

# Environmental Scan for the Electricity Supply Industry summary report

## for Kohi Whakaaro - the Electricity Supply Industry Workforce Development Strategy

April 2021



**Infometrics**

Economics put simply

## Authorship

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## Introduction

The aim of this environmental scan is to lay the groundwork for a electricity supply (ES) sector workforce development strategy. It does this by better understanding the current workforce and the environment in which it operates, and by generating insights into the forces that will shape the sector going forward. More specially it attempts to quantify the future demand for skills and the extent to which the skills supply pipeline can be expected to meet that demand.

## Sector definition

For the purposes of this environmental scan, the ES sector is defined as employment in all forms of electricity generation, as well as the transmission and distribution of electricity. The on selling of electricity and electricity market operation are out of scope. In terms of ANZSIC<sup>1</sup> (level 4) industries, the sector includes the following industries.

- D261100: Fossil Fuel Electricity Generation
- D261200: Hydro-electricity Generation
- D261900: Other Electricity Generation
- D262000: Electricity Transmission
- D263000: Electricity Distribution

Businesses that provide construction services, electrical services, hardware supplies and engineering consultancy services fall outside the generation, transmission and distribution industries. These businesses are probably classified in industries such as Engineering Design and Engineering Consulting Services. Unfortunately, much of the employment in these other 'non-core' industries probably isn't providing services to the ES sector. A broader ES sector definition, which includes 'non-core' industries would therefore be too broad.

## A sector facing unprecedented change

The ES sector is about to undergo profound and unprecedented change. Draft advice by the Climate Change Commission details the challenge that New Zealand faces in meeting its emissions reductions targets under the Paris Climate Agreement. Over the next 15 years a significant portion of the light vehicle fleet will need to transition from internal combustion engines to electric vehicles, and industrial heating processes will need to be electrified. All this will accelerate the demand for electricity.

At the same time, the ES sector will need to increase its capacity for generation from renewable energy sources, reduce its dependency on fossil fuels, and solve the 'dry year problem' that greater reliance on hydro-electricity generation brings with it. Transpower have stated that as much generation will need to be built in the next 15 years as was built in the past 40 years.<sup>2</sup>

Technological advancements in Distributed Energy Sources (DES), batteries, artificial intelligence, and the Internet of Industrial Things all offer opportunities to improve the efficiency of the electricity transmission and distribution system, as well as smoothing out peak demand. The exit of New Zealand's largest electricity consumer, the Tiwai aluminium smelter (now postponed until 2026) may seem like an opportunity to make a

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<sup>1</sup> Australia and New Zealand Standard Industrial Classification (ANZSIC)

<sup>2</sup> Source: Transpower, "Whakamana i Te Mauri Hiko – Empowering our Energy Future" (Mar 2020), p45

step reduction in our reliance on fossil fuel generation, but could dilute the pressure to make significant investment in renewable investment. If the Lake Onslow pumped hydro storage generation scheme gets the green light this could also upend the sector.

### Future skill needs

Infometrics estimates that to grow the sector and to replace workers who leave, could require the ES sector to attract 150 engineers, technicians and trades people a year. Engineering roles are mainly electrical engineers as well as smaller numbers of structural engineers, and civil engineers.<sup>3</sup> Technical and trade roles are mainly Power Generation Plant Operators, Electrical Line Mechanics, Electricians, and Electrical Engineering Technicians.<sup>4</sup>

If we take a broader definition of the sector to include engineers, technical and trade staff working in the sector as well as engineers, technical and trade staff providing services to the ES sector but working in contractors and consultancies outside the sector, we estimate that around 700 engineers, technicians and trade workers will be required per year.

A number of assumptions have had to be made to arrive at these estimates. The estimates should be treated with caution for the following reasons.

- Employment forecasts are based on CAPEX spending commitments, assuming that there is a close relationship between CAPEX spending and employment growth.
- Forecasts of replacement demand are based on projecting forward historical trends in workforce exits.
- Estimates of the number of engineers, technicians and trade workers in the ES sector are based on ANZSCO<sup>5</sup> occupation classifications, which may not accurately reflect occupations actually employed in the ES sector.
- Forecasts of the number of engineers, technicians and trade workers required, assumes employment in these occupations grows at the same rate as employment in the ES sector as a whole.
- The broader definition of the ES sector probably over-estimates the number of workers providing contracting and consultancy services to the ES sector because the official industry definitions include contracting and consultancy services to other sectors.

### Future roles

A Electricity Engineers Association 2019 Industry training needs survey found that respondents had a clear idea of what roles will be required in the next 2 years, but that

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<sup>3</sup> Also includes small numbers of engineers classified under a range of other engineering occupations in ANZSCO Level 3, 233 Engineering professionals, and ANZSCO Level 4, 2633 Telecommunications Engineering Professionals

<sup>4</sup> Also includes small number of technicians and trades people classified under ANZSCO Level 1, 3 Technicians and Trade Workers.

<sup>5</sup> The Australia and New Zealand Standard Classification of Occupations.

planning further ahead was challenging. In the next 2 years, the roles that would be needed the most were also the roles that are currently hard to recruit.

- Line mechanic
- Protection engineer
- Communication technician
- Protection technician
- Data scientist.

Roles identified as being required in the next 2–5 years were:

- Asset manager
- Engineering management
- Artificial intelligence
- Contract manager
- Protection engineer
- Line mechanics
- Communications technician
- Project management
- Cable jointer
- Civil engineering

Transpower note that new capabilities will be required to deliver a range of new technologies including virtual network infrastructure, such as digital and technology innovation, automation, robotics, artificial intelligence and data science.<sup>6</sup>

In their discussion paper about the future skilling implications of the smart grid, Energy Skills Queensland identify distribution network operators, supply chain organisations operating in areas such as telecommunications overlays or software integration, and electrical contractors providing new 'smart' services to domestic, commercial and industrial markets as being the workforce groups most directly impacted by the uptake of the smarter electricity grid.<sup>7</sup>

### Current challenges

The ES sector is currently experiencing shortages of key technical skills. External contributors to these shortages include the following.

- The tight New Zealand labour market.

It looks like the New Zealand labour market will take little more than a glancing blow from COVID-19. Infometrics now expects the unemployment rate to peak at 6.6% in the March 2021 quarter, and to trend gradually downwards to below 5% by the second half of 2023. A downside to the resilience of the New Zealand labour market is that skill shortages will continue to be an issue in some industries. In the December 2020 quarter a net 43% of businesses reported that finding skilled workers had become harder, which marked a return to pre-COVID levels.<sup>8</sup>

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<sup>6</sup> Source: Transpower, "Whakamana i Te Mauri Hiko – Empowering our Energy Future" (Mar 2020), p79

<sup>7</sup> Source: Anthea Middleton, Energy skills Queensland, "A changing electricity industry, a changing workforce".

<sup>8</sup> NZIER, Quarterly Survey of Business Opinion, seasonally adjusted series

- Strong growth in competing sectors such as construction.

The construction sector is currently running at full capacity and Infometrics expects construction sector employment growth to remain strong in the next 3 to 5 years, as the continued housing shortage, and publicly funded infrastructure projects keep builders busy.

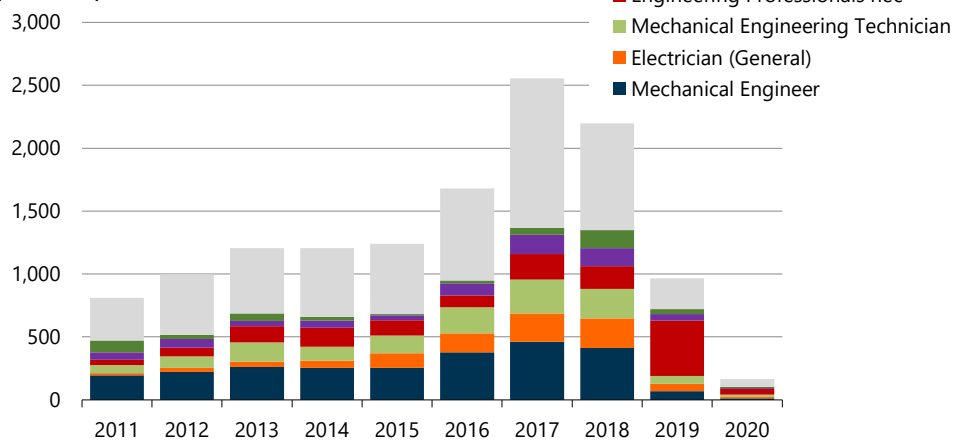
- The closing of New Zealand’s border to immigrants.

The ES sector has traditionally relied on immigration of skilled people to fill technical roles with several of its key occupations such as Electrical line mechanic, Electrician, Electrical engineer and Electrical engineering technician on Immigration New Zealand’s Long Term Skill Shortage List. The ES occupations under which the most work visas were approved in 2018 (the most recent year in which a substantial number of visas were approved) were mechanical engineers, electricians, and mechanical engineering technicians (see Chart 1). Not all of these migrants will have entered the ES sector. Many will be working in these occupations in other sectors.

Chart 1

### Offshore work visa approvals for ES related occupations, 2011-20

Top 6 occupations in 2018; source: MBIE

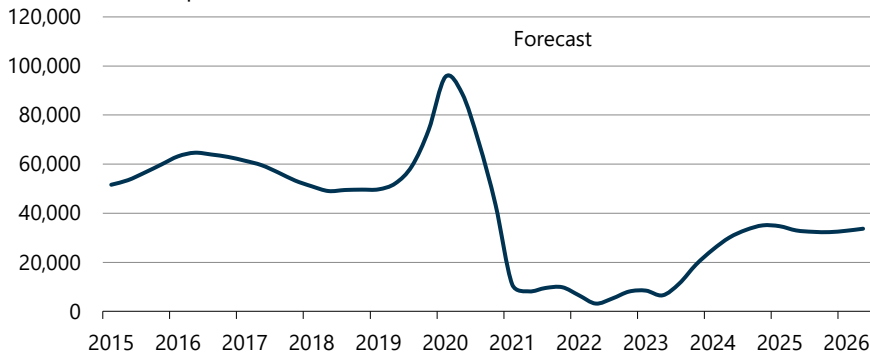


Infometrics expects overall net migration to sit between 5,000 and 10,000pa from the beginning of 2021 until mid-2023 then return to a steady level of just above 30,000pa by mid-2024, by which stage things should largely have returned to normal as the world readjusts to open borders once again. However, immigration is not expected to return to pre-COVID levels for the foreseeable future, due to tighter controls on immigration introduced in recent years (see Chart 2).

Chart 2

Annual net migration forecast, 2015-26

Arrivals less departures; source: Infometrics



- A global shortage of people in engineering roles, particularly electrical/E&I engineers, mechanical engineers and R&D engineers.

Within the sector itself contributors to these shortages include the following.

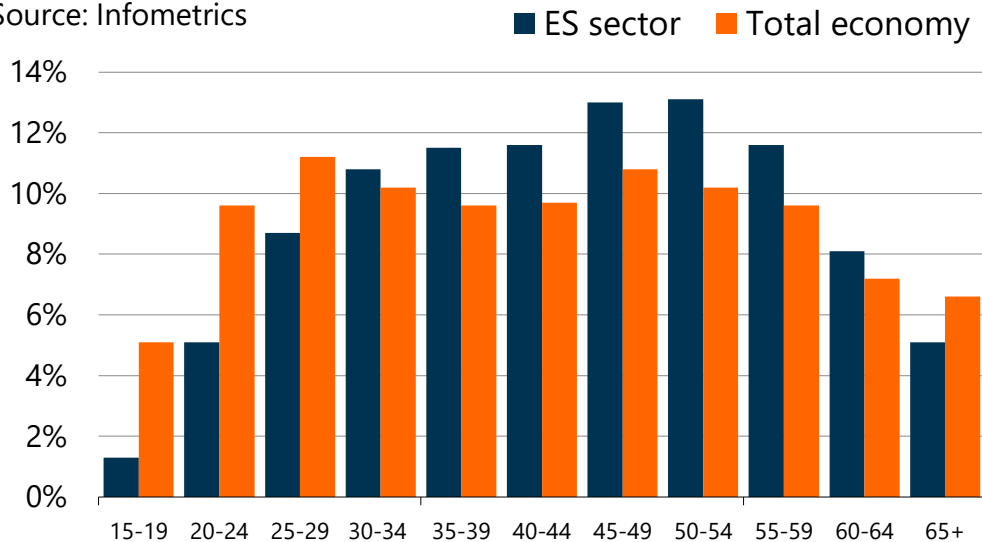
- An aging workforce.

Over the next 10 years, the ES sector is going to experience an unprecedented number of workers reaching retirement age. In 2018, 25% of the ES sector workforce was aged 55 and above compared with 23% of the total economy (see Chart 3).

Chart 3

ES employment by age, 2018

Source: Infometrics



- A prevalence of workers outside the main centres.

In 2020, 15% of the ES workforce was located in Auckland compared with the total economy average of 35%. Northland, Waikato, Taranaki, Manawatu-

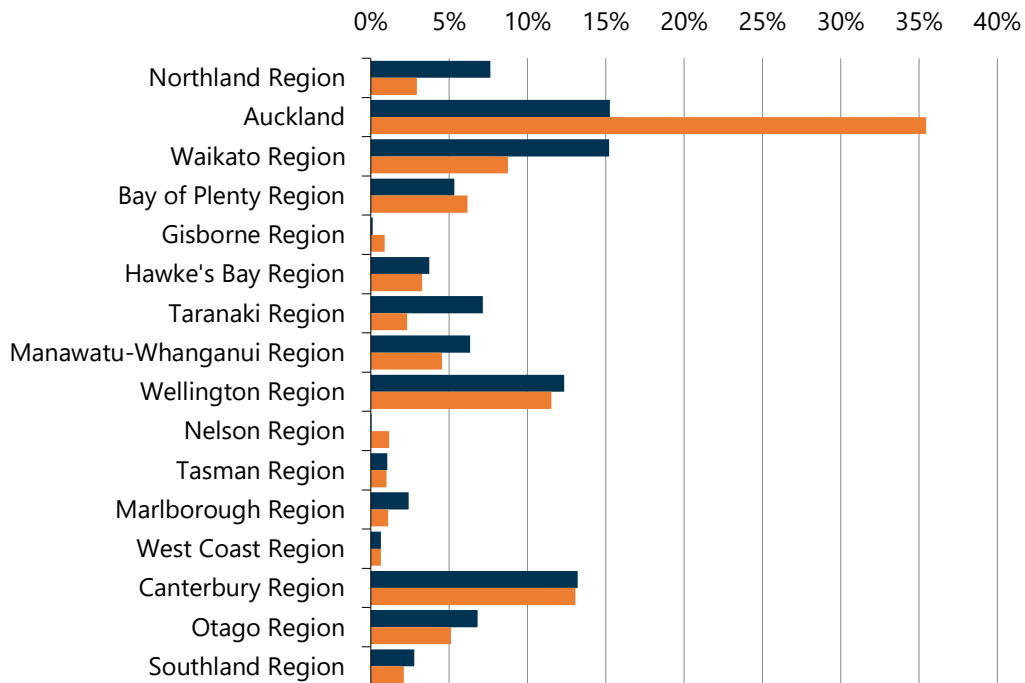
Whanganui all have disproportionately large ES workforces compared with the total economy average (see Chart 4).

Chart 4

## ES employment by region, 2020

■ ES sector ■ Total economy

Source: Infometrics



- A lack of work flexibility

In 2018, 88% of the ES sector workforce said it worked 40 hours or more per week compared with 62% across the whole economy. If the sector is unable to cater for more flexible work practises, this may be a barrier to attracting young people and people with families, and therefore greater workforce diversity.

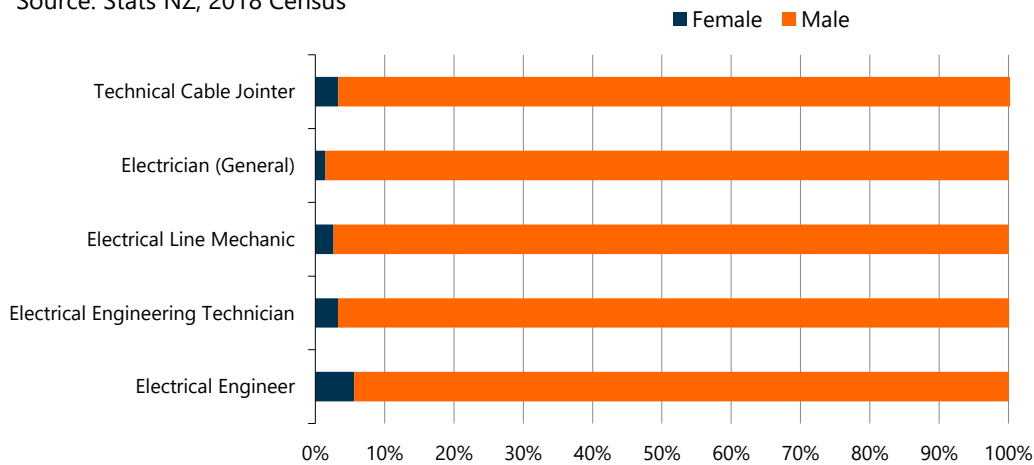
- A lack of diversity in technical occupations (see Chart 5).



Chart 5

## Electricity supply occupation employment by sex, 2018

Source: Stats NZ, 2018 Census



- Falling completion numbers in some qualifications.

Completions in the key Cable joiner, and Transmission Line Maintenance qualifications look reasonably healthy in the last couple of years and there was spike in Fault Response and Switching, and Line Mechanic completions in 2019. However the pipelines of Electricity Supply Electrician, Distribution Faultman, Field Switcher and Electrical Fitter completions have all weakened recently (see Table 1).

Table 1

## ES sector level 4 qualification completions by specialisation, 2015-20

	2015	2016	2017	2018	2019	2020
Electrician	35	47	40	32	32	17
Cable Joiner	40	40	52	20	54	46
Line Mechanic Distribution & Transmission	188	117	126	153	187	198
Transmission Line Maintenance	0	0	0	4	24	35
Distribution Faultman	5	1	1	0	0	0
Fault Response and Switching	0	0	0	17	196	24
Field Switcher	36	42	3	1	0	0
Electrical Fitter	1	6	8	4	0	0
Other	14	31	18	36	30	39
Total	319	284	248	267	523	359

Source: NZQA

## Responding to skill needs will be challenging

The ES sector needs a workforce that can respond to and, in many ways, drive change. Change is already being forced on the sector. The closing of the borders in response to the COVID-19 pandemic, and the likelihood that immigration to New Zealand will not return to pre-COVID levels any time soon, has removed a key source of skilled labour to the sector literally overnight.

The sector must now pivot towards the domestic workforce: school leavers, tertiary education graduates, and skilled workers in other sectors. The sector needs to maintain, and hopefully increase the pipeline of graduates from tertiary education and industry training. The Reform of Vocational Education offers the opportunity to better combine classroom study with workplace training, but the tertiary education pipeline could be disrupted as the reforms take time to bed down.

The sector also needs to find a way to compete for skilled workers with higher-profile sectors such as construction – the ES sector's relatively high earnings are an advantage. There are opportunities to tap into under-utilised labour pools such as Māori and females, but this adds to the growing list of things the sector needs to do differently.

The Global Energy Talent Index offers insights as to what attracts people to the sector. Career opportunities and technological advancements seem to be more important than the transition to cleaner energy sources.

The Global Energy Talent Index 2021 survey asked professionals in the power and renewable sectors what was the main reason for choosing their sector.

- In the power sector, 36% said opportunities for career progression, 19% interest in the wider economy, 17% innovation and 14% job security.
- A similar picture emerged in the renewables sector with 32% pointing to career progression, 21% interest in the wider economy, 17% innovation and 15% technology. Only 3% mentioned the renewables sector's ethical reputation as a reason for choosing the sector.

Respondents we also asked what were the most important opportunities facing their sector over the next three years. Here, transition to cleaner energy did feature more highly, but technological change was front and centre.

- In the power sector, 74% of respondents said advances in engineering techniques and technologies, 33% said new digitally enabled skills and competencies, 47% said the economic outlook and 44% said the transition to cleaner energy.
- In the renewables sector, 70% said advances in engineering techniques and technologies, 27% said new digitally-enabled skills and competencies, 47% transition to cleaner energy and 45% said the economic outlook.

Skill needs in the ES sector could be met by people moving jobs within the sector. However, research has shown there are barriers to this happening. In their discovery and engagement project, the Energy Academy found that fragmented networks in the ES sector mean that workers do not get exposure outside their own networks. This lack of exposure to opportunities in the broader sector, coupled with the view that careers and training should be linear, restricts people and blocks opportunities for self-development through lifelong learning.<sup>9</sup>

### Workforce planning under unprecedented circumstances

While many of the challenges faced by the ES sector such as decarbonisation and technological change are unprecedented, the underlying principles of workforce

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<sup>9</sup> Energy Academy, "Discovery and engagement summary", (2020)

development – plan, recruit, develop and retain are well established. The ES sector can look to other industries such as construction and food and fibre for ideas and guidance. However, developing an evidence base to understand current and future skill needs is a key challenge for the ES sector, and requires a sector-specific approach.

### Building a clear picture of the current and future workforce

The forecasting exercise carried out as part of this environmental scan has been challenging. Firstly, to forecast future skill needs, one first needs a clear picture of what those skill needs are currently. Unfortunately, certain aspects of the sector – its contractors, consultants and suppliers – are not well delineated in official statistics. Service providers to the ES sector are grouped together with providers to a range of other sectors making it difficult to estimate the number of people employed in providing services to the ES sector. Secondly, the unprecedented nature of the changes heralded by the Climate Change Commission that the sector is expected to undergo, adds to the complexity of forecasting the effect of those changes on the workforce.

The ES sector needs a clear picture of how many people it employs, particularly in engineering, technical and trade occupations. And it needs a methodology for forecasting skill needs into the future. To accomplish this, Infometrics makes the following recommendations.

- Identify all businesses either operating in the sector or providing services to the sector.
- Create a full census of employment in these businesses including a count of employment in key roles.

A 2019 survey by the Electricity Engineers' Association (EEA) attempted to do this but was only partially successful because only half of the sector's employers responded.<sup>10</sup> Our recommendation is to generate employment numbers based on businesses' HR records. If this is not possible, the effectiveness of a survey can be maximised by making it short, carrying it out in person (rather than by post or online), following up with non-respondents several times, and comparing responses with official data where possible to check for accuracy. Underpinning all this is the need for sector-wide agreement on role titles and definitions.

- Identify a methodology for forecasting future skill needs.

Infometrics has attempted to do this within the context of the environmental scan, but it is a much bigger project. Infometrics would like to help. Employment forecasts work best when they are derived from quantified underlying drivers. We think that spending on asset maintenance and infrastructure offers the best way forward. Infometrics can build and maintain a forecasting model, but we need expertise from the sector to help us work out how to derive workforce forecasts across key roles from spending on different types of infrastructure.

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<sup>10</sup> A 50% response rate is relatively high compared to most surveys of this type, but a much higher response is required to create an accurate estimate of total employment.