Australian Council of Engineering Deans

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Australian Workforce and Productivity Agency
Engineering Workforce Study Project Team

26 March 2014

Dear AWPA

ACED Submission: AWPA Engineering Workforce Study Issues Paper

The Australian Council of Engineering Deans (ACED) is very pleased to have this opportunity to provide responses to the questions raised in the AWPA Engineering Workforce Issues Paper. This response is submitted on behalf of the council, following approval by the ACED President, Professor Daryoush Habibi, Head of the School of Engineering, Edith Cowan University.

ACED's members are the 35 Australian universities that provide engineering degree programs that are accredited by the professional body, Engineers Australia. Each university is represented by its Faculty Dean or Head of Engineering. ACED's mission is to promote and advance engineering education, research and scholarship on behalf of Australian universities. ACED tracks engineering enrolments, graduations and other measures, undertakes project work (some of which has been referred to in the AWPA study Issues Paper), and encourages collaboration between its members in undertaking quality improvement in engineering education. ACED works closely with Engineers Australia and is a member of the Australian National Engineering Taskforce (ANET).

The responses in this submission elaborate points and issues in which ACED and its members have particular interest, knowledge, expertise and data. As such, the responses deal primarily with the engineering degree programs that provide 'entry-level' skills by means of qualifications at AQF Levels 8-9, and the career pathways of their graduates. We summarise some of the recent research on the recruitment and retention of women in engineering. We also summarise work being led by ACED with funding from the Commonwealth, on increasing industry exposure within engineering degrees. This has also been submitted to AWPA as a Case Study.

The response also notes that enrolments in Associate Degrees (AQF Level 6) are growing, but that these may not translate into new entrants into the engineering workforce directly, since most students in these programs express aspirations to articulate to professional engineering degrees. We suggest that more national attention needs to be paid to understanding the value of paraprofessional (technicians) and engineering technologist occupations, and the provision of corresponding qualifications at AQF Levels 5-7.

I am the ACED contact for the purposes of this study, and may be contacted as below. ACED and its members will be pleased assist this important study.

Yours sincerely

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Australian Government

Australian Workforce and Productivity Agency

Submission to Engineering workforce study

Please email your submission to AWPA at **engineeringstudy@awpa.gov.au** by **26 March 2014**.

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Publication consent

Do you provide consent for AWPA to publish the information provided in this submission in the Engineering workforce study final report and in other AWPA publications which may appear on the internet and in print, electronic or video media? *(Please tick)*

☒ Yes ☐ No

Responses to questions for discussion

Please expand boxes as needed to fit your responses. You do not have to respond to all questions.

1. Are there engineering skills that are difficult to source? How do companies source these skills?

Australia's engineering skills are sourced at two levels: at 'entry-level', by graduates of formative qualifications; and at 'experienced' levels by recruitment from the qualified and employed workforce.

Considering the ten years to 2013, there has generally been an undersupply of engineering skills at both entry level and experienced levels. This skills shortage has been across all broad engineering disciplines of electrical, mechanical, civil and chemical, with some variation between states depending on their key economic drivers. Shortages of mining engineers have been particularly critical. Although the shortage of engineering skills has been less severe for short periods due to economic slow-down at the global level (e.g. GFC in 2008) or in key regions (eg. China's declining growth since 2012), the long term trend remains that of moderate to severe skills shortage, reflected in the high median salaries for engineers in Australia, among the highest in the world. The shortage of engineering skills at the experienced level in the last 10 years has been partially (but not fully) addressed through skilled migration and the issuing of 457 visas to overseas engineers.

The 35 universities' engineering faculties whose leaders form the membership of the Australian Council of Engineering Deans (ACED) have roles to play in providing entry level graduates (from associate degrees, bachelors degrees, and some masters degrees), and in supporting individuals' in career advancement through postgraduate study and research. Thus the ACED members' faculties

contribute to the annual supply of suitably skilled engineering employees, principally in three groups:

- 'entry to practice' programs, mostly in professional engineering (some 10,500 graduates per year, about 33% of whom are international students);
- postgraduate coursework programs in technical specializations (about 4,500 graduates per year, about 60% international);
- higher degree by research graduates (more than 1,150 in 2012, about 50% international).

The faculties are responsive to student demand, but are cognizant of general industry needs. Undergraduate demand trends reflect current skills shortages, rather than anticipate future graduate demand or on an even longer timescale, the demand for experienced engineers. Nevertheless, the up-to-date technological skills of bachelor degrees graduates are often valued by companies. Australian commencing enrolments into undergraduate engineering programs have increased since 2004, in line with national participation. With the downturn in international enrolments since 2010, at least some universities could admit more Australian undergraduates into their programs, provided that they are suitably educationally qualified and motivated.

Postgraduate coursework enrolments may reflect individuals' career advancement needs, or employers' more immediate skills needs. Some companies may support their employees to take coursework programs in topics of immediate importance.

Research degree enrolments may address industry's future interests where research projects are industry supported. Companies may invest in the development of advanced skills through collaborative research in, for example, ARC Linkage projects, and Cooperative Research Centres.

The universities themselves have experienced critical shortages of academic staff in areas in which they also have demand to provide graduates (e.g. the oil and gas sector), due to the strong competition for suitably qualified and experienced engineers. Indeed, the Australian engineering academic workforce as a whole, recruits strongly from overseas.

2. What are some best practice approaches by companies to develop skills that are not readily available?

Collaboration between companies in the minerals sector and in the power systems sector has rectified the national trends of declining graduate numbers in those areas. Through these consortia, Mining Education Australia and the Australian Power Institute have provided high quality program material, scholarships, and good workplace integrated learning.

3. What inspires students to study engineering? What are some innovative approaches to promoting engineering careers?

Students, predominantly males, choose engineering mostly because they have achieved good grades in mathematics and science at school and they expect that an engineering degree will help them secure reliable well-paid employment. Formal and informal research also finds that prospective students see engineering as 'science-based purposeful problem solving' that can 'make a difference'. Popular TV shows such as *Engineering Connections*, and *Big, Bigger, Biggest* may reinforce these understandings.

For women the decision to study engineering is less automatic. Research undertaken within Australian engineering faculties [1] and elsewhere has found that female secondary school students can have lower self-efficacy for mathematics than male students with similar grades, and that they also lack female role models [2]. More than males, female engineers are likely to have a family connection in engineering and have been influenced by a teacher or careers counsellor. Promoting humanitarian goals [3] and the social and environmental benefits of engineering applications are more likely to attract women to engineering [4]. This is reflected in the approximate gender parity in participation rates in engineering programs in biomedical, chemical, environmental, and renewable energy engineering fields.

All engineering faculties are heavily involved in promotion of engineering to school students through such programs as the long established national *Science and Engineering Challenge* [5] led by the University of Newcastle, and in local activities with feeder schools. Many universities have provided mechanisms for engineering students to assist classroom teachers in schemes such as peer mentoring that have been highly motivational for schools and their students. Some engineering schools have sought national funding support for support to school science and mathematics teachers and teaching, by increasing teachers' and students' understanding of the ways school science and mathematics intersect with engineering, and the opportunities for tertiary studies in engineering.

1. J. Mills, M. Ayre, and J. Gill, *Gender Inclusive Engineering Education*. New York and Abingdon, Oxon: Routledge, 2010.
2. P. VanLeuvan, *Young Women's Science/Mathematics Career Goals From Seventh Grade to High School Graduation*, The Journal of Educational Research, vol. 97, p. 248, May/Jun 2004
3. D. Bennett and S. A. Male, *Looking back on future careers: Threshold concepts and possible selves within an undergraduate engineering degree*, under review.
4. S. Roberts and S. Lewis, *The national position paper for women in engineering for the career review of engineering education*, The Institution of Engineers, Australia, Canberra,1996.
5. *Science and Engineering Challenge*. http://www.newcastle.edu.au/about-uon/governance-and-leadership/faculties-and-schools/faculty-of-engineering-and-built-environment/science-and-engineering-challenge/events-and-locations/events-calendar-2014

4. How can career counselling services be supported to deliver current and accessible information about engineering to school students?

Most engineering faculties have indirect contact with schools careers counselling services, and each faculty has its own brochures and advertising material on engineering programs and careers.

Arguably a more coordinated national or state/territory approach to providing information to prospective students via the school counselors would have merit. As the work of engineers is remote from most school students' everyday experience, this approach might involve activities in which school careers counsellors engage with practicing engineers, from industry as well as the faculties.

5. What can be done to build on the increasing supply of engineering graduates to ensure that problems of engineering skills shortages do not recur in the future?

The ACED member universities have produced engineering graduates with formative qualifications (those that prepare for entry into defined engineering occupations, as Professional Engineers, Engineering Technologists, and Engineering Associates) in steadily increasing numbers since 2007. The growth in graduations has been the result of both increased commencing enrolments, and increased retention to graduation. Some of the latter has been due to improved curriculum and improved academic support for engineering students in their early study years [6]. That study also explored the provision of pathways from VET qualifications into the universities. The numbers of VET graduates with Diplomas and Advanced Diplomas who would be available for either employment and further study is rather smaller than might be expected. (See response to Q12.)

Postgraduate coursework graduations also increased up to 2011. As in previous years, approximately 70% of this cohort were international students, many of whom desire to gain engineering employment in Australia. There is some evidence that many of the latter group do not necessarily have a good match to Australian companies' employment needs with respect to communication skills and the ability to work relatively independently of direction. As a result, some universities have re-crafted their masters degrees to include industry experience and

satisfy the Engineers Australia's formal program accreditation requirements for the professional engineer qualification. (These so-called 'conversion masters' degrees are also designed for Australian science degree graduates to gain an accredited engineering qualification.) These measures will increase the numbers of professional engineering graduates available to Australian employers.

Future shortages in paraprofessional engineering occupations may be met by the increasing numbers of students enrolling in Associate Degree programs in the universities, as well as in VET diplomas and advanced diplomas. Although Associate Degree graduations at this level have quadrupled since 2007, most of the students taking this qualification aspire to use it for advanced standing in a professional engineering degree. Similarly, the 3-year engineering technology degree is largely seen as a pathway, rather than an occupational qualification in its own right. The numbers of such degrees and enrolments in them has declined in recent years. (See the response to Q12.)

As the *Issues Paper* observes, the desired employment skills profile is only partly met by graduates; many of the skills shortages are for experienced engineers. One of the challenges for the sector is to provide sufficient employment opportunities for graduates to gain the experience required for unsupervised practice during times when, as now, the engineering sector is not growing. Small engineering enterprises may find it particularly difficult to provide a wide range of graduate experience.

A further related issue is retention of engineers in the workplace, particularly women. Members of ACED faculties, and others, have undertaken several research studies of engineering workplaces, and report discrimination and harassment experienced by female engineers [7-9]. Mills et al. [10] identified a policy of ignorance around the issue of poor gender diversity in engineering. Engineers and their employers need to understand together that engineering is gendered and how subconsciously they discriminate women within this gendered culture [11]. Ongoing funded work is exploring with pre-graduation engineering students how deeper understanding of the gendered nature of engineering can help to explain common experiences as systemic rather than individual [12].

6. E Godfrey and R King, *Curriculum Specification and Support for engineering education*, 2011, http://www.olt.gov.au/project-curriculum-specification-support-uts-2008
7. Association of Professional Engineers Scientists & Managers Australia, *Women in the Professions: The State of Play 2009-10 Executive Summary of the APESMA Women in the Professions Survey Report*, Association of Professional Engineers Scientists & Managers Australia, Melbourne 2010.
8. J. E. Mills, V. Mehrtens, E. J. Smith, and V. Adams, *CREW revisited in 2007 the Year of Women in Engineering: An Update on Women's Progress in the Australian Engineering Workforce*, Engineers Australia, Canberra 2008.
9. A. Kasupra, *The Engineers Australia Survey of Working Environment and Engineering Careers*, Engineers Australia 2012.
10. J. E. Mills, S. Franzway, J. Gill, and R. Sharp, *Challenging knowledge, sex and power: Gender, work and engineering*, Routledge, 2013.
11. S. A. Male, *Engineering is Gendered' is a Threshold Concept*, in Women in STEM Careers: International Perspectives on Increasing Workforce Participation, Advancement and Leadership, D. Bilimoria and L. Lord, Eds., ed: Edward Elgar, forthcoming.
12. *Gender inclusivity of engineering students' experiences of workplace learning*. OLT project information: http://www.olt.gov.au/project-gender-inclusivity-engineering-studentsapos-experiences-workplace-learning-2013

6. What are the engineering skills needs of the future in Australia? How will Australia meet these needs?

The fundamental nature of engineering is to bring new things into being; to serve society at large though conception, design, production, operation, maintenance, retirement and disposal of physical and information-based products, processes, systems and infrastructure. There is a

growing need for engineers to understand the social, economic, environmental and cultural contexts in which they work. The scope of engineering work grows with society's demands for reliability, cost-effectiveness, sustainability and environmental impact. The materials, technologies and tools available to the engineer emerge from science and innovation, including by engineers. Engineering jobs will continue to change, as they have in the past. The breadth of application areas will Increase. A prosperous and sustainable Australia will surely need at least as many engineers (In all occupations, and as a proportion of the population) at least as well educated as in the past to tackle challenges both known and unknown.

Future engineering skills, particularly for professional engineers, are best expressed in general terms. This is evident in the competency factors identified as required by practicing engineers in two surveys (N_1=300; N_2=250) in Australia in 2009 were: *communication, working in diverse teams, self-management, professionalism, creativity/problem-solving, management/leadership, engineering business, practical engineering, innovation, contextual responsibilities,* and *applying technical theory* [13, 14].

Taking an engineering accreditation perspective, the generalities expressed in the preceding paragraphs are captured in the global [15] and national specifications [16] for accredited engineering qualifications, with which the Australian universities are fully compliant. As a result, every engineering graduate from a globally-recognised accredited formative engineering program is deemed to have at least a threshold level of engineering knowledge and skills and applications ability in a defined branch of engineering, contextual knowledge, and personal and professional attributes appropriate for commencement of supervised practice.

The engineering faculties will continue to respond to industry needs, and engage their students with knowledge at the forefront of their discipline, through investigative project work, and exposure with industry (see Q 7-9). Engineering degrees (and the corresponding knowledge base) will continue to be grounded in the tools and principles of mathematics and science, and application through projects. The main engineering branches (civil, electrical, etc,) will continue to evolve, and spin out new and interdisciplinary areas (such as engineering with nano-technology materials) in which new industry expertise is required. The contextual dimensions of engineering are likely to grow in importance, however, and there may be increased needs for interdisciplinary studies in different engineering, physical and biological sciences, and with business and the human sciences, to adequately support areas such as health, agriculture, advanced manufacturing, mineral resources, energy, transport and water.

The present models of 2-year Associate Degrees, 3-year BEngTech and 4-year BEng (Hons) degrees, double (bachelors) degrees and two-cycle BEng-MEng degrees probably offer Australian students adequate program diversity for the short-term. One can envision future national and international pressures to have the masters degree as the qualification for professional engineering.

13. S. A. Male, M. B. Bush, and E. S. Chapman, *An Australian study of generic competencies required by engineers*, European Journal of Engineering Education, vol. 36, pp. 151-163, 2011.
14. A. Male, M. B. Bush, and E. S. Chapman, *Identification of competencies required by engineers graduating in Australia*, presented at the 20th Conference of the Australasian Association for Engineering Education: Engineering the Curriculum, Adelaide, 2009.
15. Interrnational Engineering Alliance, *Graduate Attributes and Professional Competencies* Version 3: 21 June 2013. http://www.washingtonaccord.org/GradProfiles.cfm
16. Engineers Australia, *Stage 1 Competency Standards*, 2013, http://www.engineersaustralia.org.au/about-us/program-accreditation#standards*Accreditation*

7. Are there industry committees collaborating with universities in developing engineering curriculums? How do these work and what have been some of the outcomes?

The ACED member faculties that run formative engineering qualifications degrees that are accredited by Engineers Australia are required to demonstrate that their programs contain 'exposure to practice'. Engineers Australia also requires that they have formalised industry advisory processes to advise on the curriculum. Many universities also have a similar requirement for industry consultation, especially for new programs.

In general the faculties welcome these advisory processes, as they can assist with student placements, provision of guest lecturers and industry-based projects, and industry-linked research, as well as mainstream curriculum development.

ACED itself has been involved with several industry-informed studies of formative engineering education. The national review in 1995-6, reported as *Changing the Culture*, led to the adoption of an outcomes-based accreditation system, with greater focus on student-centred, active learning. The study for the 2007-8 report, *Engineers for the Future*, was led by ACED [17], and funded by the Australian Learning and Teaching Council (now the Office of Learning and Teaching). Since 2008, these (and other bodies) have funded many collaborative projects in work integrated learning and other improvements in engineering education in the university sector.

17. R. King, *Engineers for the Future: addressing the supply and quality of Australian graduates for the 21st Century*, ALTC, 2008, http://www.olt.gov.au/resources?text=Addressing+the+Supply+and+Quality+

8. Are there sufficient work-integrated learning opportunities for engineering graduates? How can smaller companies be supported to provide entry-level opportunities for graduates?

The question is about graduate positions. In these, learning on the job is essential. Many larger companies operate good graduate development schemes that may take graduates into a classroom from time to time. Smaller companies will find this more difficult and may more often call for graduates to be 'job-ready'. This frequently used term deserves more in-depth study, for employers and universities to understand the real gaps in readiness, and ways in which they can be breached effectively and rapidly.

For the engineering schools, preparing graduates of formative programs for engineering employment is a commitment expressed explicitly in the accreditation requirement to provide 'exposure to engineering practice' referred to earlier. All ACED member faculties now include a work placement requirement (of some form) in their program regulations, but this is often a zero credit course unit, and is thus unfunded through the universities' normal fee-based funding distribution mechanisms. In addition to industry placements, the engineering faculties use a range of other approaches to meet the 'exposure to practice' accreditation requirement, by including industry guest lecturers, industry-based projects, visits, etc.

For professional engineering degrees, the placement is normally of at least in 12 weeks duration. In general, there are insufficient placements available (at least over the December - February period), and their quality is highly variable (see Q9). Good placements are highly sought after by students, as they may lead to employment after graduation (or even before). Recent data collected from students has found that about 70% have completed the placement requirements before commencing their final year of study. Students unable to complete the placement requirement before they have completed their academic studies, are usually able to have their initial period of engineering employment signed off, and thereby can graduate with their peers.

With the overall aim of improving exposure to industry practice in engineering degrees, including

placements, ACED has been undertaking a consultative project with funding from the government's Workplace Innovation Program. A description of the project and resources produced has been provided as a Case Study to this AWPA study. Due for completion in June 2014, the project has involved 12 universities and several engineering industry peak bodies. The outputs of the project will include good practice guidelines [18], exemplars of good practice, recommendations for universities, industry, peak bodies, and government, and some industry-inspired curriculum resources.

18. S. Male and R. King. (2013, 7 March 2014*). Best Practice Guidelines for Effective Industry Engagement in Australian Engineering Degrees*. http://www.arneia.edu.au/resource/59

9. What works well in effective work-integrated learning programs?

Drawing on literature, interviews and focus groups with academics and employers, and focus groups with students, the study referred to above has found what works well for within-industry placements in engineering. Major points include:

1) Reflective practice before, during, and after the industry placement experience is important. Before the placement, students should be aware of the expected learning. During the placement they should take every opportunity to learn from others. Afterwards they should reflect on their learning and the experience by sharing with other students so that they can position their experience among those of others.

   Universities that have extended placements, such as the two 6-month placements taken by all Australian students enrolled in the BEng/BEng(Hons) Dipl.Eng.Prac. program at the University of Technology, Sydney, institute such reflective requirements for student credit.
2) Universities should provide more support in finding placements. Some students do not have the connections or the resources of others. Students on placements should be remunerated.
3) The student must have someone in the workplace who is responsible for mentoring them, and other team members should be aware that the student is there to learn.
4) A university approved commitment from the employer regarding providing relevant experience including responsibility and interaction with engineers is valuable.
5) The student should have someone in the engineering faculty who the student can contact and who is concerned for the welfare of the student. If feasible, this person should visit the workplace.
6) The person with overarching responsibility for placements must recognise their value.
7) Managing students' placement experiences requires commitment from a staff member who has workload time allocated to the role.

Most ACED member faculties have well-managed internship schemes for selected students. The latter may have company sponsorship, and may undertake advanced work that can be further developed in their capstone investigative project. The company may value the relationship with the university very highly, and their relationship with the students as one for potential recruitment.

Alternatives to industry placements for achieving WIL are being explored in the current ACED study, and will reported in June 2014

10. What are your views on engineering graduates not working as engineers?

ACED members want to see good employment and career outcomes for their graduates, in whatever roles they take. Given that engineering degrees include applied problem solving, research skills and professional skills, as well as engineering science, many graduates are attracted into positions outside engineering. Graduates of double degrees with business or management as the second degree who choose to work in finance or management may bring engineering perspectives and approaches to their work. In general, the engineering faculties will celebrate and value high achievement and positions of influence gained by their alumni, irrespective of their field.

The loss of engineering graduates from engineering work immediately or soon after graduation is, nevertheless, a poor return on an expensive educational investment and commitment by the individuals, their families and government, especially when there are shortages of engineers. When graduates cannot gain the employment in engineering that they have worked so hard for, the investment that they and their families have made may be resented: their investment was made in faith that the qualification will help them secure reliable well-paid employment. From the point of view of society, investments in the nation's engineering education are made on the basis of expectation of improved products and services generated during the engineers' working lives.

Engineering careers tend to develop from an initial focus on technical functions, and then develop with increasing management responsibilities for more complex technical functions, and possibly general management. Graduates who stay in specialized technical roles tend to earn less than the management track. Australian industry could benefit, in terms of stability and retention of specialized knowledge from enhancing the status and remuneration of the technical career track.

As noted earlier, engineering workplaces are highly gendered. Most aspiring female engineers enter study as high achievers, yet they leave the profession (after graduation) at a faster rate than men. Due to their family commitments, many women will find it difficult to establish themselves again either in engineering or in another highly paid profession. They pay a high opportunity cost for choosing engineering, and the universities and others see dissipated the efforts they have put into encouraging women to study engineering.

11. What strategies exist to improve communication and dissemination of information about existing VET articulation pathways into higher education? What are the outcomes of these strategies?

As noted earlier, all universities allow for VET students to enter their engineering degrees with suitable advanced standing. ACED data (from the Department of Education Higher Education Statistics collection) shows that about 6% of Australian commencing enrolments have prior study in VET as their basis of admission. However, some large engineering faculties, notably in dual sector institutions typically have 15-17% such admissions.

Despite many student support mechanisms, the graduation outcomes from such pathways have been found to be quite variable [6], and on average lower than their school-leaver classmates. There are of course some outstanding success stories, but many articulating students find it extremely hard to manage part-time work and family commitments alongside the rigours of engineering degree study. As noted earlier, the pool of potential VET articulants with Diplomas or Advanced Diplomas in engineering is not large.

12. Is there a demand for engineering paraprofessionals? How can this demand be addressed?

Several of the reports and studies that ACED has been involved in have raised concerns about the roles and opportunities for paraprofessionals (Engineering Associates) with 2-year post school qualifications. Similar concerns have been raised for Engineering Technologists (with 3-year degrees), with declining provision and numbers.

These reports also raise concerns that graduates from professional engineering programs may have to take on roles for which they are both 'overqualified' and 'underprepared'. This is not an optimum outcome for either the high-cost education system or the individuals. ACED would welcome the opportunity to participate in a study of these occupations, with a view to improving the matches between the educational qualifications and occupational needs.

13. What are your views on labour market outcomes for skilled migrant engineers?

ACED is aware that labour market outcomes for migrant engineers are not as good as government, industry or the individuals may desire. ACED members could envisage providing additional courses to assist awareness of the Australian engineering work culture, or more specialized material on, for example Australian codes and standards.

14. How are workplace family-friendly policies used by engineering employees?

This is an important issue, referred to in responses to Q5 and Q11. Universities are generally family-friendly workplaces. It is noteworthy that much higher proportions of women are employed in teaching positions (12%) and research-only roles (25%) in the engineering faculties, than in the engineering workforce as a whole.

15. What are your views on the availability and take-up of part-time and job-share opportunities in the engineering workforce?

The work on women in engineering (see Q3 and Q10) have shown that engineering has too few part-time and job-share positions. The current generation of graduates, male and female, will expect more flexibility than has been typical.

16. What effective strategies do companies have in place to support and retain mature-age engineers?

This is an important issue, but not directly relevant to ACED.

17. How can lifelong career guidance services facilitate mid-career entry into the engineering workforce?

ACED members would welcome the opportunity to discuss the development and provision of specific education packages (e.g. on-line) that would support such services.

18. What pathways are available for mature-age engineers to re-enter the engineering workforce?

ACED members would welcome the opportunity to discuss the development and provision of specific education packages (e.g. on-line) that would support mature-age engineers to reenter the workforce.

19. What are some best practice approaches to improving the participation of Indigenous Australians in higher education engineering courses?

The number of indigenous Australian school leavers with pre-requisite study in physical sciences and mathematics is extremely low. As a result, most ACED member faculties would have only a small number of indigenous students. Several of the faculties support the work of the Australian Indigenous Engineering Summer School, and Australian Indigenous Mentoring Experience to promote engineering opportunities to indigenous school students.

Do you have any other comments on the issues raised in this paper?