmarsat Global XpressNetwork Satellite Station

ExoAnalytic Solutions (SSA telescopes)

NBN ground station

Starlink

Cingulan Space

LeoLabs West Australian Space Radar (SSA)

Clean Energy

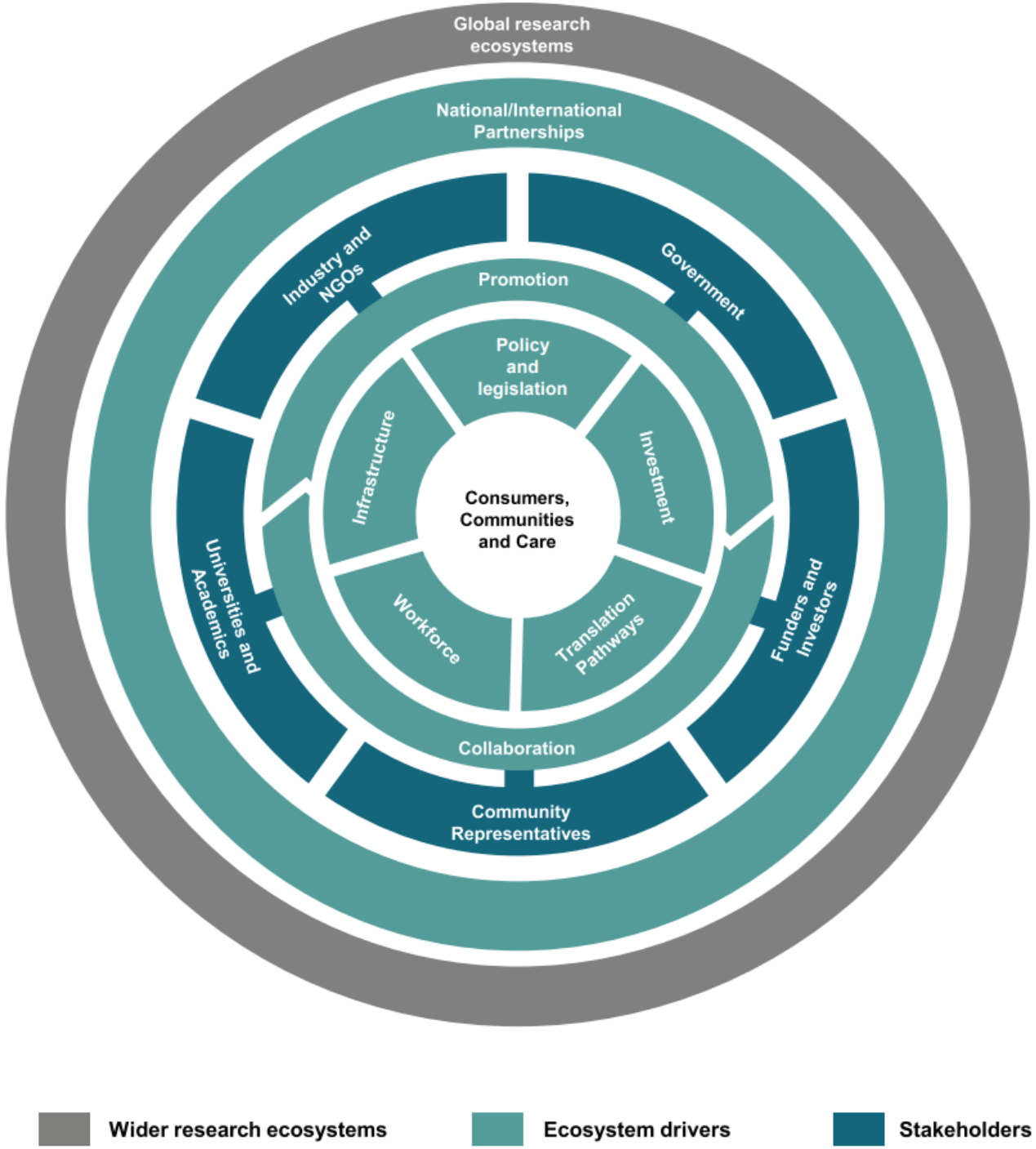
- Western Australia has a target of net zero emissions by 2050 and is set to retire state-owned coal power stations by 2030.
- One of Australia's largest renewable hydrogen plants will be built in the Pilbara, with ENGIE and Yara Pilbara Fertiliser (Yara). Located on Murujuga near Dampier New plant, it will supply renewable hydrogen and electricity to Yara's liquid ammonia facility and will be capable of producing up to 640 tonnes of renewable hydrogen annually.
- Multiple public and private clean energy projects are in proposal and under construction stages, including over 70 wind farms and a dozen solar projects.
- King Rocks Wind Farm (Eastern Wheatbelt) is currently being developed by Synergy, with a maximum installation of 150MW.

Clean Energy

- The **Murchison Green Hydrogen project**, located approximately 20km north of Kalbarri, will produce 2 million tonnes of green ammonia and reduce 5.3 million tonnes of carbon emissions. The project will include 550 wind turbines and 7,000 hectares of solar panel.
- BP's **Australian Renewable Energy Hub** is situated on a 6,500-sq km site in the Pilbara region, integrating solar and onshore wind power, green hydrogen and green ammonia. The project intends to supply renewable power to local customers in the largest region in the world and also for the domestic Australian market and export.
- Aboriginal Clean Energy Partnership's **East Kimberley Clean Energy Project** will be the first 100% green energy, hydrogen, and ammonia export project in Australia. The Aboriginal Clean Energy Partnership has created an opportunity for Traditional Owner groups to co-develop, co-decide and self-determine the project architecture appropriate for their Country and economic independence.
- It has been designed to utilise the existing infrastructure in the region, including electricity transmission lines, roads, airport and the Port of Wyndham. The project will see a ~ 2,000-hectare solar farm developed on MG Corporation freehold land near Kununurra with supporting Green Hydrogen and Green Ammonia production plants.

Health and Medical Life Science Industry Strategy

- The State is home to a growing pipeline of promising early-stage companies such as OncoRes Medical, Neurotologix, Orthocell, Artrya, VeinTech, REX Ortho, CoraMetix, Setonix Pharmaceuticals.
- In 2023-24, the WA Innovation Seed Fund funded 11 innovators and early-stage start-ups to develop and commercialise cutting-edge health and medical innovations.
- Of the 15 drugs developed through the Australian university sector that have achieved US FDA approval, 7 are from Western Australia.
- The Royal Perth Hospital implemented the Health in a Virtual Environment (HIVE) enabled by AI to allow clinical experts to remotely monitor patients 24/7.
- Epichem is Australia's only commercial chemistry company for drug discovery, development, and design and based in Western Australia.
    - The company exports 80% of its products and services to the United States and Europe
    - top 10 small-to medium-size enterprise employers of PhD graduates

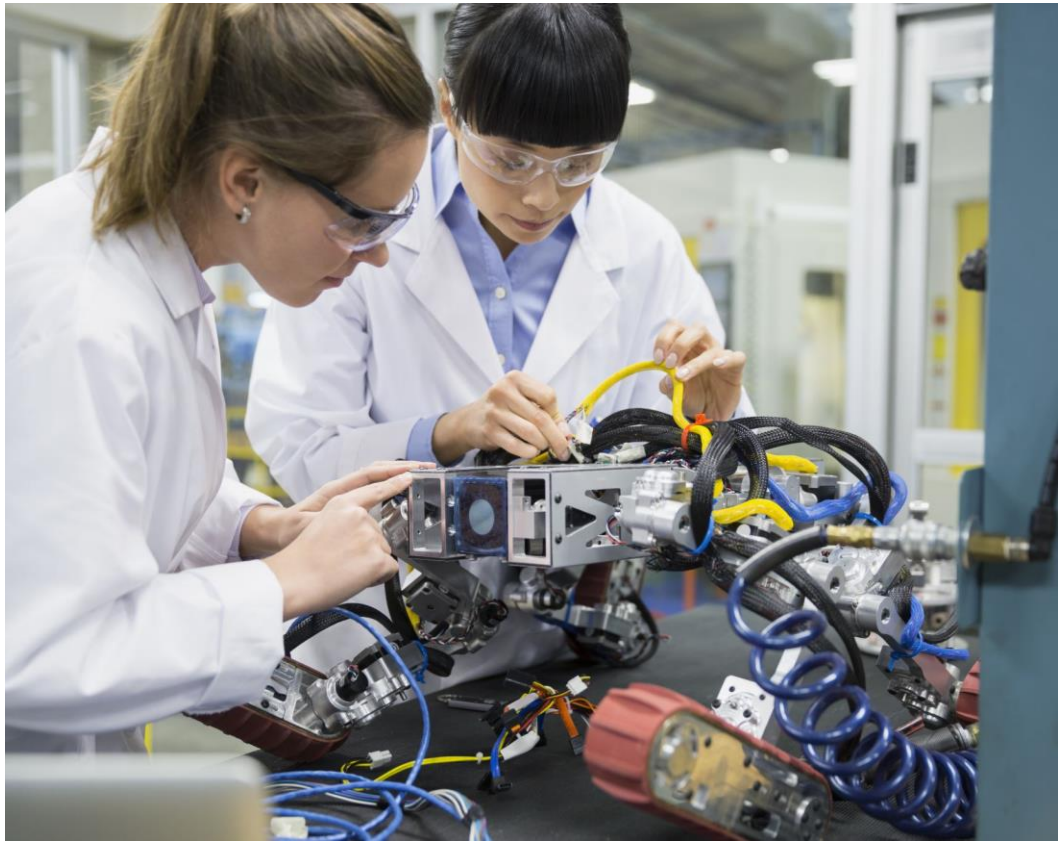


Defence Industry

- WA is strongly positioned to play an increasing role as a hub for naval activity in the Indo-Pacific region.
- WA will be at the forefront of Australia's AUKUS nuclear-powered submarine pathway.
- Austal has been selected as the national strategic shipbuilder and will be delivering Landing Craft Medium to Navy as early as 2026.
- Consolidation of the Henderson Precinct is underway to increase the AMC's capability to support larger navy vessels and potential future sustainment.
- The Commonwealth has announced a pathway for continuous shipbuilding in Western Australia providing a significant pipeline for workforce across a range of VET and STEM fields within Western Australia.

Innovation

- WA’s Innovation Strategy provides a 10-year Vision for WA to become a renowned global hub of invention, investment, innovation and impact.
- The **GreenTech Hub** aims to support and grow local emerging and established green technology businesses.
- The **WA Data Science Innovation Hub** aims to ensure the WA remains at the forefront of the digital revolution.
- The **Creative Tech Village** brings together and supports tech creatives both online and in person at its headquarters in Bunbury.
- The **WA Life Sciences Innovation Hub** aims to accelerate the growth of WA’s medical technology, biotechnology and pharmaceutical sector.
- **CyberWest,** the WA Cyber Security Innovation Hub aims to improve Western Australia's cyber security posture.



Innovation in our WA schools

- Many schools in WA are leading innovation in STEM education and industry partnerships, for example:
- Joseph Banks Secondary College in partnerships with AROSE is setting up **the Western Australian Space Science Education Centre** at the College.
- Cecil Andrews College has embedded STEM throughout their whole curriculum, coupled with their **P-TECH Program.**
- Manea Senior College offers their **Health and Medical Specialist Program** (HMSP) supporting students seeking careers in health and medicine.
- **Two-way science** at Marble Bar and Wiluna Remote Community Schools partnering in CSIRO's Science Pathways for Indigenous Communities Indigenous STEM Education Project,

Our STEM future

- In 2021 the National Skills Commission projected employment in STEM occupations would grow by 12.9% over the next five years.
- Research indicates 1.5 million Western Australian workers will need reskilling in the coming years.
- Proliferation of new technologies are influencing future jobs opportunities, where 65% of today's students are expected to enter jobs yet to exist.
    - Renewable energy & energy analysts
    - Health – drug discovery, informatics specialists and biostatisticians
    - Defence sustainment, innovation and deep technology
    - Data Science, AI, Robotics, Automation
    - Additive Manufacturing, Quantum, Cybersecurity
    - Creative industries and tourism
- Complemented by curiosity, entrepreneurism, critical thinking, empathy problem solving capabilities

Government of **Western Australia**
Department of **Jobs, Tourism, Science and Innovation**

10-Year Science and Technology Plan - Draft

OUTCOMES

GOALS

Western Australia is:

- home to cutting-edge research and technology capability with successful translation and commercialisation
- a leading destination for science and technology expertise and investment
- host to an interconnected network of high-quality, multipurpose physical and digital infrastructure
- renowned for research and development collaborations, integration of Aboriginal communities' traditional knowledge, and capacity to transfer technologies within and across sectors
- home to world-class STEM education, training and career pathways where all people can meaningfully participate in science and technology
- a place where science is celebrated, trusted and used for evidence-based decision making.

STRATEGIC ACTION AREAS

- **Talent, Skills & Workforce**
- **Funding & Investment**
- **Physical & Digital Infrastructure**
- **Leadership, Collaboration & Communication**
- **Translation, Commercialisation & Procurement**
- **Policy, Regulation & Governance**

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RESEARCH AND CAPABILITY PRIORITIES

The Focus Areas and their associated priorities define what the Government will focus its science and technology efforts on.

Decarbonisation and Clean Energy

- Low Emission Energy
- Carbon Capture, Utilisation and Storage and Biosequestration
- Advanced Energy Storage

Health and Wellbeing

- Regional, Remote and Aboriginal Health
- Precision Health
- Disease Prevention and Community Resilience

Environment and Sustainability

- Conservation, Restoration and Discovery
- Climate Adaptation
- Water Security
- Recycling for a Circular Economy

Critical and Emerging Technology

- Remote Operations, Robotics and Autonomous Systems
- Artificial Intelligence and Cybersecurity
- Data Insights, Linkage and Optimisation
- Quantum Capabilities
- Radio Astronomy and Space Technology
- Advanced and Additive Manufacturing

Mineral Supply and Value-Adding

- Mineral Exploration and Characterisation
- Precision and Low Impact Extraction
- Critical Minerals Supply
- Value-added Processing

Sustainable and Secure Food Production

- Climate Resilient Food Production
- Land and Water Optimisation
- Value-added Food Supply

Integrating modern technology and Aboriginal knowledge

Future State, future skills

- The State STEM skills strategy Future Jobs, future skills: Developing STEM skills in Western Australia was released in May 2019.
- The strategy aims to cultivate a diverse, inclusive, and industry-connected STEM education and skills talent pool in Western Australia.
- The next phase of the strategy will provide a targeted approach for the next five years, amplifying the success of ongoing STEM-related initiatives at various community, industry, research, and government levels.

Priority action areas 2024 - 2029

Career pathways and industry linkages

Diversity and inclusion

STEM culture and literacy

WA participation in STEM

- Around 90% of Year 12 students studied STEM subjects or STEM VET qualifications in 2023.
- Students studying at least one advanced mathematics, chemistry, or physics decreased from 21.5% in 2018 to 18.2% in 2023.
- Fortunately, post school pathways into STEM have grown since 2018 including post-school VET and university STEM courses.
- However, STEM uptake is stagnating or shrinking in some fields of education such as natural and physical sciences.
- Similarly, under-represented groups in STEM remain at risk of being excluded from STEM opportunities. In 2023:
  - 64% of Year 12 students from low SES background studied STEM
  - 54% of Year 12 indigenous students studied STEM
  - 49% of Year 12 students living very remotely studied STEM

Power of early experiences

- The decline in enrolments in the most challenging STEM subjects signals a need for targeted interventions in primary schools.
- Research shows students are likely to make decisions about career aspirations **before they are 10**.
- *Youth in STEM WA* published in 2022 demonstrate:
  - Gender disparity in STEM careers is evident before secondary education.
  - Parents are major influencers of student career intentions and future qualification choices.

Awareness of WA STEM industries

- Approximately 75% of WA parents would encourage their children to pursue STEM-based careers.
- However, just over one in four Western Australians (26%) are interested in pursuing a career in STEM-related fields.
- 35% of Western Australians surveyed reported a high awareness of the jobs available in the State's STEM industries (mainly in the resources sector).
- However, many Western Australians are unaware of our other WA STEM jobs in world-leading industries including:
    - 31% aware of STEM jobs in defence industries within WA
    - 19% aware of STEM jobs in space technologies within WA
    - 25% aware of STEM jobs in marine and shipbuilding within WA
    - 28% aware of STEM jobs in agriculture and agribusiness within WA

Importance of STEM capabilities

- It’s not just industry recognising future skill needs, young people also understand the impact of new technology.

- Opportunity to foster greater collaboration with industry and education to demonstrate:
  - Transferable skills inherent in STEM careers.
  - The adaptability and flexibility of STEM skills.
  - ALL jobs need STEM skills.
  - STEM is for everyone ☺

Thank you

ANY QUESTIONS?