GO8 INDUSTRY SUMMIT:
SECURING THE FUTURE OF AUSTRALIA'S ENGINEERING WORKFORCE

PROGRAM

Thursday, 2 December 2021
13:30 – 15:30 pm (AEDT)

Susan Wakil Health Building
Lv8 Boardroom
The University of Sydney
Western Avenue, Camperdown
NSW 2006

Join Zoom Meeting

GROUP OF EIGHT AUSTRALIA

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PROGRAM

13:15	***Virtual Room Open***
13:15–13:30	Virtual room open for attendees to test/connect before forum
13:30–14:00	**WELCOME AND OVERVIEW** ■ **Vicki Thomson** Go8 Chief Executive & Summit Facilitator – Welcome ■ **Professor Margaret Gardner AC** Go8 Chair, President and Vice-Chancellor, Monash University – Outline of Summit objectives and outcome ■ **Innes Willox AM** Chief Executive Ai Group – Industry overview ■ **Dr Bronwyn Evans AM** Chief Executive Officer, Engineers Australia – Engineering profession overview
14:00–15:00	**SESSION 1: WORKFORCE NEEDS – ENGINEERING WORKFORCE STEP-CHANGE AND THE CONSEQUENCES OF INACTION** **Facilitator: Vicki Thomson, Go8 Chief Executive** ■ What step-change is required in the national engineering workforce and what are the best solutions to achieve this (that universities can contribute to)? ■ What is at stake for industry and the nation if we do not take action? **Summary of industry insights on the engineering workforce problems – including timeframes, solutions, consequences of inaction and what keeps industry leaders up at night:** ■ **Louise Adams** Chief Operating Officer Aurecon ■ **Andy Keough CSC** Managing Director, SAAB Systems ■ **Professor Elizabeth Croft** Chair Go8 Deans of Engineering and Dean, Faculty of Engineering, Monash University **30 minute facilitated discussion amongst all participants**

15:00–15:25	**SESSION 2: SHARED SOLUTIONS** **Facilitator: Vicki Thomson, Go8 Chief Executive** ■ How can universities deliver the engineering graduates that industry needs? ■ What constraints are restricting a step-change in the engineering workforce and how can industry and universities work/advocate to unlock these constraints? ■ What options should we put to government as an outcome of this Summit? **Facilitated discussion amongst all participants**
15:25–15:30	**SUMMIT WRAP** **Summary of outcomes and next steps** ■ **Professor Brian Schmidt AC** Go8 Deputy Chair and Vice-Chancellor and President, The Australian National University
15:30	***Summit Close***

THU 2 DECEMBER 2021

DISCUSSION PAPER

CONTENTS

CONTEXT AND RATIONALE

Australia is facing a skills shortage in several areas central to the Commonwealth Government's growth agenda, among them engineering, which is critical to the nation's economic recovery.

All streams of engineering from environmental to civil, and now including nuclear, are critical to our nation's post COVID economic recovery.

The make-up of Australia's engineering workforce is highly complex.

In 2019 Engineers Australia estimated that there were more than 185,000 employees in the various engineering occupations.[1] This included professional engineers, engineering technologists, and engineering associates working in a wide variety of roles and industries.

The Group of Eight Industry Summit is therefore focused on developing solutions that can increase the national supply of **professional engineers** to meet Australia's future needs.

This complexity of Australia's engineering sector is also reflected in the *Engineering 2035* initiative of the Australian Council of Engineering Deans (ACED). This is a long-term project that considers the changing nature of professional engineering practice and the implications this has for engineering education in Australia.[2]

In recent years it has become increasingly evident that there are significant current and future shortages across the range of engineering occupations, all of which have material implications for a post COVID Australian economic rebound and for the Government's determination to deliver a more sovereign nation.

The National Skills Commission (NSC) in its *2021 Skills Priority List* listed 13 engineering occupations in its highest priority list of *Occupations in current national shortage, with strong future demand*.[3] The NSC *Labour Market Information Portal (LMIP)* models that by 2025 there will be a need for over 40,000 additional engineering professionals, not including software engineers.[4]

These workforce shortages are also confirmed for specific industry sectors, for example the increase in infrastructure spending by State and Federal Governments will require an increasing supply of engineers.

Analysis by Infrastructure Australia found that there will be a peak public infrastructure workforce shortage of 70,000 engineers, scientists, and architects out to 2025 relative to the $225 billion spend over the Federal, State and Territory 2020–21 Budget Forward Estimates – an increase of nearly $46 billion or 26 per cent.[5,6]

The Australasian Institute for Mining and Metallurgy (AusIMM) forecasts strong future demand for engineering graduates to meet the needs of Australia's mining industry.

1 *The Engineering Profession: A Statistical Overview,* Fourteenth Edition, June 2019 see http://www.engineersaustralia.org.au/

2 https://www.aced.edu.au/index.php/engineering-2035

3 https://www.nationalskillscommission.gov.au/2021-skills-priority-list

4 https://lmip.gov.au/default.aspx?LMIP/EmploymentProjections

5 *Infrastructure workforce and skills supply – October 2021* published by Infrastructure Australia

6 *Australian Infrastructure Budget Monitor 2020–21* published by Infrastructure Partnerships Australia

CONTEXT AND RATIONALE *continued*

The Deloitte report *ACS Australia's Digital Pulse: Future directions for Australia's Technology workforce 2021* predicts a huge increase in workforce – including engineers – for emerging technology sectors such as AI which could require a specialist workforce of as many as 161,000 by 2030.[7]

In what could be described as the perfect storm, while engineering workforce demand is set to increase dramatically, COVID-19 border restrictions have introduced additional constraints on the workforce pipeline.

Pre-COVID an estimated 16,000–20,000 engineers came to Australia annually through temporary or permanent migration pathways.

In addition, international students comprised over half (56%) of Australia's higher education engineering graduates.

That fact alone highlights the urgent need for Australia to strengthen its sovereign capacity to build a sustainable engineering workforce.

As demand for the engineering workforce is set to increase, so too are the salary outcomes for engineering graduates in both the short and long-term.

Department of Education, Skills and Employment (DESE) income data (2018) shows the median income of 2016 bachelor graduates in engineering was $63,000 – fourth behind medicine, dentistry, and teacher education. For engineering bachelor graduates of a decade earlier (2007) the median 2018 income was $112,900 second only to medical graduates.[8]

The challenge in building a nationally sustainable engineering workforce will also provide substantial opportunities for Australian industry and the engineering workforce.

The role of universities

Universities are only one part, albeit a critical part, of the engineering workforce pipeline that extends from school education through to the senior levels of many different industries.

The Go8 is responsible for educating almost half the nation's engineering graduates. For engineers already in the workforce, universities also provide the opportunity to add to their technical skills or pivot to a different engineering specialism.

Given the above, the aim of this Summit is not to add to the list of detailed analyses and reports on the engineering workforce, nor to develop migration policy options.

Rather we must identify broad-based solutions in one specific part of the engineering workforce pipeline – education in Australia's world-class university sector.

The focus is on the collaborative actions that need to be taken by universities, industry, and governments if we are to safeguard Australia's sovereign capability to produce an essential engineering workforce in both quality and quantity.

The alternative is too economically damaging to contemplate.

To be successful, we must consider both the short and medium-term contribution of universities to the engineering workforce and also examine long-term options, to ensure Australia has the engineering workforce capacity to meet the needs of new or emerging sectors – such as AI and nuclear. In this way, Australia can avoid having the same discussions of engineering workforce crisis in 2030 to those in which we are currently engaged.

7 https://www2.deloitte.com/content/dam/Deloitte/au/Documents/Economics/deloitte-au-economics-australias-digital-pulse-2021-160621.pdf

8 *Graduate incomes: Insights from administrative data October 2021* Phil Aungles, Gabrielle Hodgson and Simon Parbery – Department of Education, Skills and Employment (DESE)

Australia lags in OECD terms

In 2019 university students completed 21,735 qualifications in the broad field of Engineering and Related Technologies at bachelor level (58%) and postgraduate coursework (42%).[9]

In OECD terms this is not a strong performance as Australia ranks third lowest in terms of engineering graduates as a proportion of all graduates.[10]

Of the 21,735 qualifications 9,711 or ***fewer than half (45%) were domestic students*** and of these 7,754 were at Bachelor level. As context, this represents just half of Canada's annual production of domestic graduate engineers.

Not only does Australia lag significantly behind our international competitor countries in producing engineering graduates, over the five years to 2019 the Full Time Equivalent (FTE) of domestic students enrolled in coursework higher education engineering qualifications did not increase significantly.

Over the same five-year period, overseas student FTE increased by 63% across the university sector and by 69% at the Go8. At the Go8 there was also a concentration of enrolments from key international markets with 57% of enrolments from China, 15% from Malaysia and 6% from India in 2019.

Diversity in the Engineering Workforce

One of the longstanding and well-recognised challenges in the broad engineering workforce is to increase access to talent by diversifying the workforce. This is particularly the case with respect to gender.

Gender representation in the engineering workforce has been a focus of significant effort by industry, government, and universities. Consequently, it is not the intention of the Summit discussion to find solutions to the gender diversity issue but that this context is fully recognised and part of any solutions proposed.

The Engineers Australia statistical overview of the engineering workforce indicates that on 2016 census figures only 11% of Australia's engineering workforce was female. While this is a slight improvement on the census figures from a decade earlier – where only 8% of the engineering workforce was female, there were over 140,000 more men employed in engineering occupations in 2016 than women.

In terms of university enrolments, in 2019 17% of domestic bachelor enrolments in Engineering were by women and while this is up from a decadal low of 13.6% in 2012, Engineering and IT have by far the lowest representation of women amongst all broad fields of education.[11]

The Go8 universities are leaders in encouraging women into engineering training with 23% of all domestic undergraduate bachelor enrolments by women at the Go8 compared to under 15% outside the Go8.[12]

It should be noted that the lack of gender diversity in the engineering workforce and engineering education is not an issue only for Australia. In the UK only 14% of the engineering industry is female[13] and 18% of undergraduate university enrolments in engineering and technology are female.[14] Similarly in Canada female undergraduate enrolment in engineering was 23.4% in 2019.

9 DESE uCube http://highereducationstatistics.education.gov.au/

10 OECD Education at a Glance 2020, Tertiary Graduates by Field

11 The next lowest is Architecture and Building where 38% of domestic bachelor enrolments are by women.

12 Noting that the University of Melbourne and the University of Western Australia are not represented in these figures due to their respective accredited engineering programs operating at the postgraduate level.

13 *Mapping the UK's Engineering Workforce September 2020* UK Engineering Council www.engc.org.uk/workforce

14 UK Higher Education Statistics Agency https://www.hesa.ac.uk/

CONTEXT AND RATIONALE *continued*

Government and its Financial Support

For engineering education, the Job Ready Graduates (JRG) package introduced by Government in 2021 has made it financially significantly more difficult for universities to increase the numbers in engineering education. While the cost for students to study engineering has reduced by 18% at the same time total per student funding received by universities for engineering has decreased by 16% or over $4,500 per student per year.

The single funding benchmark for engineering has been set by a modelled median cost of delivery of engineering education. This same cost model is set across all 10 engineering and technology disciplines, 70 subdisciplines, across all 36 public universities delivering some form of engineering education – regardless of location of campus or class sizes – and across all qualification levels from sub-bachelor to postgraduate.

Go8 internal data suggests that postgraduate engineering education is significantly more expensive than undergraduate education – although the Government has not released benchmarking of postgraduate engineering education costs so that this can be verified across the sector.

A recently released detailed cost of education study conducted by the Melbourne Centre for the Study of Higher Education and the Pilbara Group notes that:

> *The analysis in this paper raises questions about whether the current Commonwealth funding model reflects the real costs of delivering higher education courses in Australia and whether it should be reviewed by focusing on a more granular analysis than can be achieved through broad average costs.*[15]

It also suggests that engineering costs are potentially higher than the government benchmarking levels.

One likely, and unfortunate consequence of this pricing regime is that the viability of delivering smaller and more expensive engineering programs will become less viable in the current resource constrained environment.

Another significant change in the JRG changes is that it formally separates the teaching and research enterprises at universities. Engineering education at Go8 universities will always take place in a research-intensive and research-active environment – it is an essential characteristic of Go8 universities. This is particularly important for engineering fields which are all driven by innovation.

According to the ABS $5.3 billion or 29% of all investment in R&D by business in Australia takes place in Engineering and a further $7.1 billion or 39% in Information and Computing Sciences.[16]

Under the JRG funding model the education of the next generation of domestic engineers has been formally decoupled from research activity that is at the heart of engineering in Australia. In its place the Government has introduced a National Priorities Industry Linkage Fund (NPILF) to support industry engagement across ***all disciplines*** potentially including but not limited to research activity. On average the NPILF will support industry engagement activity by approximately $300 per student per year – not a meaningful substitute for resourcing for a broad-based research-engaged education.

This is particularly an issue in the context of the *Blueprint for Critical Technologies* released by the Prime Minister on 17 November 2021.[17]

15 *Working paper: What does it cost to educate a university student in Australia November 2021* Melbourne Centre for the Study of Higher Education and the Pilbara Group https://melbourne-cshe.unimelb.edu.au/research/research-projects/policy-and-management-in-higher-education/cost-of-delivery-of-teaching

16 ABS Research and Experimental Development, Businesses, Australia, 2019–20

17 https://www.pmc.gov.au/resource-centre/domestic-policy/blueprint-critical-technologies

According to the ABS $5.3 billion or 29% of all investment in R&D by business in Australia takes place in Engineering and a further $7.1 billion or 39% in Information and Computing Sciences.

The Blueprint is strongly based on science, technology, and research. Indeed, two of the four pillars of the Blueprint refer to the knowledge and skills to take advantage of critical technologies (Pillar 1) and investment in research and commercialisation of critical technologies (Pillar 2). Of the nine critical technology areas of initial focus under the Blueprint all are heavily dependent on engineering.[18]

Now is not the time to be cutting back on the research and innovation elements of funding to engineering education.

Demand for Engineering Education

Under the JRG in 2021 there has been only a modest increase in domestic undergraduate applications and acceptances for engineering over the first COVID-19 pandemic year 2020. More broadly, and even under the previously uncapped enrolment system of the preceding decade there has been little movement in the number of applications and acceptances for engineering.[19]

This is indicative of the significant challenge in increasing student demand for engineering courses to a level that will satisfy future workforce needs.

To date it appears that the current system cannot, in isolation, produce the required step change in the production of engineering graduates, particularly as it effectively defunds engineering education in universities. To meet Australia's future engineering workforce needs universities, industry and governments must work together to develop alternative and more innovative solutions to support the role of universities in addressing this challenge.

18 These areas are: Critical minerals extraction and processing; Advanced Communications; Artificial Intelligence; Cyber security technologies; Genomics and genetic engineering; Novel antibiotics, antivirals and vaccines; Low emission alternative fuels; Quantum technologies; and Autonomous vehicles, drones, swarming and collaborative robotics.

19 In 2012 there were 19,344 applications and 13,158 acceptances for undergraduate courses in the broad field of education for Engineering and Related Technologies. This compares to 19,1665 applications and 12,655 acceptances in 2021. Department of Education, Skills and Employment (DESE) Undergraduate Applications, Offers and Acceptances Publications.

OBJECTIVES AND OUTCOMES

Motivating the objective and outcome for this Summit are four essential observations:

- Australia is facing an immediate and future engineering workforce crisis that must be urgently addressed.
- The demand for engineering graduates comes from industry.
- The supply of domestically trained engineering graduates comes, in the first instance, from universities – supported (in part) by Government funding.
- Solutions to the engineering workforce crisis must come through teamwork – a strong collaboration between industry and universities and facilitated where necessary by Government. These solutions will not be a "tweak" of business-as-usual practices and funding.

The ***objective*** of this Summit is to provide the opportunity for industry, university, and government stakeholders to discuss and develop policy solutions that can enable universities to successfully deliver the domestically trained workforce that is critical to meet our nation's challenges in the future.

Policy options should be aimed at increasing the overall engineering workforce in response to current and future demand but also allow the flexibility to deliver the workforce required for specific industries – existing and emerging. This should also include the continual improvement of the quality and preparedness of graduates to work in industry.

The discussions should frame solutions not only in the context of industry need for a greatly enhanced engineering workforce but also consider the cost of inaction. An enhanced engineering workforce is a "must have" for Australia's economic future.

Given limited discussion time, it is proposed that the focus be on the core of the engineering workforce, professional engineers.

The *outcome* of this Summit will be a fast-tracked development of an options paper from the group to government outlining solutions to the engineering workforce crisis facing Australia.

PRIORITY AREAS FOR DISCUSSION

TOPIC 1: AUSTRALIA'S CURRENT AND FUTURE ENGINEERING WORKFORCE NEEDS

Many different industries and sectors central to the government's growth agenda have a heavy reliance on an engineering workforce. This includes defence, energy, resources, med-tech, advanced manufacturing, mining equipment and technologies, food and agribusiness, and industry 4.0.

Each of these sectors – and indeed individual employers in each of these sectors – will have specific and particular needs for an engineering workforce.

Consequently, the national engineering workforce must have the scale and flexibility to accommodate these demands as well as those of emerging sectors and the cyclical nature of some sectors (for instance resources).

Key Questions

1. What is the scale of the increase in/pivot of the engineering workforce required by Australia in the:
   - **a.** Short-term: 0–2 years
   - **b.** Medium-term: 3–5 years; and
   - **c.** Long-term with a focus on emerging industries: 5+ years?
2. What is the mix of engineering disciplines needed from the future engineering workforce?
3. What balance should be struck between upskilling engineers already in the workforce and graduating new fully accredited professional engineers?

TOPIC 2: THE ROLE OF UNIVERSITIES IN AUSTRALIA'S ENGINEERING WORKFORCE PIPELINE

Australian universities provide qualifications across the broad engineering workforce of engineering technologists, engineering associates and professional engineers accredited by Engineers Australia. In terms of the core cohort of professional engineers, there are several pathways:

- **Foundation**: Undergraduate engineering programs leading to a bachelor degree with honours is the standard pathway to becoming an accredited professional engineer and typically takes four years.
- **Conversion**: A conversion masters typically takes two years and converts a bachelor degree in a program related to Engineering such as Science or Mathematics, into an accredited qualification as a professional engineer. In the case of the University of Melbourne this is the standard route to becoming an accredited professional engineer.
- **Reskilling**: To upskill already accredited professional engineers there are a number of options including microcredentials, graduate certificates, graduate diplomas, and masters degrees – taking anywhere from a few weeks to two years.

PRIORITY AREAS FOR DISCUSSION
continued

Identifying the mix of these pathways to meet the industry engineering workforce demands is a key challenge. However, other challenges include:

- Increasing the number of quality applicants to engineering pathways. Domestic applications and acceptances for engineering qualifications are lower in 2021 than they were at the beginning of the demand driven system in 2012.

  The Engineers Australia Statistical Overview of the Engineering Profession from 2019 noted that in late 2012 "demand for qualified engineers collapsed primarily due to the end of the mining construction boom, but also due to a slowdown in infrastructure developments generally."[20]

  How directly this collapse in demand affected domestic applications to engineering programs from 2013 is less clear, however what is clear is that the level of applications established since that time needs to be dramatically increased as a matter of urgency to meet future job market demands.

- Ensuring universities can support all required engineering pathways. As noted above, reduction in per-student funding for engineering education under the Job Ready Graduates package in the context of decreasing revenues for universities puts at risk the viability of small courses and/or expensive disciplines such as biomedical systems engineering, mechanical and systems engineering, digital systems and telecommunications, and software engineering.

Key Questions

1. How do these pathways match the workforce demands discussed in Topic 1?
2. How do we encourage more high-quality applicants into engineering programs?
   - **a.** Special targeted programs with additional funded places at both bachelor and masters conversion level?
   - **b.** Collaboration between universities and industry to promote engineering careers?
3. How do we drive a *general* uplift in the number of qualified professional engineers while supporting both?
   - **a.** Engineering specialties with small course numbers that are expensive to teach; and
   - **b.** Emerging industries/sectors?

20 Section 2.6 of *The Engineering Profession: A Statistical Overview* Fourteenth Edition, June 2019, Engineers Australia

APPENDICES

Profile of the Go8

The Group of Eight (Go8) is the peak body for Australia's eight leading research-intensive universities. Membership of the Go8 comprises The University of Queensland, UNSW Sydney, The University of Sydney, The Australian National University, The University of Melbourne, Monash University, The University of Adelaide, and The University of Western Australia.

The Go8 members are in the top tier internationally with seven ranked in the top 100 universities in the world and seven in the top 100 globally for Engineering.[21,22]

Collectively, the Go8 members educate over 425,000 students and over one in three international students that study at Australian universities do so at a Go8 member.

Go8 members produced over 115,000 graduates in 2019 including 43% of the national total in Engineering and Related Technologies.

In research the Go8 spends $6.5 billion on R&D including over $770 million on research in the fields of Engineering and Technology.

To prosecute this research agenda, the Go8 has nearly 23,000 researchers and 31,000 higher degree by research students. In 2019 the Go8 graduated 4,800 PhDs, representing 51% of the national total.

This research is conducted at a standard that sees over 99% of Go8 research rated as world class or above by the Australian Government's official university research audit Excellence in Research for Australia (ERA). ERA also rated five Go8 members at the maximum rating of 5 (well above world standard) for research in engineering.

21 2021 Academic Ranking of World Universities

22 2022 Times Higher Education Rankings 2022 for Engineering

APPENDICES *continued*

Go8 Global Rankings for Engineering Disciplines

Table 1: Academic Ranking of World Universities 2021: Global Ranking of Engineering Subjects[23]

- Top 10 Globally
- Top 50 Globally
- Top 100 Globally

Engineering Subject	Go8 University Global Rankings							
	Monash	ANU	Adel	Melb	UNSW	UQ	Syd	UWA
Aerospace Engineering	–	–	–	–	41	–	–	–
Automation and Control	–	21	25	76–100	51–75	–	51–75	–
Biomedical Engineering	76–100	–	201–300	76–100	201–300	51–75	151–200	151–200
Biotechnology	101–150	201–300	151–200	47	51–75	7	101–150	101–150
Chemical Engineering	45	–	101–150	151–200	51–75	76–100	151–200	301–400
Civil Engineering	50	–	35	51–75	12	101–150	21	151–200
Computer Science and Engineering	101–150	51–75	48	76–100	51–75	101–150	38	301–400
Electrical & Electronic Engineering	201–300	76–100	76–100	76–100	38	201–300	76–100	301–400
Energy Science and Engineering	37	76–100	76–100	151–200	31	51–75	151–200	201–300
Environmental Science and Engineering	101–150	151–200	101–150	101–150	46	26	201–300	21
Food Science and Technology	151–200	–	201–300	76–100	201–300	14	101–150	–
Instruments Science and Technology	76–100	–	51–75	201–300	32	–	101–150	–
Marine/Ocean Engineering	–	–	–	–	32	–	–	10
Materials Science and Engineering	51–75	101–150	101–150	101–150	76–100	76–100	151–200	201–300
Mechanical Engineering	51–75	–	76–100	76–100	36	76–100	51–75	151–200
Metallurgical Engineering	10	–	–	–	51–75	24	51–75	–
Mining and Mineral Engineering	6	–	7	76–100	8	16	–	3
Nanoscience and Nanotechnology	51–75	76–100	76–100	101–150	76–100	51–75	201–300	301–400
Remote Sensing	33	51–75	–	76–100	12	–	–	–
Telecommunication Engineering	201–300	51–75	201–300	201–300	27	201–300	21	–
Transportation Science and Technology	45	76–100	–	51–75	40	51–75	14	–
Water Resources	41	43	31	40	8	23	–	37

23 https://www.shanghairanking.com/rankings/gras/2021

Table 2: QS World University Rankings by Subject 2021: Engineering and Technology

- Top 10 Globally
- Top 50 Globally
- Top 100 Globally

Engineering Subject	Go8 University Global Rankings							
	Monash	ANU	Adel	Melb	UNSW	UQ	Syd	UWA
Chemical Engineering	31	–	101–150	49	50	45	80	201–250
Civil and Structural Engineering	23	–	51–100	28	12	30	14	47
Computer Science and Information Systems	76	51	99	39	59	107	50	251–300
Electrical and Electronic Engineering	68	63	108	46	33	96	60	151–200
Engineering and Technology	58	79	134	50	36	85	65	163
Mechanical Engineering	73	134	151–200	60	54	116	65	151–200
Mineral and Mining Engineering	15	–	24	18	5	3	–	6
Petroleum Engineering	–	–	11	–	18	27	–	51–100

APPENDICES *continued*

Go8 ratings for Engineering Fields of Research in ERA 2018

Excellence in Research for Australia (ERA) benchmarks research discipline groups at each Australian university on an international scale. ERA was lasted conducted in 2018.

Table 3: ERA 2018 Rating Scale and Descriptors

Rating	Descriptor
5	The Unit of Evaluation profile is characterised by evidence of outstanding performance **well above world standard** presented by the suite of indicators used for evaluation.
4	The Unit of Evaluation profile is characterised by evidence of performance **above world standard** presented by the suite of indicators used for evaluation.
3	The Unit of Evaluation profile is characterised by evidence of average performance **at world standard** presented by the suite of indicators used for evaluation.
2	The Unit of Evaluation profile is characterised by evidence of performance **below world standard** presented by the suite of indicators used for evaluation.
1	The Unit of Evaluation profile is characterised by evidence of performance **well below world standard** presented by the suite of indicators used for evaluation.
n/a	Not assessed due to low volume. The number of research outputs does not meet the volume threshold standard for evaluation in ERA.

Table 4: Go8 ERA 2018 in Fields of Research in Engineering

Field of Research	Go8 University							
	Monash	ANU	Adel	Melb	UNSW	UQ	Syd	UWA
09 Engineering	5	5	5	4	5	4	5	4
0901 Aerospace Engineering	5	n/a	n/a	n/a	n/a	n/a	5	n/a
0902 Automotive Engineering	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
0903 Biomedical Engineering	5	n/a	n/a	4	5	4	4	n/a
0904 Chemical Engineering	5	n/a	5	5	5	4	5	4
0905 Civil Engineering	4	n/a	5	5	5	4	4	3
0906 Electrical and Electronic Engineering	5	5	5	5	5	4	5	5
0907 Environmental Engineering	n/a	n/a	n/a	3	n/a	5	n/a	3
0908 Food Sciences	n/a	n/a	n/a	3	5	4	n/a	n/a
0909 Geomatic Engineering	n/a	n/a	n/a	4	5	n/a	n/a	n/a
0910 Manufacturing Engineering	5	n/a	n/a	n/a	4	n/a	n/a	n/a
0911 Maritime Engineering	n/a	n/a	n/a	5	n/a	n/a	n/a	n/a
0912 Materials Engineering	5	5	5	5	4	5	5	3
0913 Mechanical Engineering	4	n/a	5	5	4	5	4	4
0914 Resources Engineering and Extractive Metallurgy	n/a	n/a	5	3	4	4	n/a	3
0915 Interdisciplinary Engineering	n/a	n/a	n/a	1	n/a	n/a	n/a	n/a
0999 Other Engineering	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

GROUP OF EIGHT AUSTRALIA

MEMBERS

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THE UNIVERSITY OF WESTERN AUSTRALIA

MONASH University

Australian National University

THE UNIVERSITY of ADELAIDE

THE UNIVERSITY OF MELBOURNE

UNSW SYDNEY

THE UNIVERSITY OF QUEENSLAND AUSTRALIA

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