

# Engineering education

Can a crisis be averted?



**PRESENTED BY**



Australian Academy of  
Technological Sciences  
& Engineering

**Wednesday 30 August**  
**8:00am-6:30pm AEST**

**Engineers Australia Auditorium**  
**44 Market Street, Sydney**  
**and online**

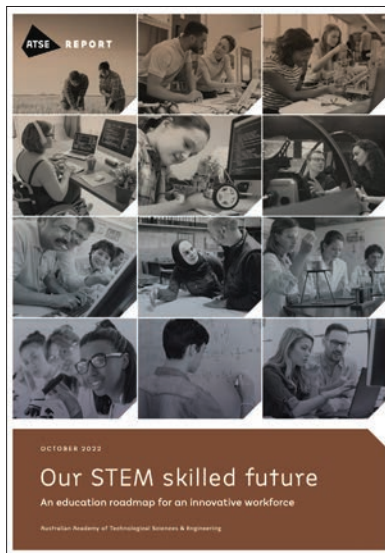
# Australia is faced with a national skills crisis.

Our nation currently lacks the capacity and critical capabilities to be able to deliver on our technology-powered, human-driven potential – both now, and into the future.

The impacts of COVID-19 on border closures and impacts on skilled migration, coupled with rapid advances in business digitisation and transformation, have exposed the fact that Australia's workforce needs to be more resilient and responsive if we are to ensure we have enough science, technology, engineering, and mathematics (STEM) workers in the roles where they are needed most, and to prevent us from becoming a global digital and technological laggard.

The Fellows at the Australian Academy of Technological Sciences and Engineering (ATSE) have identified five key areas that require immediate attention if we are to unlock the country's technological potential. These are in the areas of mathematics, digital skills, agricultural technologies, engineering, and entrepreneurship. Expert Fellows in each of these domains highlighted the critical issues in these areas and hosted a series of five roundtables to consult Australia's leading experts across a broad and diverse range of sectors and industries and explore short and medium-term policy solutions to address the pressing challenges identified. Their topic-specific recommendations are presented in this report.

Four themes emerged as overarching recommendations that apply to each domain and to addressing STEM skills shortages more broadly. The recommendations acknowledge key work and initiatives to be learned from and built upon, wherever possible.



**DOWNLOAD THE REPORT**

[atse.org.au/education-report-2022](https://atse.org.au/education-report-2022)



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08:00–08:30	<b>Registration and coffee</b>
08:30–08:45	<b>Opening Session: Welcome Remarks</b> <b>Dr Katherine Woodthorpe</b> AO FTSE FAICD – President, Australian Academy of Technological Sciences & Engineering
08:45–09:15	<b>Keynote address</b> <b>Professor Mary O’Kane</b> AC FTSE – Chair, Australian Universities Accord Review Panel
09:15–10:15	<b>Session 1: Setting the scene</b> Chair: <b>Professor Mark Hoffman</b> FTSE Deputy Vice-Chancellor and Vice-President, The University of Newcastle <b>Jane MacMaster</b> FIEAus – Chief Engineer, Engineers Australia <b>Mark Bazzacco</b> – Chief of Research Technology and Operations, Defence Science and Technology Group <b>Megan Lilly</b> – Head of Education and Training, Ai Group
10:15–10:45	<b>Morning Tea</b>
10:45–11:45	<b>Session 2: Perspectives from the universities</b> Chair: <b>Dr Katherine Woodthorpe</b> AO FTSE FAICD – President, Australian Academy of Technological Sciences & Engineering <b>Professor Mark Scott</b> AO – Vice-Chancellor and President, University of Sydney <b>Professor Barney Glover</b> AO FTSE – Vice-Chancellor and President, Western Sydney University <b>Professor Vicki Chen</b> FTSE – Acting Vice-Chancellor, University of Technology Sydney
11:45–12:30	<b>Session 3: Government overview</b> Chair: <b>Dr Richard Sheldrake</b> AM FTSE – Vice-President Diversity, Australian Academy of Technological Sciences & Engineering <b>Professor Hugh Durrant-Whyte</b> FRS FREng FAA HonFIEAus FIEEE – NSW Chief Scientist and Engineer <b>Adam Copp</b> – Chief Executive Officer, Infrastructure Australia <b>Professor Scott Sleep</b> – STEM Curriculum Advisor, NSW Department of Education
12:30–13:15	<b>Lunch</b>

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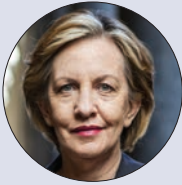
<p><b>13:15-14:00</b></p>	<p><b>Session 4: Perspectives from industry</b>                  Chair: <b>George Maltabarow</b> FTSE HonFIEAus FAICD – Chair, NSW Division, Australian Academy of Technological Sciences &amp; Engineering  <b>Grant King</b> – Former Chief Executive Officer, Origin Energy  <b>Bill Cox</b> FTSE – Chief Executive Officer, Aurecon  <b>Dr Marlene Kanga</b> AO FTSE HonFIEAus – Former President, World Federation of Engineering Organisations  <b>Group Captain Chris Ellison</b> – Director of Military Recruiting, Defence Force Recruiting</p>
<p><b>14:00-14:30</b></p>	<p><b>Afternoon Tea</b></p>
<p><b>14:30-15:30</b></p>	<p><b>Session 5: The education pipeline</b>                  Chair: <b>Dr Bobby Cerini</b> – Deputy Director, Questacon  <b>Professor Lyn English</b> – Professor of STEM Education / Mathematics Education, Queensland University of Technology  <b>Professor Manjula Sharma</b> – Director, STEM Teacher Enrichment Academy, The University of Sydney  <b>Peter Thompson</b> – Chief Executive Officer, Don't Panic STEM Curriculum Support  <b>Dr Michael Myers</b> OAM FAICD HonFIEAust – Founder and Chairman, Re-Engineering Australia Foundation</p>
<p><b>15:30-16:30</b></p>	<p><b>Session 6: What are the solutions?</b>                  Chair: <b>Professor Peter Lee</b> FTSE – Former Vice-Chancellor, Southern Cross University  <b>John Phillips</b> – Director, AustSTEM Foundation and Chief Executive Officer, SLAM Education  <b>Glenn Fahey</b> – Director of the Education Program, The Centre for Independent Studies  <b>Professor Matt Bower</b> – Professor in Education Technology, Macquarie University and Chair of the Australian Technologies Teacher Education Network</p>
<p><b>16:30-17:15</b></p>	<p><b>Conclusion: What have we learned? Summary panel discussion</b>                  Chair: <b>Dr Katherine Woodthorpe</b> AO FTSE FAICD – President, Australian Academy of Technological Sciences &amp; Engineering  <b>Professor Mark Hoffman</b> FTSE MIEAus – Deputy Vice-Chancellor and Vice-President, The University of Newcastle  <b>Professor Peter Lee</b> FTSE MIEAus – Former Vice-Chancellor, Southern Cross University</p>
<p><b>17:15-18:30</b></p>	<p>Vote of thanks followed by cocktail reception and networking</p>

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## Can a crisis be averted?

**Join us as we delve into the pressing issue of the shortage of professional engineers in Australia and explore strategies to avoid a potential crisis.**

With the demands posed by the energy transition, digital transformation, infrastructure programs, defence industries, and the booming resources sector, the shortage of engineers is a problem that carries significant social and economic consequences. To gain a comprehensive understanding of the engineering workforce in Australia, we will examine the insights presented in the ATSE report titled *Our STEM skilled future* published in 2022.



### KEYNOTE ADDRESS

**Mary O'Kane AC FTSE**

**Chair, Australian Universities Accord  
Review Panel**

Professor O'Kane is Chair of the Australian Universities Accord. She was NSW Chief Scientist & Engineer from 2008-2018 and Vice-Chancellor of the University of Adelaide from 1996-2001. For the last 25 years, Mary has served on many Australian and overseas boards and committees in the public and private sectors, especially related to research, engineering, ICT, energy, and international development.

Professor O'Kane has an extraordinary breadth and depth of experience in the innovation, research, higher education, energy, ICT, public policy and development spheres. She also has extensive national and international networks reflecting this expertise.

In the innovation sphere, Professor O'Kane has been a reviewer for several innovation agencies in Europe, including the FFG, the Austrian Research Promotion Agency, and VINNOVA, the Swedish Governmental Agency for Innovation Systems. She is frequently invited to give keynote speeches on productivity and innovation.

Professor O'Kane has a history of carrying out reviews of government and scientific agencies in Australia and has been significantly involved in many research centres, currently chairing the Digital Health Cooperative Research Centre and the Space Environment Management Cooperative Research Centre.

In the higher education sphere, Professor O'Kane was Vice-Chancellor and President of the University of Adelaide from 1996-2001 and Deputy Vice-Chancellor (Research) from 1994-96. Before that, she was Dean of the Faculty of Information Sciences and Engineering at the University of Canberra. Through O'Kane Associates she advises many universities in Australia and the region.

In the energy sphere, Professor O'Kane was Chair of the Board of the Australian Centre for Renewable Energy, and in 2018 a member of the Independent Review into the Future Security of the National Electricity Market, and chair of the NSW Energy Security Taskforce.



## **Mark Bazzacco**

### **Chief of Research Technology and Operations, Defence Science and Technology Group**

Mark joined Defence Science and Technology Group in 2022 bringing with him a deep understanding of research and innovation including 20 years' experience in the public service and a passion for leading integral science and technology support services required by researchers. Mark was Head of Strategy and Chief of Staff at CSIRO. As a part of the CSIRO Leadership team Mark led the strategy, planning, performance and evaluation, investment and portfolio management functions.



## **Professor Matt Bower**

### **Professor in Education Technology, Macquarie University and Chair of the Australian Technologies Teacher Education Network**

Professor Matt Bower is a professor in the School of Education at Macquarie University, who specialises in the innovative use of technology for learning purposes. He is interested in how contemporary technologies such as AI, augmented reality, web-based tools, social networking, and virtual reality can be used to support learning. In 2021 he was one of four recipients of an Australian Award for University Teaching Excellence. Matt is also Chair of the Australian Technologies Teacher Educators Network, which draws together Technologies educators from higher education institution across Australia.



## **Professor Vicki Chen FTSE**

### **Acting Vice-Chancellor, University of Technology Sydney**

Professor Vicki Chen is UTS's Provost and Senior Vice-President. Professor Chen graduated with a Bachelor of Science in Chemical Engineering from the Massachusetts Institute of Technology (MIT) and a Ph.D. in Chemical Engineering from the University of Minnesota. Prior to joining UTS in 2022, Professor Chen was the Executive Dean of the Faculty of Engineering, Architecture and IT at the University of Queensland (UQ).



## **Dr Bobby Cerini**

### **Deputy Director, Questacon**

Dr Bobby Cerini is General Manager of Science and Learning at Questacon. She is responsible for quality and creative direction, national strategic engagement and impact of Questacon's activities to deliver successful exhibitions and programs throughout Australia. Bobby represents the Department of Industry, Science and Resources on a variety of STEM program boards across Australia, and in key national and international stakeholder networks.





**Adam Copp**  
**Chief Executive Officer,**  
**Infrastructure Australia**

As CEO, Adam has led Infrastructure Australia's Strategy, Finance, Risk, People & Culture and Digital Technology functions. He has also worked for more than a decade in strategic stakeholder engagement and government relations roles, including creating and leading Infrastructure Australia's public affairs and government relations functions. An accomplished and transformational public sector leader, Adam has over 15 years' experience in a range of policy, strategy and public affairs roles in Australian Government agencies across infrastructure, workplace relations and the Council of Australian Governments.



**Bill Cox FTSE**  
**Chief Executive Officer, Aurecon**

William (Bill) Cox is Aurecon's Chief Executive Officer, leading the company's rapid growth including diversification across Digital, Advisory and Asia with a team of over 6,000 engineers, scientists and advisors. Bill has a proven track record in building a financially successful, high performance culture with strong client engagement and is a civil engineer with over 35 years' experience.



**Hugh Durrant-Whyte FRS FREng**  
**FAA HonFIEAus FIEEE**  
**NSW Chief Scientist & Engineer**

Hugh Durrant-Whyte is the NSW Chief Scientist & Engineer and Commissioner of the Natural Resources Commission. From 2016-18, Hugh was Chief Scientific Advisor to the UK Ministry of Defence. From 2014-16 and from 2002-2010, he was a Professor and ARC Federation Fellow at the University of Sydney. From 2010-2014, he was CEO of National ICT Australia, and from 1995-2010 Director of the ARC Centre of Excellence for Autonomous Systems and of the Australian Centre for Field Robotics.



**Group Captain Chris Ellison**  
**Director of Military Recruiting,**  
**Defence Force Recruiting**

Group Captain Chris Ellison is responsible for management of attraction and marketing activities, recruiting operations, and governance functions related to entry into the Australian Defence Force. Chris has been in uniform for 31 years, undertaking his initial military training at the Australian Defence Force Academy, together with degree studies as an aeronautical engineer. His Service experience spans operational aircraft maintenance, sustainment and acquisition related to air mobility assets; command of the Royal Australian Air Force School of Technical Training, supervising delivery of aviation maintenance training to the three Services; and a second command overseeing all initial, trade, and post-graduate training for Air Force.



**Professor Lyn English FASSA**  
**Professor of STEM Education /**  
**Mathematics Education, Queensland**  
**University of Technology**

Lyn English is Professor of STEM Education / Mathematics Education, Queensland University of Technology. Her areas of research include mathematics/STEM education, engineering education, ways of thinking in STEM-based problem solving, mathematical modelling, and reasoning with probability and statistics. Professor English is a Fellow of The Academy of the Social Sciences in Australia and is founding editor (1997) of the international journal, *Mathematical Thinking and Learning*.



**Barney Glover AO FTSE**  
**Vice-Chancellor and President,**  
**Western Sydney University**

Professor Barney Glover is a distinguished academic leader, an accomplished mathematician. He is strongly connected with industry and the private sector, including as a Director of the NSW Innovation and Productivity Council, the Powerhouse Capital Campaign Group, and on the Board of the NSW Accelerating R&D Advisory Council. Recently, Professor Glover co-chaired the NSW Innovation & Productivity Scorecard and he is working with the NUW Alliance to build a multiversity campus within the planned high-skills jobs hub of the Western Sydney Aerotropolis.



**Glenn Fahey**  
**Director of the Education Program,**  
**The Centre for Independent Studies**

Glenn Fahey is program director in education policy at the Centre for Independent Studies. His research has covered topics including school funding, teacher training, evidence-based pedagogy, among others. Glenn is an active participant in teacher and researcher exchanges in communities of practice. His perspectives on Australian education are widely covered across all major media networks. He is a regular contributor to the *Australian Financial Review* and the *Daily Telegraph*.



**Professor Mark Hoffman FTSE**  
**Deputy Vice-Chancellor (Academic)**  
**and Vice President, The University of**  
**Newcastle**

Professor Mark Hoffman is a Board Member and Fellow of the Australian Academy of Technological Sciences and Engineering and Chair of the Education Policy Forum. He is co-author of ATSE's seminal report *Our STEM skilled future – An education roadmap for an innovative workforce*. He was recently appointed Chair of the NSW universities Deputy Vice Chancellor Academic Committee. Previously he was Dean of Engineering at UNSW 2015-20.





**Dr Marlene Kanga AO FTSE HonFIEAus**  
**Former President, World Federation of Engineering Organisations**

Dr Marlene Kanga is President of the World Federation of Engineering Organisations (WFEO), the peak body for engineering institutions internationally representing some 100 engineering institutions and approximately 30 million engineers. WFEO is committed to advancing the UN Sustainable Development Goals through engineering. Marlene is the 2018 Engineers Australia Professional Engineer of the Year and has been listed among the Top 100 Women of Influence in Australia and the Top 100 Engineers in Australia. She is a Member of the Order of Australia, a national honour, as recognition of her leadership of the engineering profession.



**Grant King**  
**Former Chief Executive Officer, Origin Energy**

Grant King has extensive experience in the Australian energy industry. He was formerly the Managing Director of Boral Energy and General Manager, AGL Gas Companies where he held a number of management positions. He retired in 2016 after 16 years in his role as Chief Executive, Origin Energy Limited. He is Chairman of HSBC Australia, CWP Renewables, GreenCollar and is Chairman of Sydney Water. He also Chairs the Climate Change Authority. He is also the Chairman of Arventa and runs his own advisory business specialising in energy markets, climate and technology.



**Professor Peter Lee FTSE MIEAus**  
**Former Vice-Chancellor, Southern Cross University**

Emeritus Professor Peter Lee is an experienced senior executive of large organisations with complex stakeholder environments, and an expert in corporate and academic governance of higher education institutions. Peter was Vice-Chancellor and CEO at Southern Cross University for seven years after holding senior positions including Deputy Vice-Chancellor (Academic) at the University of South Australia, Executive Dean (Engineering, Science and Computing) at Curtin University of Technology, and Foundation Dean of Engineering at Murdoch University.



**Megan Lilly**  
**Head of Education and Training, Ai Group**

Megan has an enduring commitment to research, policy and advocacy in education and training, especially in relation to work. In leading the work of the Centre, Megan represents members on a diverse number of international, national, and state based committees, councils and boards. Megan is a strong advocate for reform and has been involved in key national reforms over many years. Megan is firm in the belief the capacity of education and training to transform lives.



**Jane MacMaster FIEAus**  
**Chief Engineer, Engineers Australia**

Jane MacMaster has worked as an aerospace, mechanical and systems design engineer in Australia and internationally, focusing primarily on supersonic flight vehicle design, operations research and rapid prototyping in the Defence and cyber security sectors. She has previously worked as a senior advisor within the strategy unit of the Department of the Prime Minister and Cabinet. She is a director on the Board of the Australian Council of Professions.



**George Maltabarow FTSE HonFIEAus**  
**FAICD**  
**Chair of the NSW Division of the Australian Academy of Technological Sciences and Engineering**

George Maltabarow was Managing Director of Ausgrid from 2004 to 2012. George is an experienced chief executive as well as an energy and financial specialist whose career has included utility and policy roles in all sectors of the electricity industry. He is also currently Chairman of Isothermix, a company developing thermal battery technology. George is a director of the UNSW Energy Institute's Advisory board as well as being an executive committee member of the Warren Center Energy Hub, University of Sydney.



**Dr Michael Myers OAM FAICD**  
**HonFIEAust**  
**Founder & Chairman Re-Engineering Australia Foundation**

Michael, a distinguished Mechanical Engineer, has led technology start-ups for over 40 years, implementing computer-aided engineering for BOEING, Toyota, IBM, the Department of Defence. In 1998, he founded the Re-Engineering Australia Foundation, empowering K-12 students, teachers, and industries. To date, over 1,200,000 students have been mentored, resulting in 42 world champions and podium finishes in international competitions. Michael has helped implement successful STEM programs in France, the UK, New Zealand, China, and Canada.



**John Phillips**  
**Director, AustSTEM Foundation and Chief Executive Officer, SLAM Education**

John is a systems engineer with extensive international telecommunications project and employee relations experience. He retired from Telstra in 2000 and worked with The Warren Centre where he promoted STEM education. He is a Director of the AustSTEM Foundation which aims to raise STEM literacy in Middle School classrooms across Australia, and CEO and co-founder of SLAM Education based in Newcastle.



**Professor Manjula Sharma**  
**Director, STEM Teacher Enrichment Academy The University of Sydney**

Professor Manjula Sharma is a physicist, as well as a nationally and internationally renowned science education expert. She is the Director of the STEM Teacher Enrichment Academy The University of Sydney, and is serving as Vice Chair of IUPAP Commission C14 on Physics Education. Nationally, she has led several substantive Australian government funded projects including Advancing Science and Engineering through Laboratory Learning, ASELL. She co-founded the premier Australian Conference on Science and Mathematics Education (ACSME) and the International Journal of Innovation in Science and Mathematics Education (IJSME).



**Dr Richard Sheldrake AM FTSE**  
**Vice-President Diversity, Australian Academy of Technological Sciences and Engineering**

Richard Sheldrake had a 38 year career in the NSW Public Service, and was Director-General of four Departments (Agriculture, Natural Resources, Industry and Investment and Primary Industries) between 2002 and 2013, when he retired. Richard is currently a member of the Board of the Academy of Technological Sciences and Engineering, and is a member of the NSW Government's Innovation and Productivity Council.



**Professor Mark Scott AO**  
**Vice-Chancellor and President, The University of Sydney**

As Vice-Chancellor and President, Professor Mark Scott AO leads the University of Sydney's strategic direction, in close consultation with the Chancellor, senior leaders and the University's Senate and Academic Board. In this role he is committed to driving transformative change that will support students and staff from all backgrounds to excel and realise their potential, solve the world's most pressing challenges and secure a prosperous future for the University.



**Professor Scott Sleep**  
**STEM Curriculum Advisor, NSW Department of Education**

Dr Scott Sleep is a passionate advocate for STEM and engineering education and brings over 25 years of experience as an educator to his role as an advisor to the NSW Department of Education. Holding a PhD in Engineering, Dr. Sleep has been instrumental in workforce development in the STEM sector. He has previously directed a Defence-funded, OECD-recognised STEM workforce development program.



## **Peter Thompson**

### **Chief Executive Officer, Don't Panic STEM Curriculum Support**

Peter is CEO of Don't Panic STEM curriculum support. He is the recently retired Inspector, Technology Education at the NSW Education Standards Authority. This position followed a 35-year high school teaching career. A passion for advanced manufacturing, Peter and his technology educator wife Ruth placed the first 3D printer in schools over a decade ago. They have taught CAD modelling to over 3000 teachers nationally. Peter has presented both here and in the USA regarding NSW engineering and design and technology education. He is the author of the NSW chapter in pre-university engineering education edited by Marc DeVries.



## **Dr Katherine Woodthorpe**

**AO FTSE FAICD**

### **President, Australian Academy of Technological Sciences and Engineering**

Dr Katherine Woodthorpe AO FTSE is one of Australia's most influential people in innovation and President of the Australian Academy of Technological Sciences and Engineering (ATSE). A scientist, industry leader and climate champion, she has led some of Australia's most pioneering organisations working on the net zero transition and supporting the shift to electrify everything.

She is also a Fellow of the Australian Institute of Company Directors and has been a Fellow of ATSE since 2015. In 2017, she received an Order of Australia for her ongoing service to research and technology innovation in Australia.

Katherine has been a professional director for over 20 years including as Chair of Natural Hazards Research Australia, the Antarctic Science Foundation and the HEARing Cooperative Research Centre. She has been a Director of the Olivia Newton-John Cancer Research Institute, Bioplatforms Australia (NCRIS), the Australian Renewable Energy Agency, Vast Solar, and listed companies Sirtex and Anteotech. She previously chaired the National Climate Science Advisory Committee and currently chairs the Government's "Vision 2040" committee reviewing the strategy for investment in medical research for the next two decades.

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