

Identifying and bridging the
“Engineer’s practical skills gap”
in the New Zealand Power Distribution Industry

“A second look at the practical skills gap in the New Zealand Power Industry through the eyes of engineers”

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Introduction

Following on from the initial paper of identifying and bridging the skills gap of Graduate engineers. This paper is a second way of looking at the same problem of a practical skills gap of the power industry from a different perspective. Identifying this skills gap through the “eyes of an engineer” rather than a student or a technician (which will be covered in the third paper). It investigates the interpretation of what an engineer is, if they are adequately supported in the industry, the skills gap, and engineers’ attitudes towards rewards and recognition.

This paper begins with a literary review of the documents and publications investigating the skills gap in detail from 2017 to early 2023 from U.K literature and findings, notes taken from the e.e.a APEX 2022 conference in Christchurch, and the Engineering New Zealand “Thrive conference” 2023 in Wellington. This is followed by a summary of twenty interviews held with stakeholders of the industry, finalised with a discussion with recommendations, and further actions.

Background and Research Methodology

Using the action research methodology outlined in (Dikilitas & Griffiths, 2017) and transdisciplinary approach (Belcher, Rasmussen, & Zornes, 2015), the following section discusses the engineering skills gap specifically in New Zealand. A literature review, interviews with industry stakeholders, and a working group with consultants from the industry.

The literary review involved searching for information and finding examples from global sources of the engineers’ skills gap in industry, as very little information is available in New Zealand.

Interviews were carried out using video conferencing and recorded using dictation software. There was a total of 20 participants from Distribution Companies, Transmission, Consultancy owners and Consulting Engineers, two recent graduates, Industry Suppliers, and contracting service providers. A pre-set of questions were asked during the interviews (Found in Appendix B) and are discussed with recommendations made in the latter section.

Literary Review

The definition of an engineer

According to the national statistics, Power Distribution Engineers do not exist. When checking on the national statistics website, there was no category for a Power Distribution

Engineer.

There are many differing interpretations of an engineer, one being the following: “An engineer is a person who is professionally engaged in a field of engineering. Engineers are concerned with developing economical and safe solutions to practical problems, by applying mathematics and scientific knowledge while considering technical constraints. As such, the work of engineers is the link between perceived needs of society and commercial applications. Some consider this profession to be the link between art and science.”

What does it take to be an engineer?

To be a good engineer it takes a balance of both Implicit and Tacit knowledge, theory and practical ability, the use of evidence and experience and has the ability to turn that theory into reality. Over the last few decades engineering has gone through a phase where the theory, Implicit and evidence based engineering has come to the forefront, whereas the tacit knowledge, practical ability and experience has been neglected due to the difficulty in obtaining the required access to this experience. When defining the skills shortage in this paper, we are discussing Tacit knowledge, Practical ability and experience.

The skills shortage and its impacts

(Hayes, Rob, 2021), (Transpower New Zealand, 2021), (Edwards, 2023) All agree that there is a skills gap and something needs to be done about it. The impacts can be summarised by (Bently, 2019) where a “A world of exciting targets has become one of missed deadlines” and (Smith, 2023) says it is made worse by companies creating a ‘toxic hustle culture’, creating pressure to work harder and to make more money for their organisation. This can cause burnout of our engineers and, if they don’t rest their bodies, their bodies will do it for them.”

Why is there a skills shortage?

(Edwards, 2023) In sectors such as engineering, employers have been wary of spending money on training and upskilling for fear of losing those workers to higher-paying competitors. and “Skilling them has a multiplier effect. Upskilling gives people more confidence and research has shown it is the people lacking the skills who are more likely to leave.”

A survey by the McKenzie-DeLis Foundation, published in March 2022, found across all sectors just over 60% of employers said, though they have specific measures in place to reduce age bias in recruitment, only 15% have training geared toward older workers. Attempts by the U.K government to encourage upskilling have not been met with widespread enthusiasm.

“The biggest problem is getting people into the industry in the first place,” says Sondrel’s Curren. Which is reflected in New Zealand. The industry can do more to make engineering more attractive.

(Institute of Engineering and Technology, 2021) Engineering employers are aware that they are responsible for providing training to upskill their workforces as well as improving diversity. However, there are barriers that must be overcome. These are seen to be a general

lack of applicants, with or without the necessary technical skills required for their industry, especially in young people.

What needs to be done about the skills gap?

(Hayes, Rob, 2021) recommends that the industry should be creating sector marketing plans, creating mentoring programmes, having role models, targeting young people, Raising value of apprentice of the year presentations. Promote the value of qualified trades people, investigate bite sized training packages, and create career paths for people in the sector.

Universities are changing their way of teaching engineering, (Edwards, 2023), The UK has started to think more longer term where the prime minister has said that “We need to end once and for all this mistaken idea that learning is something you finish at 18”.

Keir Starmer thinks the UK’s employers need to focus more on upskilling to wean themselves off seeing immigration as their main way to fill staffing gaps.

Employers often point out that the numbers simply are not there when it comes to finding older engineers and others who could conceivably re-skill, and also with more focus on building a home-grown pool of expertise, rather than seeking employees from abroad.

(Edwards, 2023) Advisory board member at Delamere, Professor Sir Cary Cooper says that employees want genuine perks or benefits that have “a meaningful impact on their quality of life”, such as optional work-from-home initiatives. To attract the best talent, not only do “salary offerings need to reflect the rising costs of living”, but there needs to be a “strategy reset” when it comes to perks and benefits. “Think private health, dental care, topped up pensions and more annual leave”.

(Institute of Engineering and Technology, 2021), Employers should be forward-looking and ensure employees are well-trained throughout their employment, before the point of crisis, champion multiple areas of diversity in the workforce, plan for sustainability should be central to any recruitment.

When does it need to be done by?

Looking to the future, these skills should be addressed now to avoid employers becoming uncompetitive or unprepared to deal with future challenges, and employers should work closer with educators to improve the skills pipeline.

(Transpower New Zealand, 2021) acknowledges the energy sector is facing an acute resourcing problem with many companies competing for qualified engineers worldwide. Re-skilling the current workforce is an ongoing activity to retain and train the right skillsets to manage the power system with a high penetration of new generation technologies. Training new workforce locally by collaborating with local universities and institutions is a long-term solution. The priority for this challenge is considered high as this solution has a long lead time and requires an immediate start.

Summary of interviews and working group:

The following are the questions and summarised responses from the interviews carried out between June 2022 and January 2023 investigating the views and opinions of those that are currently in the New Zealand Power industry.

What is your interpretation of an engineer?

The majority of the people interviewed noted that they thought an engineer in general should be formally qualified as such to have a degree level of academia. Discussions on “qualified” fundamentals and solves problems. There was also a strong emphasis that professional registration should be a part of the description.

What are the attributes of an Engineer?

The main theme identified was having the technical and practical knowledge to carry out the tasks, not just know what to do, but also be able to do it.

Being able to critically think and be inquisitive about things, taking information and turn it into a meaningful solution, break down a problem, be organised and understanding, and the ability to work well in a team.

A few quotes from the interviews are as follows:

“Have a willingness to learn and being able to apply first principles”, “seek the understanding” and “not just copy and paste like the students do these days”.

Do you think that Professional Registration is important?

Using the term “What’s in it for me”, the majority of those interviewed recognised that in theory professional registration is a good idea, however, pragmatically it doesn’t benefit them to be registered. Until it does benefit them, it is not something the majority of the interviewees would actively pursue.

Do you think that you are adequately supported by organisations and Industry?

Most of the interviewees were not aware if there was any “support” but those that had reached out felt that there was.

One of the interviewees summarised their view by saying that there were a lot of “crusty demons” ready to retire offering support and guidance in the industry, however there was no one to pass on their knowledge to.

It has been observed there is poor communications between those in the industry i.e contractors, consultants, DISTRIBUTION COMPANIES’s, academia and professional bodies, leading to poor support within the industry overall.

What do you think is important to an engineer?

The ability to be a benefit to society was an underlying factor, respect, meaningful work, some people it was status, and for those that are later in their career, money was not that important, however the majority thought that they should get paid more for their roles.

What is your definition of a skills gap?

Overall, there was varied views on this, it was seen that there is a difference of where we want to be, and where we are at.

“it's about not having the right resource at the right time, or having ready access to that resource”.

In relation to the Power Distribution Industry: It was seen to be the supply and demand of engineers in the market, which is currently in high demand.

Do you think a skills gap exists?

There was an overwhelming yes to this question from all interviewees.

Why?

There were various answers to this, such as underinvestment for decades, the Universities not giving the skills to prepare for Power Distribution. Some interviewees thought the profession was not sexy enough, the commercial business models do not encourage educational principles or people development. It's a small population and there are better incentives to work abroad, lack of promotion of the profession from a lack of advertising, finally, the competition for skills with other industries.

For one person that had a trade background, they emphasised that there was no support for those who come through the trade route, and their wages were poor. The younger generation are not willing to get their hands dirty and the expectations are mis-aligned. People are coming out of university not knowing the design fundamentals and are expected to learn them on the job, some of these are seen as not that important in academia, whereas they are critical for an engineer to do their job effectively.

Do you think that you have the ability to have practical experience in your role?

For those that have been in the industry for a long period of time practical experience had been gained through various previous roles, however the younger generation seem to lack this practical knowledge as that modern management does not see it as adding value.

For the consultants interviewed the feedback was a resounding no.

The general consensus of the distribution companies was that the ability to have the practical experience was available to them.

As engineering is about doing things? Do you feel that you have the facilities to try out new ideas, test and implement them, or do you have to install and hope that it works?

It was identified that Distribution companies have the ability to conduct field trials, but get contractors to implement them.

The potential is there, but the equipment and facilities are not, therefore gaining practical experience is limited. Some engineers have had to “beg, borrow and steal” to get the equipment to test their ideas.

Our suppliers do have the ability of testing and trying new things with their own equipment, but not really with interactions with other technologies.

“As the Power industry is not really ground breaking, we use the “tried and tested” methods and rely on high probability of things working”.

Do you think that we (The Power Distribution Industry) do enough to attract people?

In general, the interviewees thought not enough has been done. We as an industry are not attracting people. There are barriers to entry such as the amount of study and training involved, and we could do more.

I think the biggest challenge is how and when do you need to identify people, and make them aware that an opportunity for them exists?

If no, what ideas do you have that could get people to join us?

There were lots of different ideas that came from this question, such as advertising campaigns, building the engineering brand, the provision of scholarships and provide and pay for training, put youngsters onto a grad program then join us. The idea of cadetships, (which some of the older engineers went through when they started in the industry), “two day camps”, and make it easier for people to bridge over from other industries.

To attract youngsters to the profession, the idea of getting into the schools a bit earlier, and get more interns, and universities to run projects. Promote and raise awareness of engineering by making it look sexy, through Power system ambassadors to attract the right type of people?

Video diaries of “a day in the life of”. Overall, whatever is to be done, it would need to be a combined effort from the industry.

Do you think that engineering is only suitable for certain types of people with a certain way of thinking? Or do you think anyone can be an engineer?

Those that are engineers answered with a resounding no, however the managerial interviewees thought that it was down to the attitude, rather than technical ability.

“You need to have the right mindset and the right interest, people try to be engineers, struggle, then become project managers which is more closely aligned to their personal skill set”

Other comments observed are:

“Yes, but it would drive some people mad, you're not limited by education. You're not limited by age. It's a mindset. If you will come from anywhere in society with the right mindset, you'll be a good engineer”.

“My personal view is I think anybody can be an engineer. I think the challenge is how do we try and push that message?”

What stops you from leaving your current job?

The responses varied but it was seen to be peer support, sense of making a difference, wanting to see things to the end, feeling valued, variety of work, having the ability to learn. The biggest reward is starting to see change, either within our business or across the industry.

How do you get rewarded for doing a great job?

“Knowing that you have made a real difference is my reward”. Getting better jobs to work on. I get recognition from people around the company and feedback from people which I feel a sense of value.

Some people got more work, but they mused whether that was a “reward or a punishment? I don't know how to figure that out?”.

For one person, they didn't get rewarded for doing a good job.

How would you like to be rewarded for doing a great job?

There were interesting responses for this but in general, engineers do not really seek rewards, they want recognition from peers and managers for the work that they have done. Just a simple “hey, you done a great job on that one” Knowing that they had made a difference and that they contributed to the solution was enough.

“We as engineers, we are intrinsic, we like being intrinsically rewarded. We don't like to make a big song and dance about things and stuff like that”.

“Sometimes a barbecue when completing a job, or going go karting, a small token gift or something similar is enough”.

Financial rewards are mainly what the younger engineers strive towards, as societies are measured by wealth, and they have mortgages etc. Also helping with the cost of living is a major factor when rewarding the younger engineers interviewed.

Discussion and Recommendations

There is a practical skills gap, we need to do something about it, and we need to do it now.

According to the research, there is no clearly defined definition of an engineer and the “engineering brand”. Going forward, a united approach from all of the industry is required of promoting engineers and what they do, and to try and attract more people into the industry.

There seems to be poor communications between the stakeholders of the skills gap, and to help with this, communication channels need to be improved and a collaborated approach is required.

Until it becomes of value to engineers, it is seen that professional registration is not something they are likely to pursue. The importance of being registered needs to be increased to set the standard of an engineer, which in turn will help establish the “engineering brand”.

Advertising and looking at ways around the existing barriers into engineering also need to be sought : the profession needs a re-branding, an advertising campaign to attract engineers needs to be created and the profile of engineers need to be increased.

There is a perception that not everyone can be an engineer. To be an engineer you need to have a particular way of thinking which not everyone has. However there is a counter argument to this where there is a discussion regarding “if you solve a problem in a different way, does that make you a lesser engineer?”.

The realisation that Engineers are our new priority customer (we want them to want to work for us), due to the shortage of engineers, and such high demand, employers are competing to attract staff, therefore need a better understanding of their motivations, utilise unique selling points to recruit and retain them. Changing the way we work and the perks of working for a good employer include, additional leave, high quality training, healthcare, flexible working, and private dental healthcare are good incentives.

Once the Engineer has met their living requirements it appears that money is not the greatest driver. Money for the older generation is less important.

Those engineers that are older had a lot more practical experience when they were mid - industry than those who are mid-industry now, which feeds the skills gap. It has been identified that there are limited younger engineers available with the flexibility of being trained practically, there is a requirement to fill this gap with the provision of this practical experience, whether it is provided via a training centre or otherwise.

Working patterns show that employees will more readily move around departments and other companies now, compared to the past, which means that if you are heavily into training, there will be people that will leave in a short period. This is a risk companies need to be willing to accept as this is the nature of the industry at the moment, as the demand changes, so will the attitude towards this risk.

Leaving the training to the smaller companies and consultants will not work. There are examples where training centres have failed in the past, because of financial reasons. Also, you cannot leave it to consultants to resolve this problem, as they have “no skin in the game”.

The changes required needs to initially come from the Larger Distribution Companies, service providers (mainly contractors) and Suppliers to the industry, either formally, or informally.

Action Research follow up:

Within Powerco, there has been recognition of the skills shortage in general. They have taken various steps to help with the skills shortage to attract engineers. Which can help with the shortage within Powerco, and if other companies can follow the lead, then this will in general help across the industry.

Powerco offer the option of having an extra two weeks of annual leave if you are willing to reduce your salary to match those weeks, and private healthcare is also available. These are good alternatives of increasing the “Quality of life” of employees rather than financial rewards.

On a departmental level, there has been an increase in the number of people in the substation design team which have come from different backgrounds (50% coming from the current graduate scheme). One of the teams focus is on training and development which will help teams performance on the delivery of the service they provide.

Formal training for the team have included the provision of theory through the e.e.a. However, the practical training is still to be sought, as there doesn't seem to be any options available at the moment other than on the job training.

Two of the team members are in the process of gaining Chartership, one through the I.E.T, and the other through Engineering New Zealand.

There has also been support of the initiative of establishing an industry wide practical training "Organisation/team".

Finally, offering support to help strengthening the ties between networks. One example is a locally held pool competition between Horizon and Powerco, with more social events to follow.

This demonstrates that the gauntlet that has been laid down by the industry of the skills gap, has been taken up by Powerco at the engineer levels, but it's going to be some time before the fruits of their labour materialises.

There is a long way to go reducing this gap, and this paper has only looked at the practical skills gap In the Power Distribution Industry through an engineer's lens. There is also the Technician aspect of the Practical Skills, which will be covered in the third and final section in this series.

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Appendix A: Geographical locations of the Power Distribution Companies in New Zealand



Appendix B: Interviews and working group questions.

Questions for identifying and addressing the “engineering” skills gap in the New Zealand Power Industry:

Firstly, can you introduce yourself and give us a bit of information on what you currently do and your background.

1. What is an Engineer?

- a. What is your interpretation of an engineer?
- b. What do you think the key attributes to being an engineer are?
- c. Do you think professional registration is important? Why/Why not?
- d. Do you think you are adequately supported as an electrical engineer via the industry/professional organisations in New Zealand??
- e. What do you think is important to an engineer?
Respect/Money/Leave/Family/Sense of belonging?

2. The Definition of a Skills gap

- a. What would you describe as a skills gap?
- b. Do you think that there is a skills gap in the power Industry?
- c. If yes, why do you think the skills gap exists?

3. The need for Practical Skills?

- a. Do you think that you have the ability to have practical experience in your role.
- b. As engineering is about doing things? Do you feel that you have the facilities to try out new ideas, test and implement them, or do you have to install and hope that it works?

4. Why is it so difficult to attract people to the industry?

- a. Do you think that we do enough to attract people?
- b. If no, what ideas do you have that could get people to join us?
- c. Do you think that engineering is only suitable for certain types of people with a certain way of thinking? Or do you think anyone could be an engineer?

5. Retaining people in the industry

- a. What stops you from leaving your current job?
- b. How do you get rewarded for doing a great job?
- c. How would you like to be rewarded for doing a great job?