



ENGINEERS  
AUSTRALIA

**The Treasury**  
Langton Crescent  
PARKES ACT 2600

16 January 2017

To whom it may concern,

**RE: Pre-budget submission, 2017-18**

Thank you for the opportunity to make a pre-budget submission for the 2017-18 federal budget.

Engineers Australia is the peak body of the engineering profession. We are a member-based professional association with over 100,000 individual members. Established in 1919, Engineers Australia is a not-for-profit organisation, constituted by Royal Charter to advance the science and practice of engineering for the benefit of the community.

**Introduction**

The 2015 National Innovation and Science Agenda (NISA) stated that “Innovation and science are critical for Australia to deliver new sources of growth, maintain high-wage jobs and seize the next wave of economic prosperity.” Engineers Australia agrees with this outlook, and notes that the practical application of science and innovative thinking is dependent on engineers to take ideas to reality.

This submission explores six specific items that will help ensure that the government makes best use of engineering expertise, and develops a strong pipeline of engineering talent.

To develop into an internationally competitive state, the integration of engineering into the provision of government services, delivery of nation-building infrastructure and good public policy is essential. Engineers’ specialised skills and engagement in almost every sector of the economy gives them a special insight to the innovative potential of public infrastructure like roads and hospitals, our defence capability, and our energy future. The submission details why the federal government needs to establish an office of the Chief Engineer to provide a link between it and the engineering profession to benefit from this insight.

Engineers are central to the success of an innovation agenda and there are five issues that highlight the need for concerted action on skills development to achieve the Government’s ambitions for a high-tech future:

- There is a low number of school students (especially girls) studying the subjects that prepare them for entry to and success in engineering degrees.

- Following a drop in enrolments at the end of the mining boom, engineering degree graduation numbers will soon start reducing.
- Women make up only 13 per cent of the engineering workforce.
- Almost 40 per cent of qualified engineers do not work in engineering roles.
- Skilled migrants are a huge portion of engineers in the workforce, yet have very low rates of employment in engineering roles.

This submission provides recommendations for a program that targets each of the above issues.

## 1. Chief Engineer

**Recommendation:** The federal government allocate funds to establish an office of a Chief Engineer.

In a modern society, practically every good and service consumed or used in production embodies engineering. Almost everything that we see, touch or use in our daily lives has in some way been shaped or delivered by engineers.

To develop into an internationally competitive state, the integration of engineering into the provision of government services, delivery of nation-building infrastructure and good public policy is essential.

Engineers' specialised skills and engagement in almost every sector of the economy gives them a special insight to the innovative potential of public infrastructure like roads and hospitals, our defence capability, and our energy future.

It is this life cycle experience and knowledge that provides engineers with a unique perspective of government projects and policies that can provide good governance, public surety and the reduction of risk.

Engineers Australia believes that the federal government needs a Chief Engineer to provide a link between it and the engineering profession to benefit from this insight.

### Engineering, good governance and service delivery

Good governance relies on having the right people in place to make informed decisions. It is about ensuring that decision makers have access to experienced and knowledgeable professionals when planning projects or structuring policy.

Engineers Australia believes that the appointment of a Chief Engineer will help the government to attain access to the profession's perspective on technical considerations and therefore reduce the risk of service, project or policy failure.

For example, budget overruns for projects are costing governments regularly around 21 per cent more<sup>1</sup> than the original cost. Much of this overrun can be attributed to the de-engineering of the government sector. Thirty years ago, there were about 100 000 engineers in the public service. Today, the number is around 27 000. The knowledge gap leads to life-cycle problems such as poor project scoping and management that only come to life during project delivery. This leads to inevitable extensions and re-engineering that causes additional costs and eventual loss of public confidence in the delivery of essential services.

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<sup>1</sup> *Cost overruns in transport infrastructure*, Terrill, M, Grattan Institute, October 2016.

To provide advice on big ticket questions—such as, what is needed, when and how much will it cost?—requires the expertise of an engineer who can examine a project in its entirety and provide balanced long term advice. Governments can then make informed decisions on the best course of action.

The New Zealand government, in seeing the need to have supervision of its engineering requirements, appointed a Chief Engineer to “ensure that policy decisions and activities are informed by research and evidence and will enhance engineering practice”. Closer to home, the Government Architect provides an example of how a senior independent professional advisor can support successive governments with strategic advice on urban design, capital works programs and planning issues across portfolios.

The Chief Engineer will provide leadership and strategic advice to improve social and economic outcomes and establish policy and practice frameworks that foster collaborative approaches across government in a multitude of issues such as STEM, infrastructure, workforce capacity, resilience and technical responses to current and potential threats.

Workforce planning is a particular challenge for maintaining a stable and healthy economy. As the workforce changes over the coming decades new jobs will emerge as technology advances. These new skilled positions will provide governments with new opportunities to manage risks and promote export potential.

Engineers are problem solvers, critical thinkers and practical innovators. The Chief Engineer will help to reduce risk and exploit opportunities by:

- Providing independent advice on engineering intensive policies and projects.
- Provide advice on policies and programs that foster innovation.
- Assist governments develop industry policies and programs that will drive economic growth and boost productivity.

### The role of the Chief Engineer

The Chief Engineer has a focus on providing independent advice to government across the engineering sector.

Working directly with Parliament, the Chief Engineer will provide policy direction, oversight, and assessment for the government’s engineering programs. They will serve as principal advisor to the government and other senior officials on matters pertaining to the technical readiness and execution of government’s policies, programs and projects.

The Chief Engineer would ensure that the government's efforts are planned and conducted on a sound engineering basis with proper controls and management of technical risks.

The Chief Engineer will foster and encourage a lively innovation system by promoting productive links between business, universities and government and provide independent advice on how to address policy problems that involve engineering, and provide assistance on policies that will improve project delivery and foster excellence in engineering practices.

The Chief Engineer will have responsibility to:

- Champion engineering excellence to and for the government

- Provide independent, professional and impartial strategic advice across the engineering sectors to Parliament, including Cabinet and Ministers, plus government departments and agencies.
- Assist the government to establish policy frameworks that are informed by engineering.
- Promote and advocate excellence in engineering to the wider community.
- Provide advice on ensuring the government has the ability to act as an informed buyer.
- Identify, report on and advise governments on current and potential engineering workforce needs.
- Conduct research on national and international best practice in engineering.
- Foster collaboration with government, academia, education, industry and the community.
- Promote the professionalism of engineering.

Through appointment by the Prime Minister, the Chief Engineer should reflect the professionalism of engineering by:

- Holding Chartered engineer status, as a recognition of their leadership and internationally recognised competence and professionalism.
- Being on the National Engineering Register, to demonstrate attainment of the professional benchmark required in various Australian jurisdictions.
- Having demonstrated links with government, industry and academia.

A Chief Engineer will assist government delivery across engineering intensive programs. Through independent and rigorous assessment, the Chief Engineer can work with governments to ensure that strategies, programs and policies are measured and aligned with whole-of-life cost benefits, long term projections and are delivered for the benefit of the community.

## 2. Future skills

Australia's future will be high-tech and knowledge based. Engineers are innovative, highly skilled and vital to all sectors of the economy. Government, industry and the education sector need information to help build a skilled workforce and understand how to capitalise on the opportunities available in new industries.

**Recommendation:** The federal government and industry to develop a forecast of the engineering and other high-tech skills that are emerging as those most in need for the next 30 years.

The intended outcome will be a report developed that enables:

- cross-agency action by governments, industry and the education sector to develop the next generation of skills for Australians.
- industry to understand the value of people with engineering and high-tech skills for future prosperity and create an increased pull on skills supply.

## 3. School education

A low number of primary and junior secondary school students go on to pursue STEM-related subjects at the senior secondary level. The percentage of boys and girls studying advanced

maths and physics at the senior secondary level has been dropping for about 20 years, with the rates for girls especially low.

Advanced maths is studied by 11.5 per cent of boys and 6.2 per cent of girls. Numbers for physics are 21 per cent and 5.9 per cent. Rates for chemistry have stabilised at below 20 per cent.

**Recommendation:** The federal government allocate funds to enable the COAG Education Council's STEM Partnerships Forum to be used as a mechanism for Engineers Australia and other professional associations to provide relevant expertise for implementation of the National STEM School Education Strategy.

Particular emphasis could be placed on connecting teachers with professionals, building programs to motivate children to pursue STEM-based studies and career aspirations, and implementation of the senior secondary curriculum for mathematics and science, with a particular focus on specialist maths, physics and chemistry.

The intended outcome will be increased participation rates in all mathematics courses (especially specialist mathematics), and increased participation in science (especially physics and chemistry), and especially for girls.

#### 4. Tertiary education

Acceptances by high school leavers of places in engineering courses have fallen from 12,225 in 2013 to 11,062 in 2015. This will translate into falls in course completions, just when Australia needs more engineers to drive its innovation agenda. The downward trend is somewhat offset by an increase in post-school applications.

There is little change in the number of women taking up engineering studies from 14.3 per cent in 2013 to 15.6 per cent in 2015 (an increase of 188 women).

**Recommendation:** The federal government allocate funds for a project to collaborate with Engineers Australia and relevant associations on communications to develop campaigns to ensure high school students, parents and teachers understand the value of engineering as a profession.

The intended outcome will be an increase in the number of enrolments in Bachelor of Engineering degree courses, and an increased percentage of female enrolments.

#### 5. Female workforce participation

The percentage of Australian born women in engineering related roles is 62.2 per cent across all age groups, compared with 70.6 per cent for Australian born men. The difference between men and women is 4.2 percentage points in the 24-29 age group, and starts to drop further in the 30-34 age group. It never recovers and becomes a 15-point gap by age 40.

While female engineers are slightly more likely than other skilled women to leave employment in the 25-34 age bracket, their employment in any roles recovers to match that of all women until they reach the 55-64 age group. This data indicates that female engineers are as likely as any woman to be in employment, but too often not in an engineering-related role.

**Recommendation:** The federal government allocate funds for a project to work with Engineers Australia and other industry bodies, and perhaps through the Male Champions of Change for STEM, to utilise existing research to develop industry/profession-specific guidelines on how to reduce the rate at which women leave employment that is unrelated to their professional training, like engineering.

The intended outcome will be a reduced rate at which women drop out of the engineering workforce.

## 6. Migrant workforce participation

Skilled migrant engineers are less likely than their Australian-born cohort to gain employment in engineering due to lower levels of suitability to roles that demand higher levels of experience. Engineering employment rates:

- Australian born men 70.6 per cent, and women 62.2 per cent.
- Overseas born men 57.2 per cent, and women 45.4 per cent.

**Recommendation:** The federal government allocate funds to conduct a comprehensive review of the skilled migration system. A review can explore the merits of proposals to amend selection systems for permanent and temporary work visa categories to reflect requirements under professional registration schemes like the National Engineering Register (NER), which place greater emphasis on experience and skills that will lead to engineering employment outcomes in the senior roles in which skilled migrants are primarily needed.

The intended outcome will be an increased percentage of visa holders (especially independent migrants) who attain engineering-related employment within one year of arrival and continue to be in such employment five years after arrival.

If Treasury would like to discuss this submission in more detail, please get in touch by calling me on (02) 6270 6565 or send an email to [JRussell@engineersaustralia.org.au](mailto:JRussell@engineersaustralia.org.au).

Yours faithfully,



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