



13 March 2012

Committee Secretary  
Senate Education, Employment and Workplace Relations Committees  
PO Box 6100  
Parliament House  
Canberra ACT 2600  
Australia

Dear Secretary,

**Re: Committee Inquiry – The shortage of engineering and related employment skills**

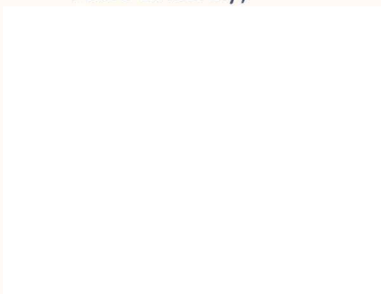
The University of the Sunshine Coast (USC) is developing a major project around the development of its new engineering programs, which it views as pertinent to the terms of reference for the current Senate Education, Employment and Workplace Relations Committee Inquiry – The shortage of engineering and related employment skills.

Attached please find USC's submission addressing terms of reference (c) options to address the skill shortage for engineers and related trades, and the effectiveness and efficiency of relevant policies, both past and present; and (e) effective strategies to develop and retain engineering talent in the private and public sectors through industry training and development, at enterprise, project and whole-of sector levels.

Senior USC representatives would welcome the opportunity to give evidence on these matters at a public hearing.

Please feel free to contact Don Maconachie (Director, Executive Projects Unit) on telephone [redacted] or email [redacted] or Julianne Bernhagen (Projects Officer, Executive Projects Unit) on telephone [redacted] or email [redacted] at any stage.

Yours sincerely,



Professor Greg Hill  
Vice-Chancellor and President

cc Mr Stephen Durkin, CEO, Engineers Australia

## THE SHORTAGE OF ENGINEERING AND RELATED EMPLOYMENT SKILLS SENATE EDUCATION, EMPLOYMENT AND WORKPLACE RELATIONS COMMITTEE

### 1. Introduction

The University of the Sunshine Coast (USC) is developing a major project around the development of its new engineering programs, which it views as pertinent to terms of reference (c) and (e) of this Senate Education, Employment and Workplace Relations Committee Inquiry. While there is a shortage of engineers on the Sunshine Coast and solid student demand for USC's new civil and mechanical engineering programs, USC wishes to accelerate growth in student demand by stimulating more interest in science, technology, engineering and mathematics (STEM) subjects and the engineering profession in schools. It has a range of strategies for achieving this, which it believes embody a fresh approach to generating more engineering graduates. This submission outlines key aspects of this USC project, including strategies and actions, target audiences and proposed partners.

### 2. About the University of the Sunshine Coast

USC's context and development is unique in the Australian higher education sector. It was established as a green field university in 1996 and remains Australia's newest public university. It has many of the characteristics of both a regional and an outer-metropolitan institution. It is situated in the centre of the Sunshine Coast Regional Council area (the fourth largest local government in Australia), and is extending its reach into other regional local government areas to the north (Gympie and Fraser Coast), but unlike most other regional universities, is growing rapidly. On the other hand, it draws increasing numbers of students from Somerset, Moreton Bay and Brisbane local government areas, and is only an hour from Brisbane and an international airport. It is in an area of high population growth and accelerating urbanization that has an economy dominated by construction. The wider Sunshine Coast region will need growing numbers of engineers for many years to come.

In its 15 years of operation USC has helped to lift the higher education participation rate on the Sunshine Coast from 1.7 to 2.7 percent of the population (15 years +), similar to the rate in Brisbane. This includes a participation rate of low SES students running at approximately 20%. Over this same period, USC has lifted its capture rates for Sunshine Coast students from 40% to almost 50%, while all other Queensland universities have either lost market share on the Sunshine Coast, or at best remained constant. The proportion of Sunshine Coast students going to interstate universities has also remained static during this time. All of this, along with an average annual growth rate of 10%, evidences a University that has understood its context and made strategic moves that are well aligned with its core markets. In 2012 USC has grown to almost 9,000 students.

USC's vision is to be recognised nationally and internationally for excellence in teaching, research and engagement while remaining relevant to its region. The coming period in the University's development is focused on achieving critical mass (12,000 students by 2015 and 15,000 students by 2020) and the economies of scale that will allow it to invest in quality improvement in teaching, research and engagement, and thereby attract the significant external resources that can sustain a more substantial profile, performance and culture.

### 3. About the Sunshine Coast

The Sunshine Coast is bounded by the Gympie region to the north and west, the Moreton Bay region to the south, and the Somerset region to the south-west, and is characterized by a land area

of over 3,100 square kilometers, including 113 square kilometres of waterways. The region has more than 200 kilometres of coastline, over 4,000 kilometres of roads, nearly 800 kilometres of bikeways and over 13,000 hectares of parks and bushland. The Kabi Kabi (Gubbi Gubbi) people are the region's traditional land owners.

The Sunshine Coast has experienced considerable population growth in the decade prior to 2011. It is expected that this trend will continue. In 2009, the Sunshine Coast population was approximately 323,000 and growing at approximately three percent, a rate well above the two percent (approximate) average national growth rate for local government areas. The population forecast for 2016 is 381,000 and over half a million by 2031.

Tourism and retail are two major sectors in the regional economic base, and the Sunshine Coast economy relies heavily on engineering and related skills to maintain a third significant economic driver – construction. The Sunshine Coast is moving toward an era of broader economic potential, offering residents greater employment opportunities with a relaxed lifestyle in close proximity to a major capital city, Brisbane. The Sunshine Coast business community is becoming increasingly aware of the number of people who reside on the coast, and commute to work daily in Brisbane and travel by air regularly to work in the mining sector.

As one of the fastest growing regions in Australia for many years, the Sunshine Coast community and all levels of government face many challenges. Key strategic priorities for the region include driving economic development and employment, advocating for key regional infrastructure, transition to a high tech-low carbon region, enhancing community health and social wellbeing, and maximizing education and training opportunities.

USC offers the region an opportunity to develop and innovate in a number of knowledge-based disciplines, including engineering, to achieve sustainability and regional economic development.

#### 4. About Engineering at the University of the Sunshine Coast

USC is developing a school of engineering within the Faculty of Science, Health, Education and Engineering, having introduced civil engineering in 2010 and mechanical engineering in 2012. The civil engineering program has provisional accreditation, and in 2013, the Faculty will seek provisional accreditation for the mechanical engineering program and full accreditation for the civil engineering program. In cooperation with Engineers Australia, USC has a partnership with the University of Southern Queensland (USQ) that enables USC to develop and deliver its engineering programs with support from a faculty that has been delivering engineering programs for in excess of forty years. Through this arrangement, USC students undertake some of their subjects through USQ, either in intensive mode or external enrolment at USQ. The partnership also involves a range of collaborative activities of mutual benefit to both institutions.

#### 5. Commentary in Relation to Terms of Reference (c) and (e)

While USC is offering engineering because the regional and wider economy requires engineers, and the University is confident the program will reach critical mass due to rapid population growth, it is also conscious that it cannot just wait for the students to enrol. The University is fully aware that it needs to encourage interest and engagement in engineering. This is especially the case in the context of rapidly growing demand for engineers due to the next wave of the resources boom and the decline in student engagement with STEM subjects at school. In order to achieve this USC has determined that it will implement three critical strategies designed to generate increased student demand for engineering education and graduate more engineers to meet the skills shortages within the wider region and beyond.

Each of these strategies are predicated on the development of a dedicated engineering facility that would provide state of the art learning and teaching spaces, and a visualization laboratory to enable the use of virtual reality techniques in engineering education. USC, with its partners, is seeking

funds for this facility under the Commonwealth's Education Investment Fund (EIF). This submission to the Senate Committee inquiry is offered in the hope that it might provide a useful perspective on fresh strategies that can help to address the skills shortages that are the subject of inquiry.

**The first of these strategies is to work with the Department of Education and Training (DET) and regional schools to provide seamless pathways from school to university in engineering.** This involves two key actions. First, development and delivery of a fieldwork program whereby primary and secondary school students will experience learning using the visualization laboratory. This is intended to stimulate school student interest in studying STEM subjects, especially among females. This program will involve working with school teachers to optimise the preparation for, experience of and follow-up to the fieldwork, supporting both effective learning and a greater understanding of engineering and related subjects.

Second, it involves extension of USC's existing Integrated Learning Engineering (ILE) program that enables regional Queensland Certificate of Education (QCE) students to undertake two first year Bachelor of Engineering subjects while completing their QCE. For this they receive full credit and guaranteed entry to USC on the successful completion of both subjects. USC will work with its partner in the ILE program, Construction Skills Queensland (CSQ), to expand its provision to many more Queensland schools. It is hoped that part of this expansion will involve options for more students to participate in the Queensland Minerals and Energy Academy's (QMEA) workplace learning intensives. CSQ is considering investing further in the ILE program by sponsoring the students who come to USC through the ILE program. While the ILE program is only in its third year it has a good record of encouraging students, including females, to go on to university to study engineering.

**The second proposed strategy is to work with Department of Education and Training (DET) and partner TAFE institutions to provide seamless pathways from VET to university in engineering.** If agreed to by the potential partners, this would involve two key actions. First, a regional VET engineering project conducted in partnership with DET, Sunshine Coast Institute of TAFE (SCIT) and Wide Bay Institute of TAFE (WBIT) to build the capacity and capability of these TAFEs in provision of certificate and diploma programs in engineering.

Second, this strategy would involve the eventual co-location of SCIT and WBIT engineering diploma programs with USC's Bachelor of Engineering at Sippy Downs, and possibly at the campus shared by WBIT and USC at Gympie. This would mirror current co-location arrangements between these institutions in nursing education, and would facilitate the joint development and delivery of engineering associate degree programs.

The target populations for this TAFE pathways strategy would be school leavers looking to go to TAFE in the first instance, current TAFE students wishing to upgrade their training to engineering and related disciplines, and members of the community who need pathways to more satisfying careers, potentially including in the resources sector.

These two student pathways strategies overlap and provide opportunities for three-way collaboration between schools, TAFEs and the University. This could be achieved through partnerships that enable students to undertake relevant VET studies in parallel with their QCE programs, for which they could receive guaranteed entry to USC. This could also be complemented by expanding USC's Tertiary Preparation Pathway (TPP) program to include engineering studies. TPP enables mature age students who have not studied for some time to undertake bridging courses that prepare them for university. It is a large and growing program at USC and has a good record in supporting student retention and completion, particularly among females.

**The third strategy is to make the study of engineering as attractive as possible through the provision of innovative learning environments and a stimulating student experience, particularly through the use of advanced visualisation techniques.** This involves three key actions. First, if funded under EIF, the new engineering building at USC would be constructed with an emphasis on innovative learning and teaching spaces and a high quality student experience. In addition to this, the building itself would be a living laboratory with inbuilt sensors providing data on just about every aspect of the structure, enabling USC, TAFE and visiting school students to experience real time engineering factors at work.

Second, this strategy involves the development and operation of a high-end visualization laboratory that will transform the learning experience, making it more effective and more attractive to students and prospective students. Visualisation employs virtual reality modules to better engage learners and improve concept development.

Third, USC will propose that DET and local schools enter into a partnership to plan and implement a curriculum and professional development project designed to prepare curricula and curriculum materials for learning and teaching using visualization techniques. This project will also involve design and delivery of professional development for school, TAFE and university teachers in the application of visualization techniques in the teaching of STEM subjects.

USC envisages that its partners in this strategy will be DET, the University of New South Wales (UNSW) and Lockheed Martin. USC has approached DET to fund the curriculum and professional development project; UNSW to pass on their experience and knowhow gained from the use of their VR Simulator in mining engineering education, and to collaborate in learning and teaching projects; and Lockheed Martin to provide state of the art technologies for the development of the visualization laboratory, and to pass on their experience in the promotion of STEM subjects in American schools.

The target populations for this strategy would be USC engineering students and students in regional schools.

This strategy also reinforces the student pathways strategies in that, through offering visualisation experiences to regional school students, new interest can be generated in the study of STEM subjects and the pursuit of careers in engineering.

Senior USC representatives would welcome the opportunity to give evidence on these matters at a public hearing.