SUBMISSION
TECHNOLOGICAL CHANGE AND THE FUTURE OF WORK

Engineering New Zealand (formerly IPENZ) is New Zealand's peak professional body for engineers. We are New Zealand's strongest and most influential voice on engineering issues. Our membership is growing, with more than 23,000 members who want to help shape the public policy agenda and engineer better lives for New Zealanders.

Engineers help generate the disruption that will change the future of work. They can drive the creation of a new wave of jobs – including new engineering jobs. At the moment, we are short of engineers and this needs to be addressed if we're going to harness disruption's full potential.

To engineer a better future for New Zealand, we need to address the skills shortage by attracting and retaining more engineers. We can do this by:

- Inspiring the next generation to engage with science, technology, engineering and maths (STEM) at school
- Better targeting women, Māori and Pasifika to choose engineering as a career
- Making the profession more welcoming and inclusive, to increase retention rates.

We also need to address occupational regulation that creates unintended barriers to the profession's growth.

Set out below are our answers to specific questions in the Issues Paper. Please contact General Manager Legal & Policy Helen Davidson if you would like to discuss any of these matters (helen.davidson@engineeringnz.org).

RESPONSES TO ISSUES PAPER QUESTIONS

Q1 Are the scenarios developed by the Commission useful for considering the future labour market effects of technological change? How could they be improved?

The scenarios help frame discussion about an uncertain future. We need to shift from 'steady as she goes' to 'more tech and more jobs'.

Q2 What other consequences might be expected under each scenario?

A shift to 'more tech and more jobs' would increase demand for design engineers and engineering technicians. However, there are existing skills shortages as evidenced by the Immigration NZ Long-term Skills Shortage list in which engineering features strongly.

This demand requires us to focus on growing the pool of New Zealand engineers though education, careers advice and retention, as well as to think about increased inward migration and more outsourcing of components of specific tasks.

Migration from 2001 through to 2012 averaged a small net gain of engineers of 160 per annum. In 2013 and 2014 the net migration gains were 500 and 1100 respectively, partly due to the Canterbury

Over the last quarter of a century, the number of professional engineers in Aotearoa New Zealand has increased by over 26% - see Figure 1 below. There were 45,600 engineers recorded in the 2013 census. Based upon historical trends, we expect there to be at least 21% more engineers in New Zealand by 2026. But this number could be significantly higher under a 'more tech and more jobs' scenario.

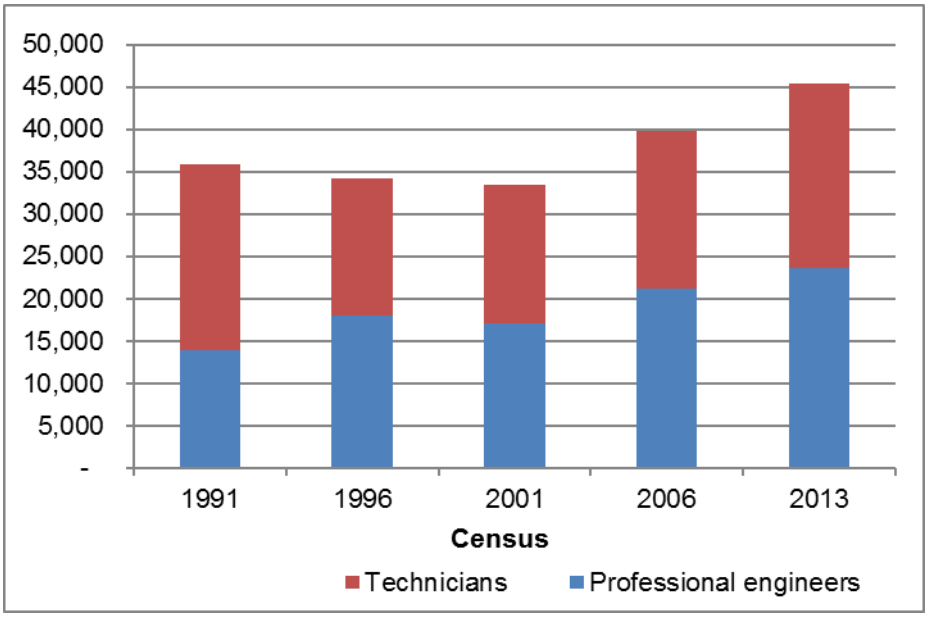

Figure 1: Number of engineers in New Zealand

Engineering is traditionally divided between civil (including structural, geotechnical and water), mechanical, electrical, chemical and other specialist areas – see figure 2 below.

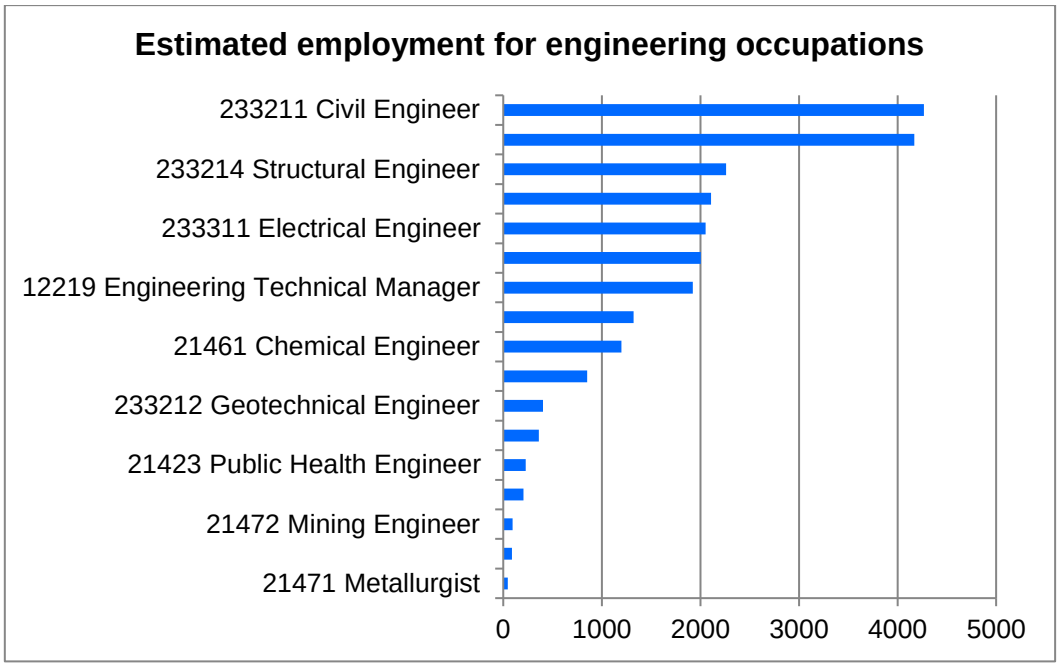

Figure 2: Engineering Occupations in New Zealand 2013 Census Categories

It is likely that increasing use of technology will mean there are changes in the demarcation between different fields of engineering practice. It may be there is a greater need for systems engineers with understanding of ICT, sustainability and integration across specialisms. This will challenge how the profession is taught, practised and regulated.

Q3 How might the impacts of each scenario vary across different groups in society or across different locations in New Zealand?

The future of work will require more engineers and technicians, particularly if New Zealand succeeds in shifting to 'more tech and more jobs' scenario. To fill this demand, engineers need to be drawn from the whole population.

Changes in the profession from 1991 to 2013 unevenly reflect New Zealand's changing demographics:

- Māori engineers increased from 4% to 5.5% of the profession.
- Pacific engineers doubled from 1.2% to 2.4% of the profession.
- Engineers from the Asian continent increased from 3.6% to 13.1%.
- The mean age of engineers increased from 36.2 years to 42.2 years.
- The proportion of working engineers over 65 years rose from 1% to 5%.

Women remain severely underrepresented in the profession.

Engineering New Zealand is committed to inspiring the next generation of engineers and making sure that the profession welcomes everyone.

The **Wonder Project** is Engineering New Zealand's free programme for schools, funded by Callaghan Innovation, that gets get young Kiwis excited about STEM. The Rocket Challenge for years 5-8 has gone nationwide this year. Now we're piloting the Community Challenge for years 7-10, with the aim of rolling it out nationwide in 2020. A STEM Careers programme for years 10-13 completes the journey through the support of our 1000+ ambassadors.

Last year we launched the **Diversity Agenda**, a partnership between Engineering New Zealand, the New Zealand Institute of Architects and ACENZ – and nearly 100 firms have already joined the movement. Our goal is to get 20 percent more women in engineering and architecture roles by 2021. And now we're starting to set our sights on other kinds of diversity.

Q4 How should government monitor the impacts of technological change on the labour market?

Government needs an accurate understanding of skills shortages, migration and the demographic composition of the workforce. If, as at present, there are enduring skills shortages that require inward migration, then there is scope for increased intervention in the education and training system. If technology occupations reflect demographic imbalances, then targeted interventions are required with educators, the professional body and industry. We recommend that measures of skills shortages are used to facilitate better workforce planning in the technology sector.

Q5 What policy objectives should governments pursue for the labour market of the future?

Education in STEM and vocational training are an ongoing priority. Engineering New Zealand supports the reform of vocational education, but this is only the start of a process of ensuring a more integrated and co-ordinated approach between government, education providers and industry to provide a flexible technology and engineering workforce able to skill up over time from a sound base level of skills and knowledge.

Q6 What are the potential tensions between different policy goals? How might such tensions be best addressed?

There is a tension between innovation and growth and maintaining an acceptable level of safety.
To accelerate the shift to 'more tech and more jobs' requires changes to how New Zealand regulates engineering-related work. Regulation will need to enable the benefits of technologically driven growth and innovation, while maintaining or improving safety outcomes. Our regulatory system can be slow to adapt, delaying productivity gains or exposing us to avoidable risk.

The best approach is professional self-regulation supported by statutory licensing for the most safety-critical areas of work, with a more effective and efficient mechanism for setting standards. At present there are significant lags between new technology and the adoption of appropriate standards to mitigate risks. Standards may well need to be international rather than Australasian (or New Zealand only) standards as we receive and adapt to world-wide technological advances. Recent examples include the introduction of new materials and mass production techniques in the building sector and the uptake of the electric car.

Q16 Are there particular areas where occupational regulation makes it harder for people to shift jobs or adjust to technological change? Would this change under each of the future scenarios?

Occupational regulation may create unnecessary barriers to entry into jobs where there are already skills shortages. Engineering New Zealand is committed to strong, effective self-regulation of engineering professionals. We've **recently commented** on proposals put forward by MBIE for the future regulation of engineers. We're concerned that the model they've proposed over-regulates the profession and could be insufficiently responsive to technological change.

Engineering New Zealand does not consider that the current statutory protection of title for a Chartered Professional Engineer is fit for purpose and support licensing for safety-critical areas of engineering underpinned by strong self-regulation of general technical competence and professionalism. This model allows for flexibility in response to technology and work force changes.

Q17 How well do the current outcomes from the education and skills system position New Zealand to respond to changing technology and different future scenarios?

The current vocational education system limits opportunities for technology-enabled growth. There is regional variability in the quality and choice of educational offering and there are gaps in essential skills areas. Strategically important areas can be poorly served under the current competitive model. Overall, the current system of vocational education is fragmented, lacks co-ordination at a regional and national level, and is vulnerable to economic cycles.

Technological developments create opportunities for more tasks to be carried out by technicians with enhanced technology-based tools and information. However, this can place additional demands on technicians, so we need to better up-skill technicians both to ensure public safety and to increase productivity. There is also a need to make sure all young people are aware of the many and varied rewarding career opportunities in the engineering profession.

Q18 What changes to immigration policy to address skills needs might be required under different future scenarios?

New Zealand relies heavily on its skilled migrant workforce and is highly likely to continue to do so. Engineering New Zealand's degree accreditation processes and membership of the Washington, Dublin and Sydney Accords serve to establish a consistent academic standard for all engineering professionals. Our engineers frequently broaden their experience by contributing their expertise overseas as part of an internationally mobile, professional workforce.

Q24 How well does New Zealand's education and training system reflect the changing skill needs of industry? Is the education and training system able to effectively respond to changing technology and different future scenarios?

The government's new proposals for the reform of vocational education could provide an improved mechanism for diploma level qualifications, apprenticeships and micro-credentials linked to on-the-job training. As noted in **our submission** on the proposed reform of vocational education, we need qualifications that are delivered flexibly to meet both student and employer needs. For the workforce to adapt to meet new and emerging industry needs requires desirable career pathways with opportunities for continued upskilling and transferability.

Engineering New Zealand welcomes the opportunity for industry leadership of new skills boards. In our view these should be broad based, to include multiple specialisms within professions. This could provide for greater transferability between qualifications, as well as providing enough dedicated resources to meet the needs of niche areas that are essential to the economy and public wellbeing.

Engineering New Zealand strongly supports the establishment of an Industry Skills Board (ISB) to encompass the broad range of engineering-related occupations. This could enable a stronger connection to industry and a more responsive qualifications regime. An Engineering ISB may provide a structure that enables us to formalise and progress our collaboration at a strategic level with a clear focus on engineering career pathways.

Q25 What programmes exist to support people to retrain, upskill or adapt to changing technology, and how effective are they?

Micro credentials and the degree apprenticeship schemes have been a way for industry to take ownership and allow qualifications to be quickly updated and to adapt to industry needs and changing technology. At

times employers have moved ahead of education providers and provided on-the-job training instead of, rather than to complement, formal education. While this meets current needs in some areas, it does not necessarily prepare for the future workforce we need and may not attract more people into a profession that has ongoing skills shortages.

The engineering profession is already working collaboratively with employers to match current skills requirements, anticipate future learning needs and ensure high-quality, internationally benchmarked qualifications. For example, the New Zealand Board for Engineering Diplomas (NZBED) provides a model of best practice that can be expanded and extended. NZBED is a collaborative partnership with participation, governance and management by industry players, education providers and industry training organisations.

NZBED was established in 2011 to oversee the National Diploma in Engineering and is recognised by NZQA as the qualification developer. The Diploma is a 240 credit, level six qualification, across four strands - civil, mechanical, electrical/electronics and fire (which was added to the qualification during 2018). The Diploma could be extended to include other areas that are becoming more technology-enabled, such as water treatment. It consists of 16 courses to complete, with five courses common to all strands that all providers teach and electives available specific to regions.