CARBON FOOTPRINT 2017-2018

FINAL SUMMARY REPORT

Transpower New Zealand Limited
December 2018

Keeping the energy flowing

TRANSPOWER

Transpower New Zealand Limited The National Grid

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Executive Summary

Methodology

Transpower's carbon footprint has been calculated in conformance with the "Greenhouse Gas Protocol: *A Corporate Accounting and Reporting Standard" (GHG Protocol)* (WRI, 2004) which is the widely accepted methodology for organisational carbon accounting and is supported by ISO 14064 (2006). The organisational boundary of this footprint includes the entire operations of Transpower New Zealand Limited. According to the GHG Protocol this report covers total Scope 1 direct and Scope 2 indirect emissions, and a limited number of Scope 3 indirect emissions generated by third parties on Transpower's behalf for which reliable data can be obtained. This year we reported for the first time Scope 3 emissions from purchased goods and services, including capital goods. The timeframe of the footprint is the financial year July 2017- June 2018.

Greenhouse Gas Emissions

Our total greenhouse gas (GHG) emissions for 2017/18 are estimated at **171,563 tCO_2e** (tonnes of carbon dioxide equivalent). This is up 36% from last year. This is due to two reasons. Firstly the emissions for electricity generation were 23% higher than the previous year and this had an impact on our total GHG emission results. In addition, we started reporting more of the voluntary scope 3 categories, i.e. purchased goods and services.

Transmission losses are responsible for 84% of our GHG emissions (144, 211 tCO_2-e) followed by purchased goods and services which are responsible for 12% or 20,588 tCO_2-e. Transmitting electricity through transmission lines results in small loses of electricity. This is largely due to resistance, in the form of heat, generated by electricity passing through transmission lines. Extra electricity has to be generated to offset the loss. The emissions associated with this extra electricity generation vary depending on the source of electricity (particularly the proportion of renewable and non-renewable electricity generation).

GHG emissions per total GWh transmitted has been steadily improving over the last 10 years, however emissions rose slightly in 2017/18, mainly due to the increase in emissions associated with electricity generation.

Sulphur hexafluoride (SF_6) gas emissions are our third largest source of emissions and continue to be the single largest scope 1 emission. SF_6 emissions have decreased by 40% over the last decade as a result of continued improvement in the management of SF_6 gas leaks.

Our corporate emissions per full-time employee (FTE) basis GHG emissions have reduced 3.8% since the previous year and are estimated at 2.4 tCO_2-e per FTE.

The largest contributor to our 2017/18 corporate emissions remains air travel followed by electricity use in Transpower offices and other buildings. Transpower staff travelled 7.3% less km by air compared to the previous year and the emissions from air travel reduced by 9%.

1 2017-18 Emissions Profile

1.1 Total Emissions

Our total greenhouse gas (GHG) emissions for 2017/18 are estimated at **171,563 tCO_2-e** (tonnes of carbon dioxide equivalent).

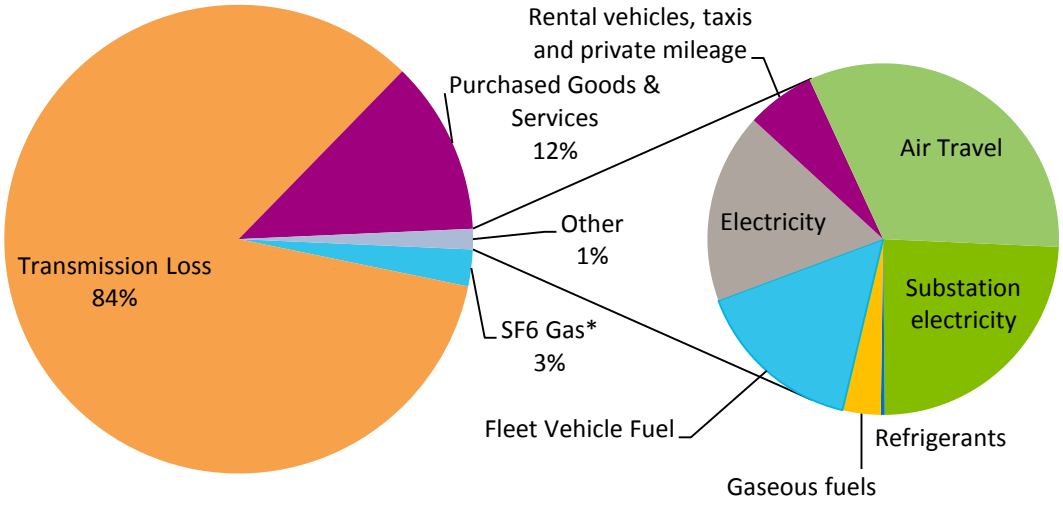

Figure 1:Breakdown of Transpower greenhouse gas emissions by source (2017-2018)

Transmission losses are responsible for 84% of our GHG emissions (144, 211 tCO_2-e) followed by purchased goods and services which represent 12% of emissions or 20,587 tCO_2-e as illustrated in Figure 1.

Transmission losses arise on the national grid network due to conductor resistance and energy lost as thermal heating of conductors. Transmission losses are determined by the quantity of power transmitted, the transmission distances and the emissions associated with the electricity generation. The emissions associated with electricity generation vary depending on the source of electricity (particularly the proportion of renewable and non-renewable electricity generation). The emissions for electricity generation were 23% higher than the previous year and this had a significant impact on our total GHG emission results.

[1]* SF_6 (Sulphur hexafluoride) is used as a switch gas in substations, due to its excellent electrical insulation properties. It is however a potent GHG, with a high Global Warming Potential. This means1 kg of SF_6 released is equal to approximately 23.5 tonnes of CO_2 released into the atmosphere (IPPC, Fifth Assessment Report).

1.2 Emissions by Scope

Scopes 1, 2 and 3 are defined by the Greenhouse Gas Protocol Corporate Accounting and Reporting Standard (WRI, 2004) and are standardised ways of reporting GHG emissions.

- Scope 1 covers the emissions over which we have direct operational control and include emissions from the use of fuels, gases (mainly SF_6 emissions) and refrigerants.
- Scope 2 covers the indirect emissions associated with electricity consumption (offices and substations) and overall transmission losses in the Transpower national transmission network. This is the largest source of emissions for Transpower as our footprint accounts for losses from the national transmission network.
- Scope 3 covers selected indirect emissions generated by third parties on our behalf. This includes emissions that fall under purchased goods and services and capital goods (Category 1 and 2), fuel and energy related activities, business travel and upstream leased assets). This approach is different from previous years in that the addition of Category 1 and 2 data is new (refer method section for more information).

Figure 2 shows that Scope 2 emissions, which include transmission losses, dominate our overall emissions profile.

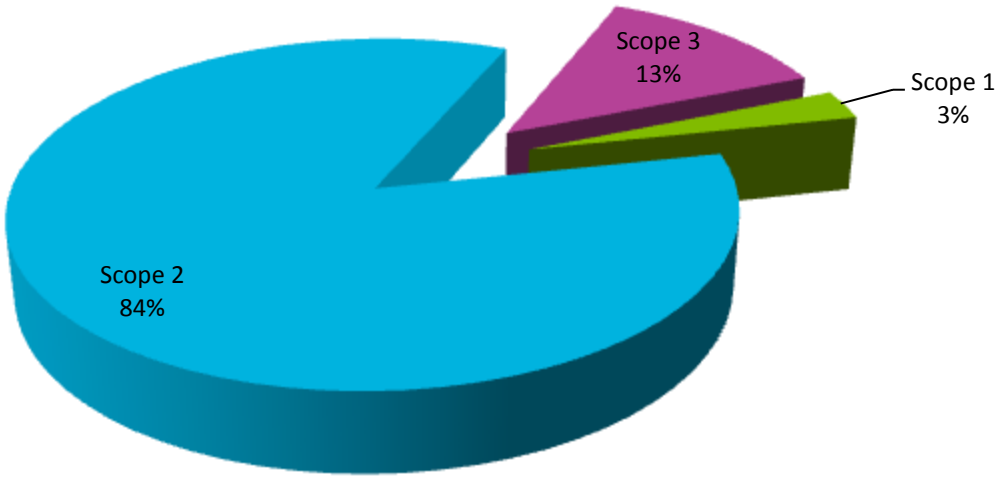

Figure 2: Transpower greenhouse gas emissions by scope (2017-2018)

Our total greenhouse gas emissions for 2017/18 show an increase of 36% from the previous year. It is important to note that our GHG emissions are largely influenced by emissions from transmission losses as discussed in the previous section. In addition, we have reported indirect emissions from the purchasing of goods and

services for the first time. These extra reported emissions are responsible for around half the increase in emissions (refer Figure 3).

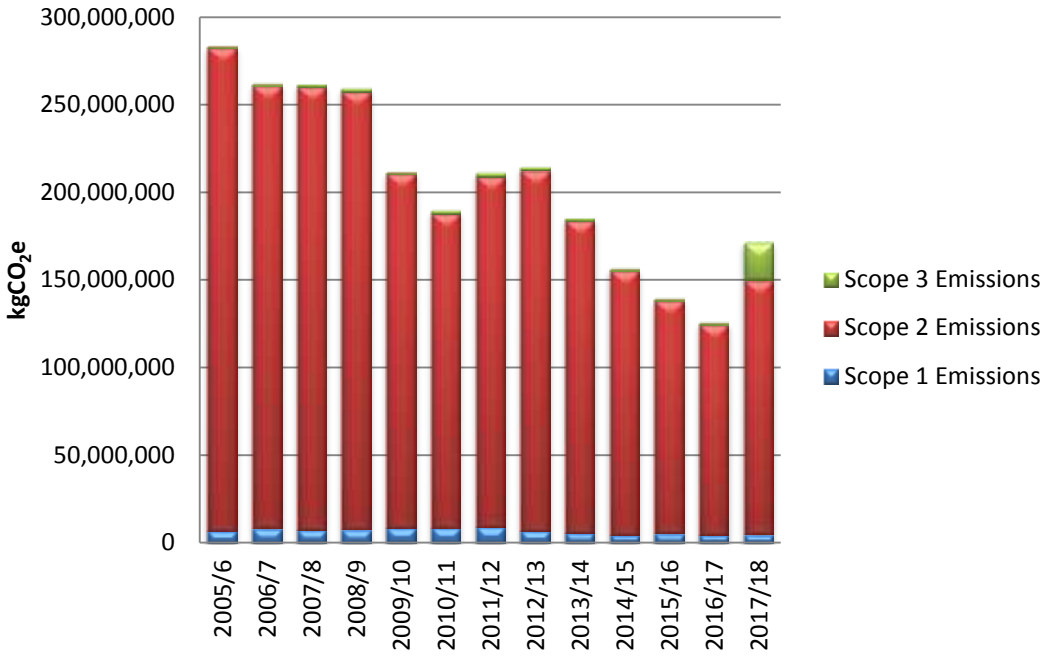

Figure 3:Total Greenhouse Gas Emissions by Scope

1.3 Corporate Emissions

The corporate GHG emissions include air travel, ground travel, electricity use, gas use and refrigerant loss from Heating Ventilation and Air Conditioning (HVAC) systems. Figure 4 outlines the contributions of these six sources to the corporate GHG emissions, with air travel being the largest emission contributor at 43% (787 tCO_2-e) of the corporate emissions for 2017/18.

Electricity used in Transpower offices and other buildings is the second largest contributor to corporate emissions at 23% (423 tCO_2-e).

The fuel-related emissions from Transpower fleet vehicles were estimated at 377 tCO_2-e for the period contributing 21% to the corporate emissions.

Other ground travel emissions (rental cars, taxis, staff mileage) for the period are estimated at 152 tCO_2-e, which accounts for 8% of the total corporate emissions.

The emissions from gas use and refrigerants contribute 4.6% and 0.5% respectively (85 and 9 tCO_2-e) to the corporate emissions.

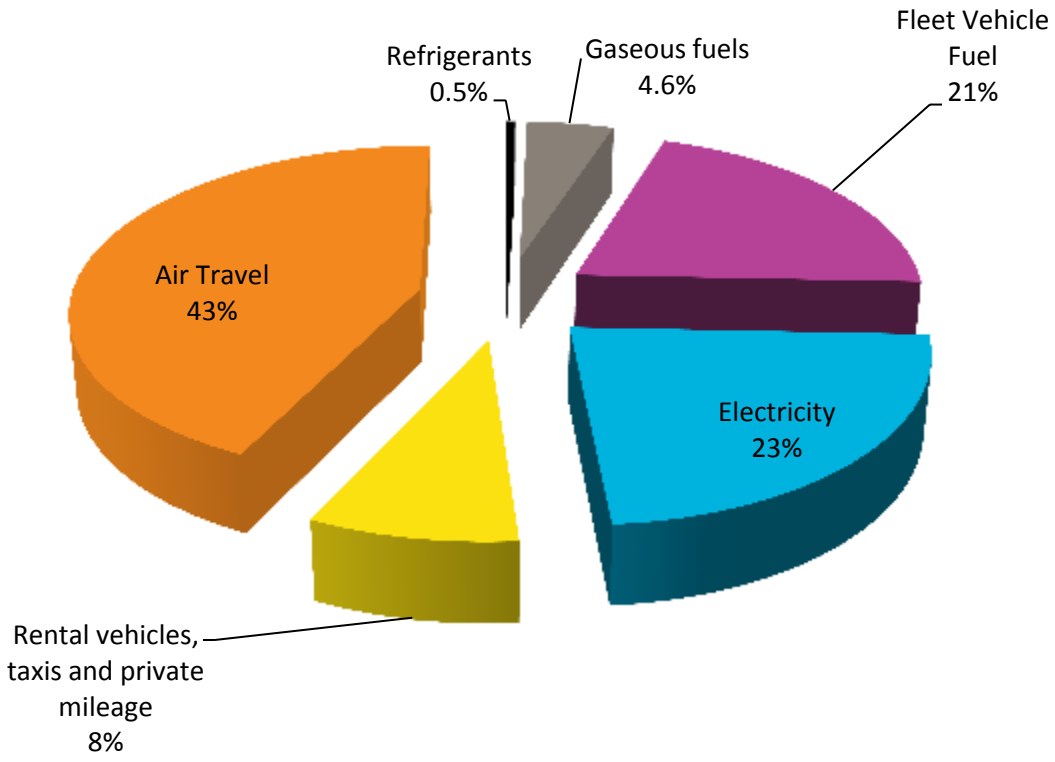

Figure 4: Corporate greenhouse gas emission sources (2017-2018)

1.4 Purchased goods and services

For the first time this year we have estimated our indirect emissions from purchasing goods and services and capital goods. Emissions from these sources are estimated to be 20,588 tCO_2-e or 12 % of total emissions.

These emissions are estimated by using financial data and generalised emissions factors for money spent on goods and services such as construction, engineering services, maintenance services and equipment, office services and equipment, and consultancy fees. We are working on improving the accuracy of measuring our scope 3 emissions in the future, with a focus on purchased goods and services.

As this is the first time we have estimated our emissions from goods and services, we have not included these emissions in the trend calculations below as we only have 1 year of data.

2 Key Trends

2.1 Carbon Emissions from Transmission Losses

Transmission losses result in more electricity generation than would otherwise be required to meet demand. Where generation includes the burning of fossil fuels in power stations, (i.e. coal, oil and gas) this means more carbon dioxide is released from the power stations than would otherwise be the case. (Transmission loss emissions occur at fossil fuel burning power stations generating the transmitted electricity, there are no direct GHG emissions from transmission conductors associated with losses).

Electricity transmission losses are treated like electricity used. In New Zealand the emissions associated with electricity used in any given year depend on the proportion of generation that comes from renewable sources (i.e. wind, solar and geothermal) and a proportion from non-renewable or fossil fuel sources.

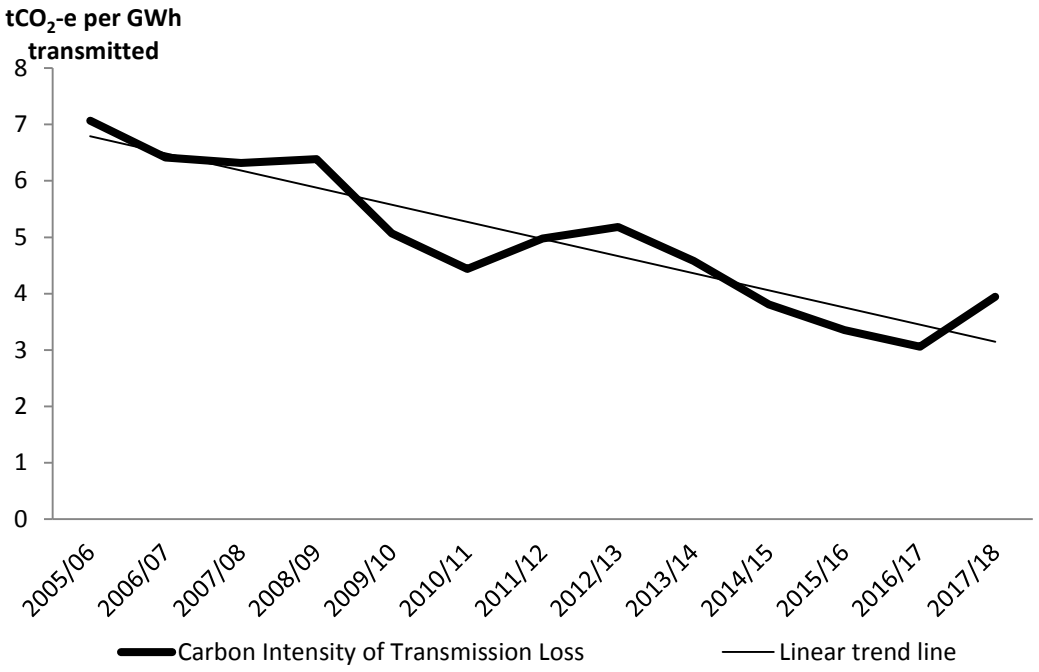

Figure 5: Carbon intensity of transmission losses since 2006/07

Figure 5 shows the carbon emissions from transmission losses per GWh of electricity transmitted improved steadily over the past decade reducing by 41% from 250,920 tCO_2-e in 2007/08 to 144,211 tCO_2-e in 2017/18. In 2017/18 Transmission losses measured in GWh decreased by approximately 2% compared to the previous year, however, emissions from Transmission per GWh increased due to the increase in the emission factor for electricity.

Changes to emissions from transmission loss are strongly related to the quantity of power transmitted, the distance between the generator and consumer, and the emissions from electricity generation.

2.2 SF_6 Emissions

Emissions related to SF_6, a potent greenhouse gas, represent our third largest emission source after transmission losses. Figure 6 shows changes in the SF_6 emission rate. This year the emission rate was 0.39% (% loss of SF_6 installed capacity). This represents a 6.35% increase in emissions compared to the SF_6 loss reported in the previous year. However, the trend line illustrates a downward trend since 2005/06. Reduction in SF_6 emissions is due to continued investment in leak reduction initiatives, including leak detection equipment, monitoring, training, and new filling equipment.

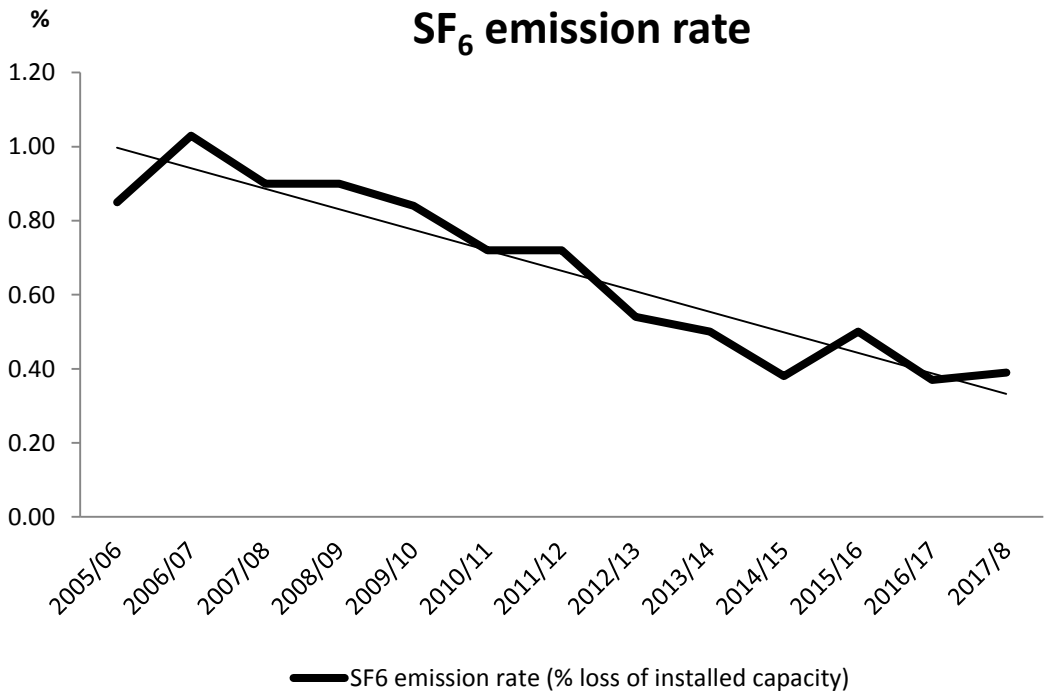

Figure 6: SF_6 emission rate as a percentage loss of SF_6 inventory

In terms of target setting, Transpower has a key environmental goal of reducing emissions from SF_6 to below 0.8% of the total SF_6 held in stock. This was achieved in 2007/08 and has been maintained since. The increase in 2017/18 is considered to be within usual operating parameters. Work is ongoing in this area.

2.3 Corporate Emissions

2.3.1 Corporate emissions intensity

Figure 7 shows our corporate emissions per number of full-time Transpower staff (FTE) since 2005/2006. Our corporate emissions are represented in relation to the number of full-time equivalent staff (FTE) to recognise that corporate emissions may decrease or increase due to staff number changes. The corporate emissions per FTE shows an 3.8% decrease since the previous year, continuing a downward trend since 2010/11-2011/12[2].

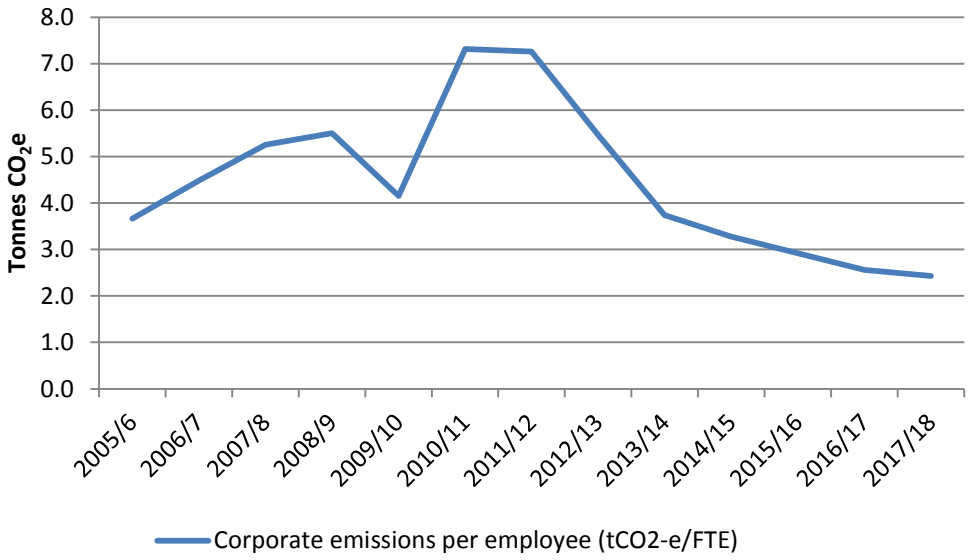

Figure 7: Transpower corporate carbon intensity (2005/6 – 2017/18)

2.3.2 Air Travel

In 2017/18 air travel was the largest source of corporate emission contributing 43% (787 tCO_2-e) of the total corporate emissions. Figure 8 illustrates the changes in air travel by Transpower's staff since 2005/06. Both domestic and long haul travel decreased during 2017/18 compared to the previous year, however, short haul international (trans-Tasman) air travel emissions have increased by 34%. Overall Transpower staff travelled 7.3% less km by air compared to the previous year and the emissions from air travel reduced by 9%. All offices have been recently fitted out with updated video conference equipment and smart-room technology to improve collaboration and reduce the need for travel.

[2] Note the trend data does not include the emissions from the scope 3 Category 1 and 2 emissions as we only have a single year of data.

The amount of emissions associated with air travel has generally decreased over the past decade. Over this period the distance travelled by long haul international air travel and Trans-Tasman travel has decreased however domestic travel, while decreasing since 2010, remains the largest source of air travel related emissions. The introduction of enhanced video conferencing will help to continue the trend in emission reduction.

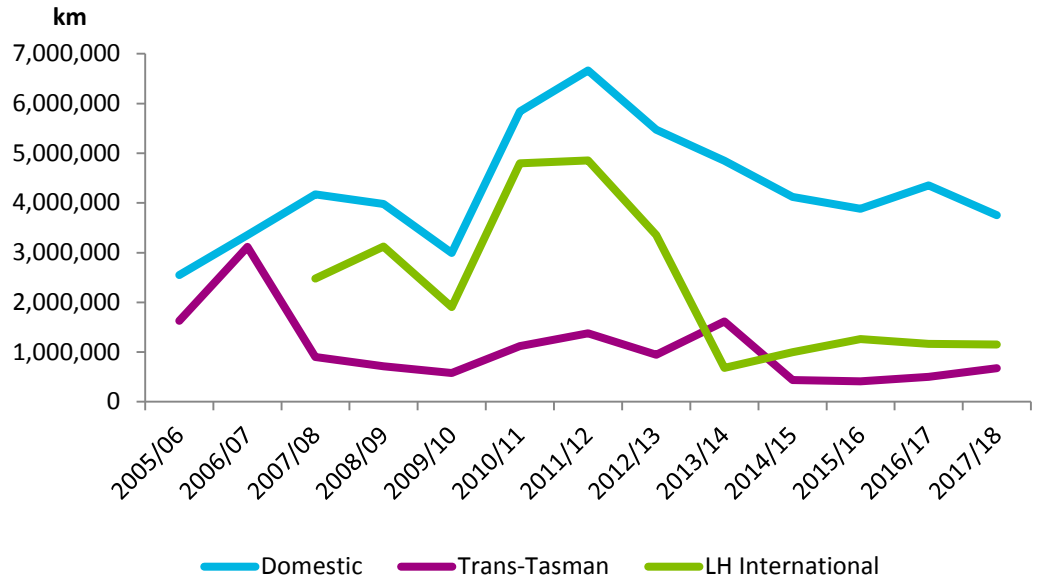

Figure 8: Air travel by Transpower Staff (2005/6 - 2017/18)

2.3.3 Land Travel Emissions

Figure 9 shows the total carbon footprint of our staff fleet, mileage expenses, car rental and taxi usages.

Compared to last year, emissions from corporate fleet vehicles decreased by 4% and fuel purchases claimed by staff have significantly decreased (20%) however emissions from rental vehicles have increased by 24% indicating that staff are using rentals for work-related travel rather than taxis. Emissions from taxi use are similar to the previous year's reporting period.

Overall, the total land travel emissions for 2017/18 have seen a decrease by 1.2% from the previous year.

This year Transpower is close to achieving a target to transition 30% of company owned vehicles to electric vehicles by the end of 2018.

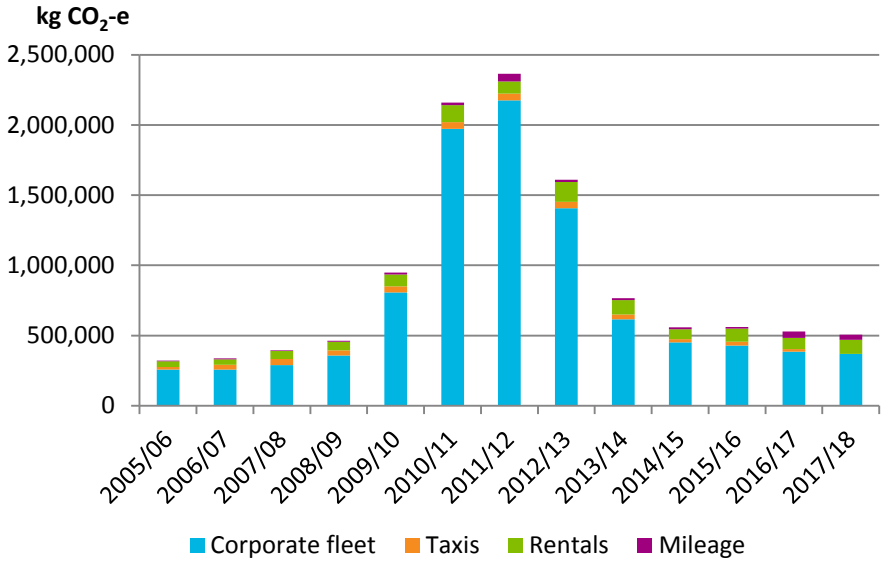

Figure 9: Total land transport emissions (2005/6 - 2017/18)

2.3.4 Energy Consumption in Offices

The emissions associated with electricity consumption from the Transpower offices are estimated at 300 tCO_2-e in 2017/18. Natural gas from the Transpower offices contributes 76 tCO_2-e in 2017/18. The amount consumed has seen a steady decrease since 2014/15. Overall energy use (in kWh) in Transpower offices has decreased by 13%.

Figure 10 illustrates the energy consumption (electricity) of the offices of Transpower over the past decade per FTE and per m^2, both of which have decreased since 2014/2015.

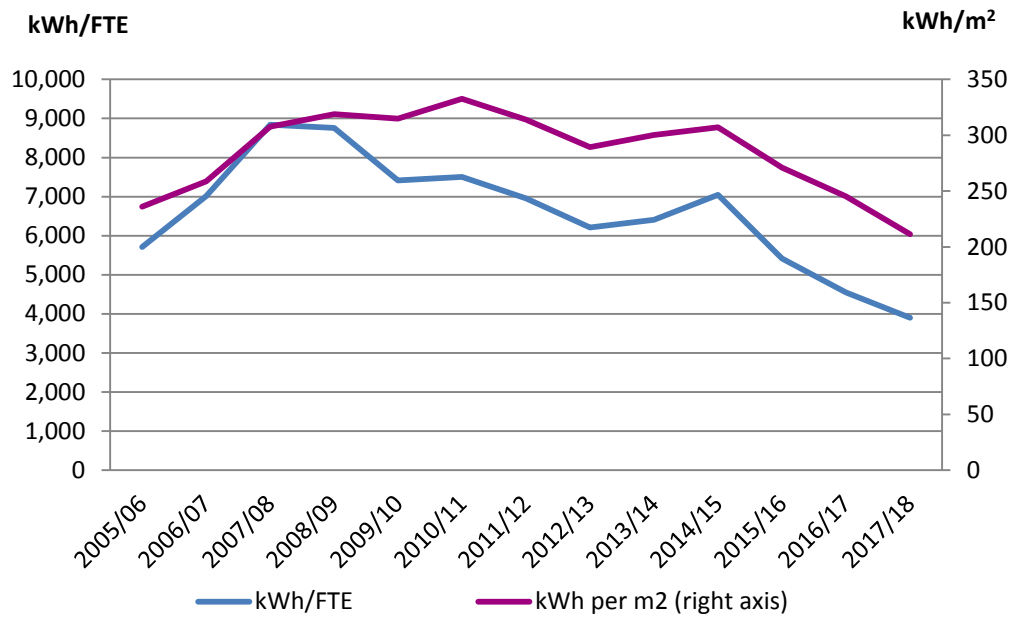

Figure 10: Energy Consumption in Transpower offices (2006/7- 2016/17)

Figure 11 shows emissions (kg CO_2-e) from Transpower energy use per FTE and by area (m^2). The emissions per m^2 of office space has decreased significantly since 2014-15 but show a slight increase from the previous year.

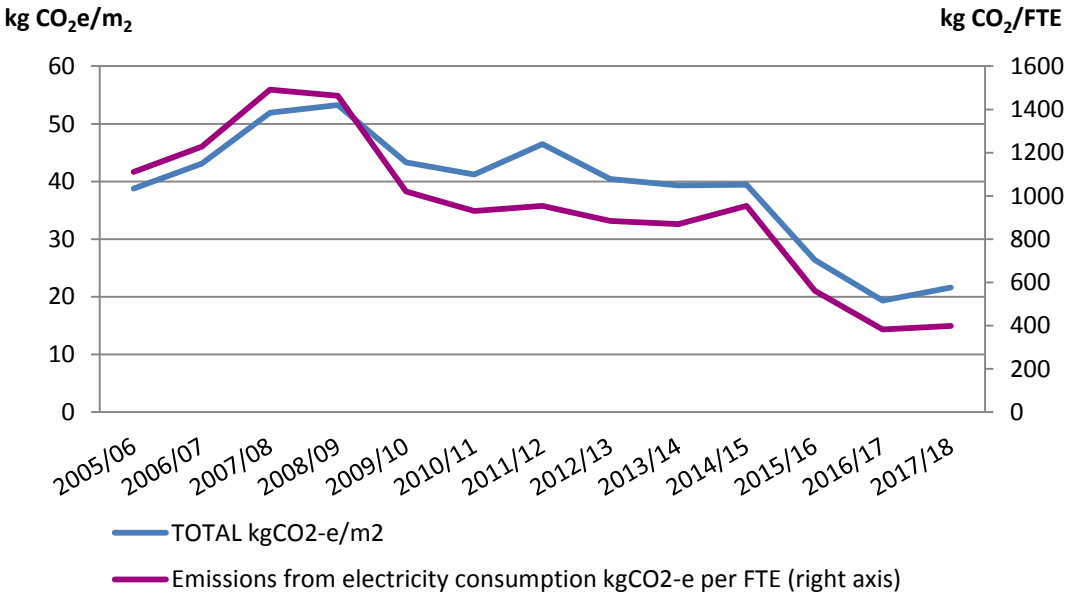

Figure 11: Transpower emissions associated with office energy use by FTE and m^2

3 Full Report & Methodology

This document is a summary report only and is based on analysis contained in the Carbon Calculator 2017/18 final excel spreadsheet, held by Transpower. The analysis was based on information available at the time.

Transpower's carbon footprint has been calculated in conformance with the "Greenhouse Gas Protocol: *A Corporate Accounting and Reporting Standard" (GHG Protocol)* (WRI, 2004). The GHG Protocol is the widely accepted methodology for organisational carbon accounting and is supported by ISO 14064 (2006). The equity share consolidation approach was adopted to determine the organisational boundaries for the carbon footprint. Under the equity share approach an organisation accounts for GHG emissions from operations according to its share of equity in the operation. The selection of the equity share approach was based on ease of application and consistency with financial reporting boundaries.

The organisational boundary of this footprint includes entire operations of Transpower New Zealand Limited. The 2005/06 financial year assessment is considered to be the 'base year' for Transpower's reporting.

In accordance with the GHG Protocol this report covers Scope 1 and 2 emissions and a number of Scope 3 category emissions, including Category 1 (Purchased goods and services); Category 2 (Capital goods); Category 3 (Fuel and energy related activities), Category 6 (Business travel) and Category 8 (Upstream leased assets). We are working to improve the data collection and reporting of our Scope 3 emissions.

Table 1:Exclusions Table

Potential emission source	Reason for Exclusion
Scope 1	
Office and vehicle refrigerants.	Low materiality compared SF_6 losses. May consider including office refrigerants in the future.
Scope 3	
Scope 3 emissions excluded include: Upstream transportation and distribution, waste generation, employee commuting, and downstream transportation and distribution. No other scope 3 emissions have been identified.	Transpower has chosen to report some relevant scope 3 emissions including business travel, upstream leased assets and for the first time this year purchased goods and services and capital goods. These are emissions which can be measured and over which we have control. The remaining are excluded.

Activity data was sourced from relevant suppliers, via third party agents, or from internal financial records. A range of emission factors exist to convert a specific quantity of activity to greenhouse gas emitted. The majority of the emissions used for Transpower's carbon footprint have been sourced from the Ministry for the Environment "Guidance for Voluntary Greenhouse Gas Reporting" (MfE, 2016).

A notable exception is the electricity related emissions factors which used the Ministry for Business, Innovation and Employment data 2018 (refer point 2 below).

Changes to methodology and assumptions compared to previous years include:

1. Substation electricity data has been calculated based on actual readings and where not available, an estimate. This resulted in a significant drop in the emissions estimate from substations. Substations fed from the transmission network are now included in Transmission losses and warehouses are accounted for separately. This change was made to historical data.
2. Electricity related emissions, including transmission and distribution losses associated with electricity purchased have been re-estimated using Ministry for Business, Innovation and Employment quarterly electricity consumption, generation and emissions data (MBIE 2018) for 16/17 and in order to assess trends for the 14/15 and 15/16 years.

Further information including the methodology, assumptions and limitations are presented in the Carbon Calculator 2017/18 final excel spreadsheet.

4 References

Greenhouse Gas Protocol Corporate Accounting and Reporting Standard. WRI, 2004

International Standards Organisation, ISO 14064-1:2006

IPPC Fifth Assessment Report of the IPPC. Chapter 8 Table 8.A.1 http://www.ipcc.ch/pdf/assessment-report/ar5/wg1/WG1AR5_Chapter08_FINAL.pdf

Ministry for the Environment “Guidance for Voluntary Greenhouse Gas Reporting” (MfE, 2016).

Ministry for Business, Innovation and Employment quarterly electricity consumption, generation and emissions data (MBIE 2018) https://www.mbie.govt.nz/info-services/sectors-industries/energy/energy-data-modelling/statistics/greenhouse-gas-emissions

Study scope and data inventory is documented in the Carbon Calculator 2016-17 final excel spreadsheet. Transpower 2018 (Confidential)

