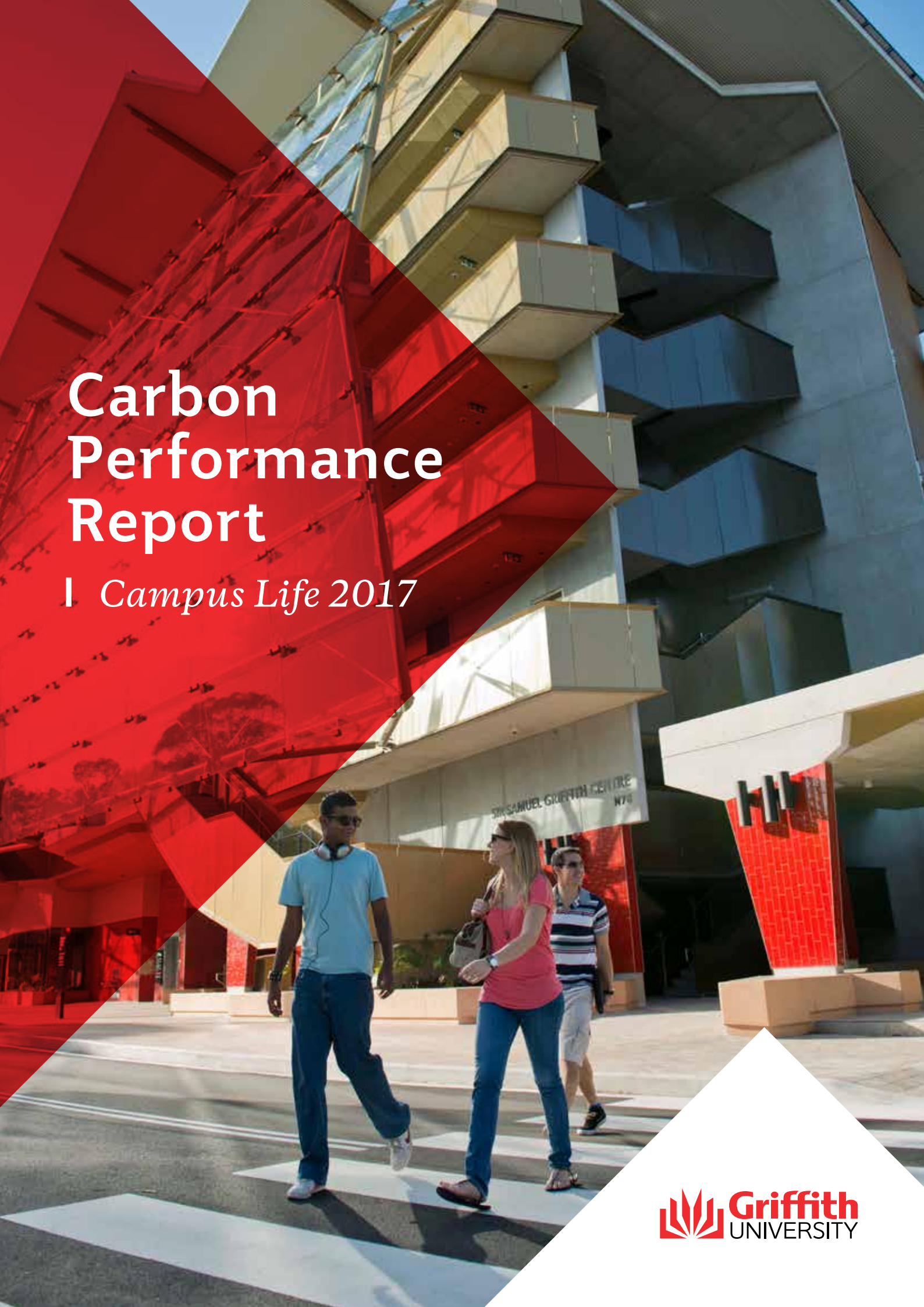
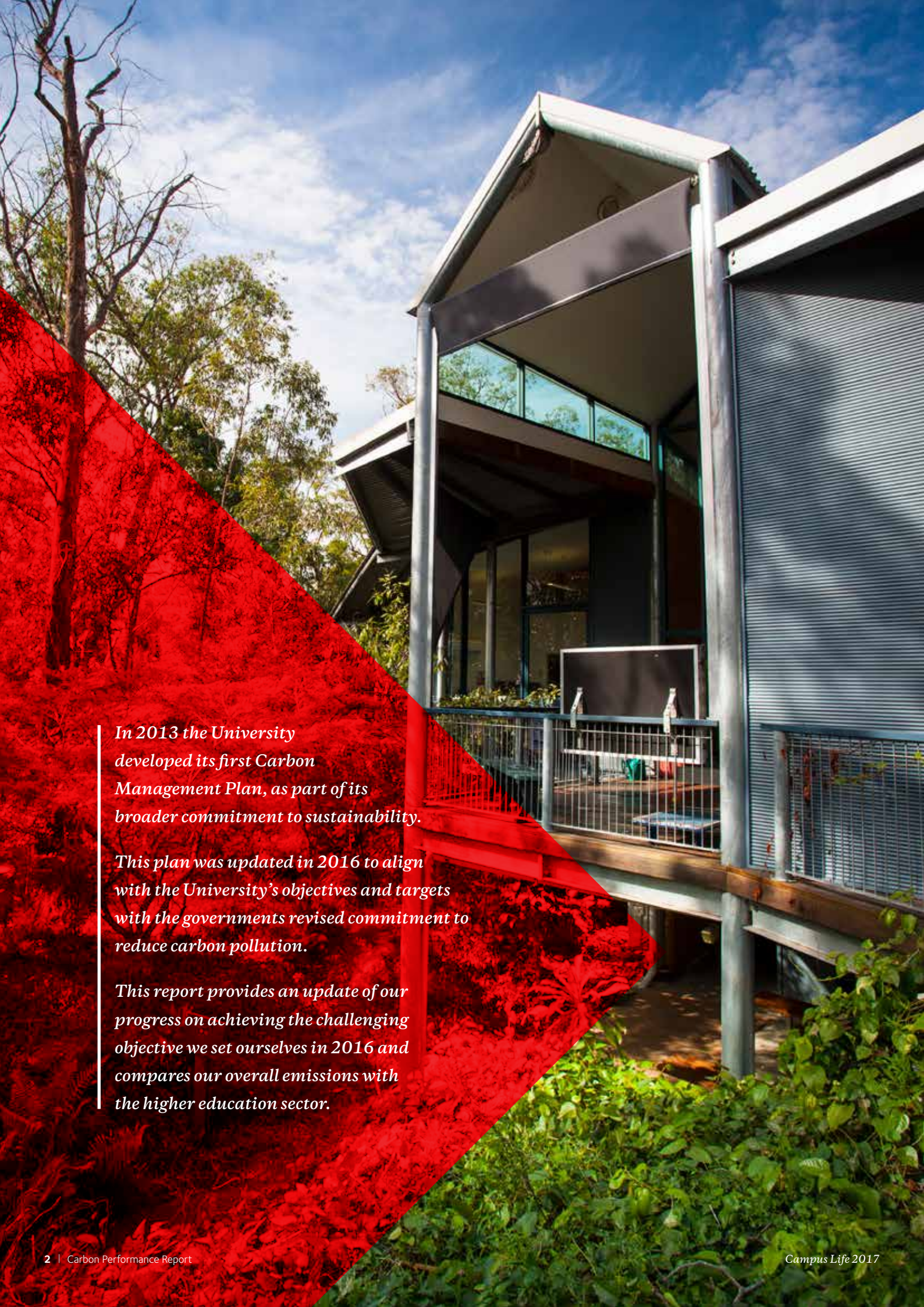
Carbon Performance Report

Campus Life 2017



Griffith UNIVERSITY



In 2013 the University developed its first Carbon Management Plan, as part of its broader commitment to sustainability.

This plan was updated in 2016 to align with the University's objectives and targets with the governments revised commitment to reduce carbon pollution.

This report provides an update of our progress on achieving the challenging objective we set ourselves in 2016 and compares our overall emissions with the higher education sector.

Campus Life 2017

Our carbon footprint

In 2017 we again appointed Pangolin to calculate the University's total carbon emissions.

These emissions cover activities over which the University has direct control, together with those generated beyond our direct control. This methodology enables us to report on our overall emissions and compare our progress against our emissions reduction target.

Categories of Carbon Emissions

Scope 1

Emissions on our campuses, or associated with the University's business generated through the combustion of fossil fuels in University owned vehicles, natural gas and LPG use as well as refrigerant gas leakage.

Scope 2

Emissions associated with the use of electricity imported from the grid or from a third party supplier of energy in the form of heat or electricity.

Scope 3

Emissions as a direct consequence of the use of goods or services provided to the University to enable it to conduct its business. Sources include: waste disposal, cleaning services and food and beverage services, IT and other equipment, paper and business flights.

Year	Scope 1	Scope 2	Scope 3	Total
16/17	1739.8	55,621.2	31,150.0	88,511.0
15/16	2,274.7	55,478.7	31,408.4	89,161.9
14/15	1,813.4	55,996.7	32,027.0	89,837.1
13/14	2,124.8	54,683.0	35,796.6	92,604.4
12/13	2,637.1	56,203.9	33,554.9	92,395.9
11/12	2,115.7	55,431.1	31,506.9	89,053.7
10/11	2,114.6	54,294.3	30,466.8	86,875.7

Meeting our low carbon emission

We continue to make progress towards achieving at least a 26% reduction from 2010/11 levels by 2030.

Our *Scope 1 and 2* emissions have increased by 1.69% on an absolute basis, compared with the 2010/11 baseline.

On a normalised basis, that is taking into consideration GFA, our Scope 1 and 2 emissions have reduced by 22.2% compared with the 2010/11 baseline.

2016/17 Performance

Scope 1 'direct emissions' are 23.5% lower than *Scope 1* emissions for 2015/16.

Scope 2 'electricity (indirect) emissions' are 0.33% lower than *Scope 2* emissions for 2015/16.

Scope 3 'other indirect emissions' are 0.2% higher than *Scope 3* emissions for 2015/16.

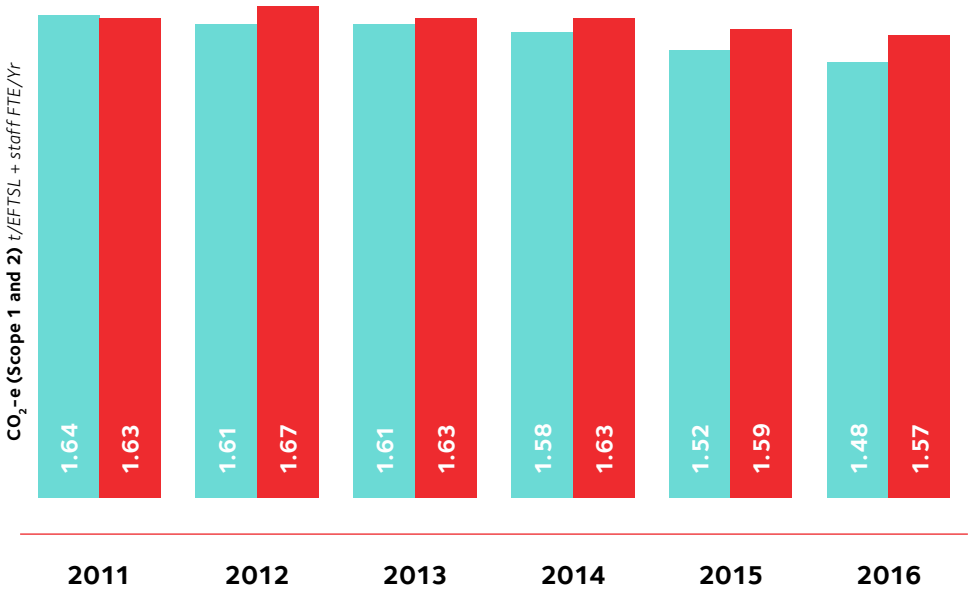
Total Greenhouse Gas emissions per square metre went from 186.2kg CO_2-e/m^2 in 2015/16 to 181.5kg CO_2-e/m^2 in 2016/17, a decrease of 2.5%.

TEFMA benchmark data

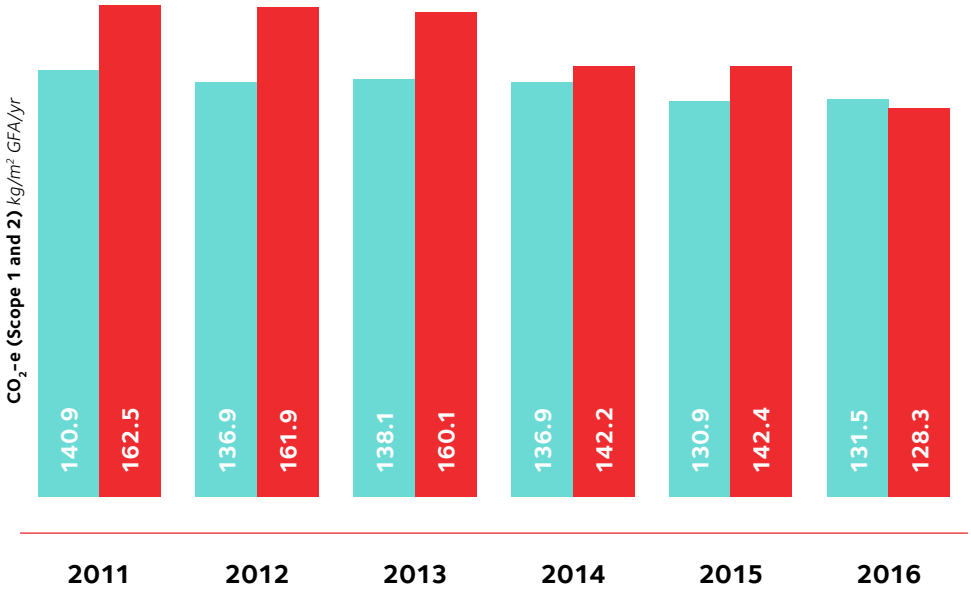
Carbon performance within the higher eduction sector

The TEFMA Benchmark data provides the Higher Education sector with information for comparing an institution's performance against the sector on a range of metrics. The charts indicate that the University's overall Green House Gas emissions are slightly above the sector average when compared on a full-time equivalent student and staff member (EFTSL+FTE) and gross floor area.

CO_2 Emissions per staff and student FTE



CO_2 Emissions per m^2 GFA



Note: *TEFMA excludes residences GFA*

Our energy footprint

Over the last two years the University has been implementing a metering project to enable reporting of electrical energy consumption by building. This means that we are better able to understand our energy consumption and work towards reducing it either through investment or local management practices.

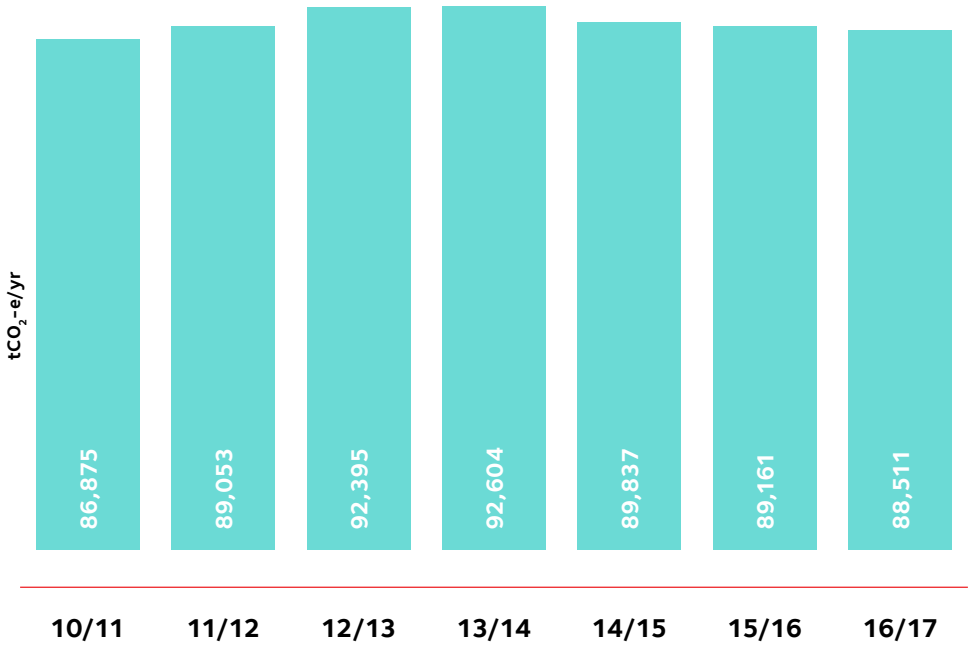
Energy Projects

A number of energy projects were completed over the 2016/17 period:

- Finalisation of all electrical metering of all major buildings on all campuses
- Renewable generation installed on Learning Commons (G11), Aquatic Centre (G45) and Graduate Centre (S07)
- LED light replacement: G13, G10, N23, N38, N61, N11
- Power factor correction on all campuses
- Chiller HLI interfaces for trending
- Ecosash fume cupboard proof of concept trialled

In addition we commenced the Building Management System (BMS) control optimisation of the heating, ventilation, air conditioning systems and installation of chilled water 'energy' meters.

2016/17 Performance



Performance against our GHG emissions target

In 2016 we set ourselves a target to reduce our GHG emissions from energy consumption by 26% against the 2010/11 baseline.

2016/17 Progress

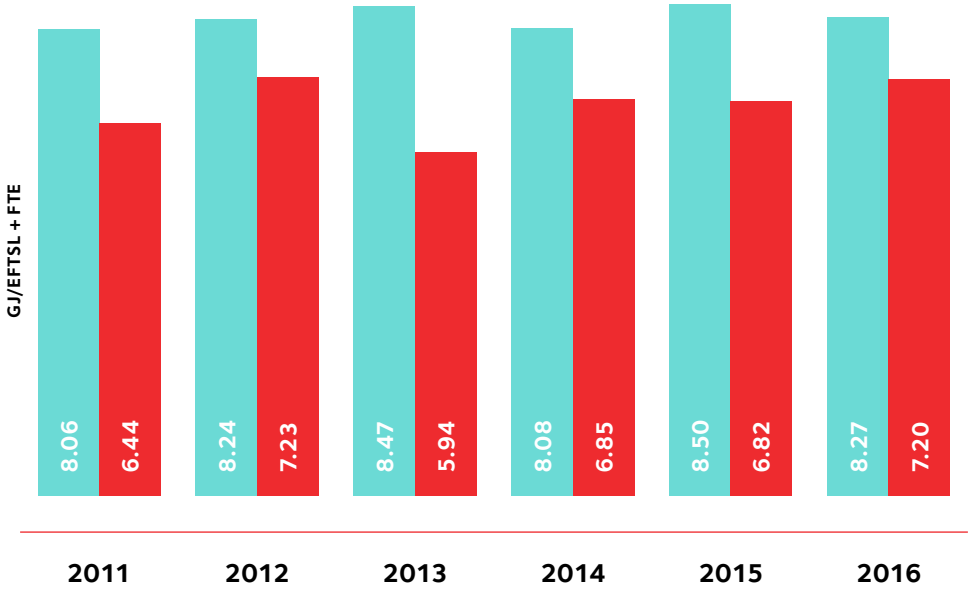
88,511 tCO_2-e, an increase of 1,635.2 tCO_2-e, +1.88% on the 2010/11 baseline.

TEFMA benchmark data

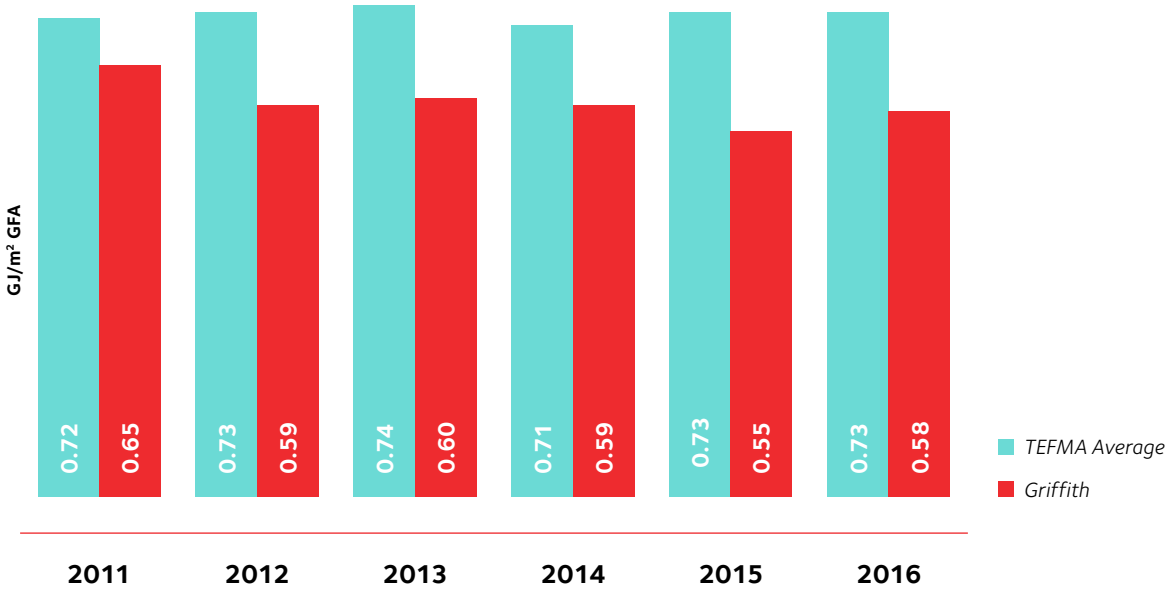
Energy performance within the higher education sector

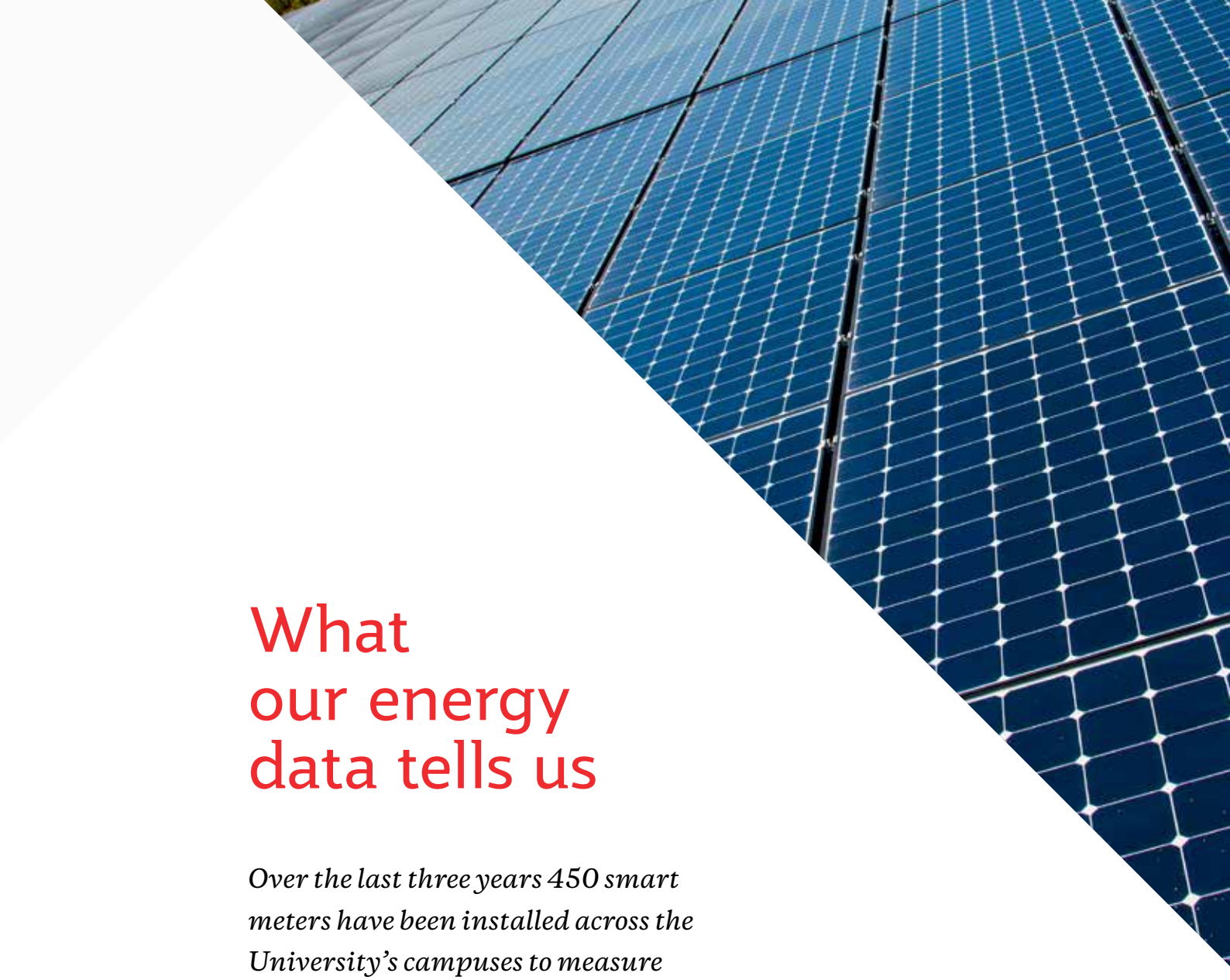
A comparison of the TEFMA benchmarks indicates that the University's Energy consumed per student EFTSL and staff FTE and per sqm GFA is lower that the sector average.

Total energy consumed



Total energy consumed





What our energy data tells us

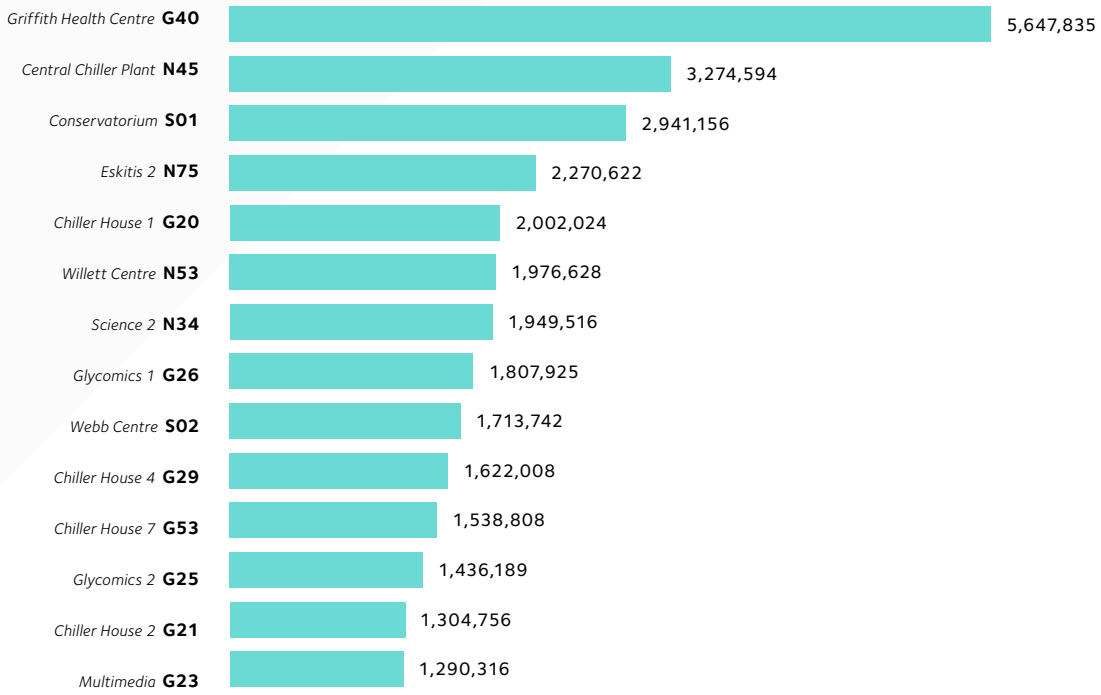
Over the last three years 450 smart meters have been installed across the University's campuses to measure electrical energy consumption.

Whole of University Metering

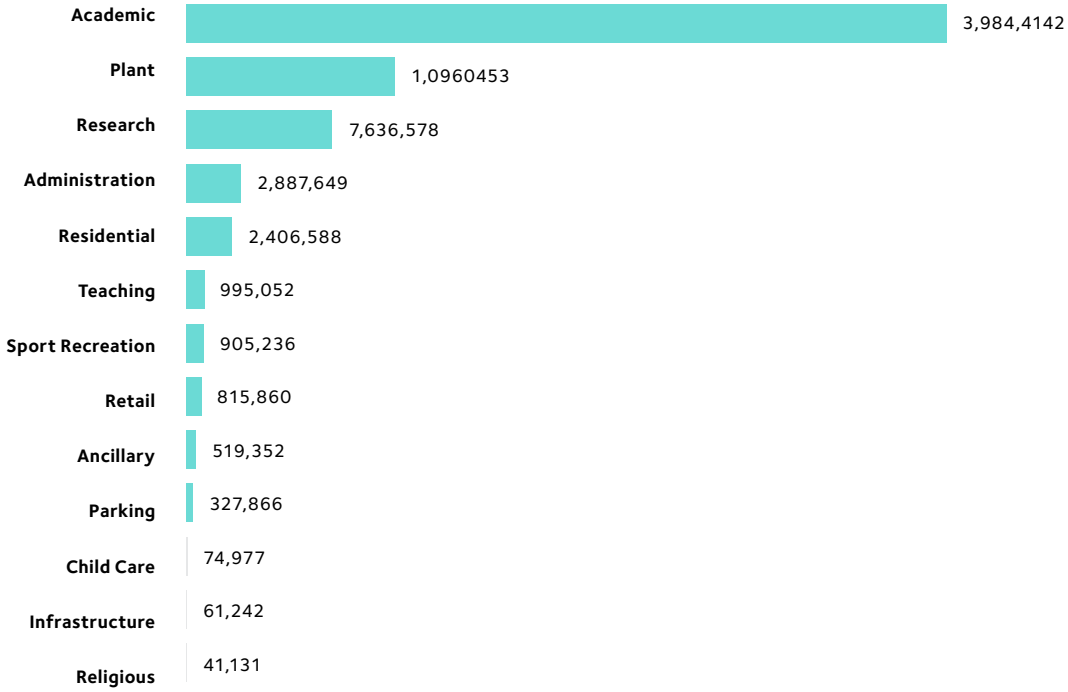
In 2017 Campus Life completed rolling out electrical meters on every major building across our 5 campuses. These meters collect information on electricity use, allowing us to understand the electrical load and consumption in near real time. This information enables us to begin to understand where we can most effectively target improvements to lower our energy load and thus carbon footprint.

The charts below illustrate specific plant and buildings that can be targeted for future energy reduction projects.

kWh's per month by building *September - September*



kWh's per month by area *September - September*



- *Academic:* Those buildings where a mix of University activities are undertaken such as teaching, academic offices, libraries etc.
- *Administration:* Those buildings where the majority of the activity undertaken in the building is administrative in nature
- *Research:* Those buildings where the majority of the activity undertaken is research
- *Plant:* Those buildings specifically associated with plant eg. chiller plants

Chillers on campus

Dedicated campus chillers contribute to almost 20% of the University's energy consumption.

By obtaining data directly from the chillers Campus Life can interrogate to fine tune the control of the chillers to achieve optimal efficiency.

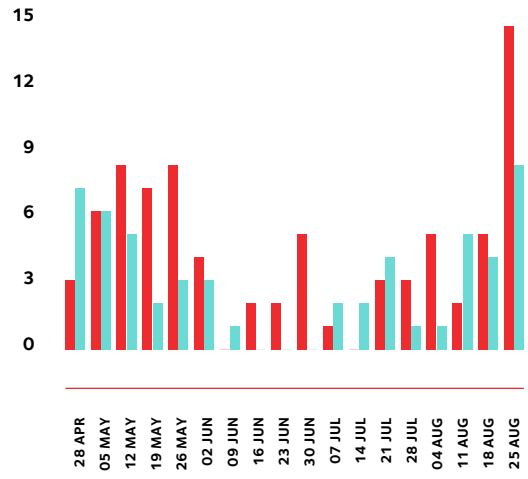
Chillers consume a large amount of energy on start-up, this is true of any large industrial equipment, additionally numerous short running intervals also contribute to higher maintenance requirements.

Ultimate efficiency is achieved with a low number of starts and multiple hours of running per start.

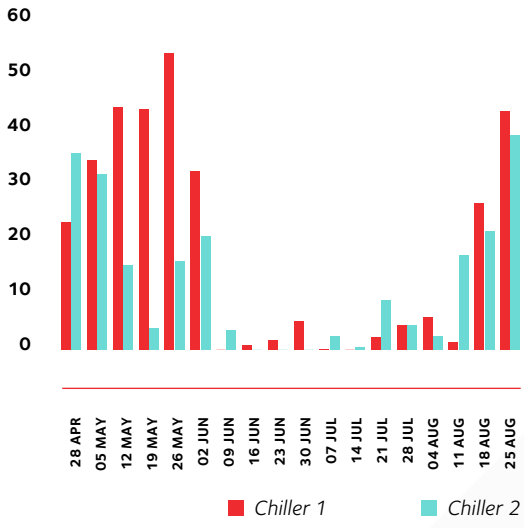
Using the data from the chillers our engineering staff can ensure that our control solutions are matching the correct chiller configurations to achieve the cooling needs of the University's buildings.

The data also allows Campus Life to identify when a control approach is poor (many starts in a short period) and work with our vendors to improve the approach.

Starts per 7 days



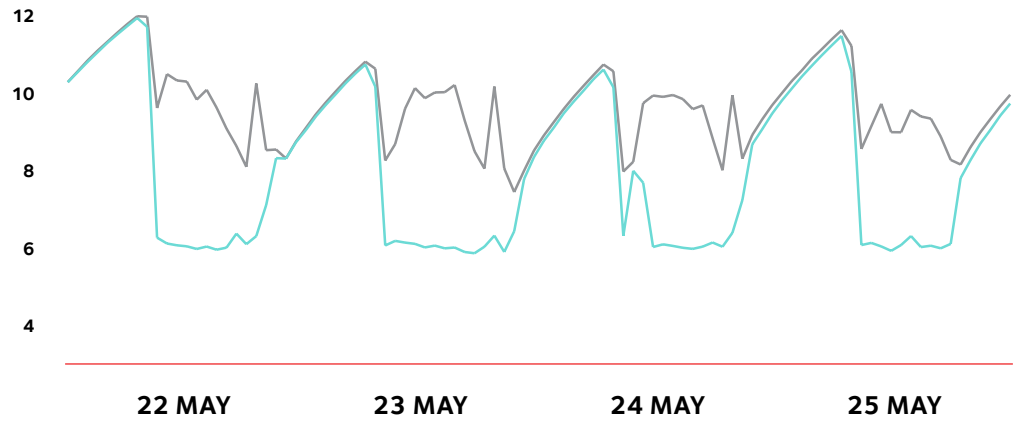
Hours run per 7 days



Detailed measures direct from the chiller also aid in proving our control systems are delivering as expected.

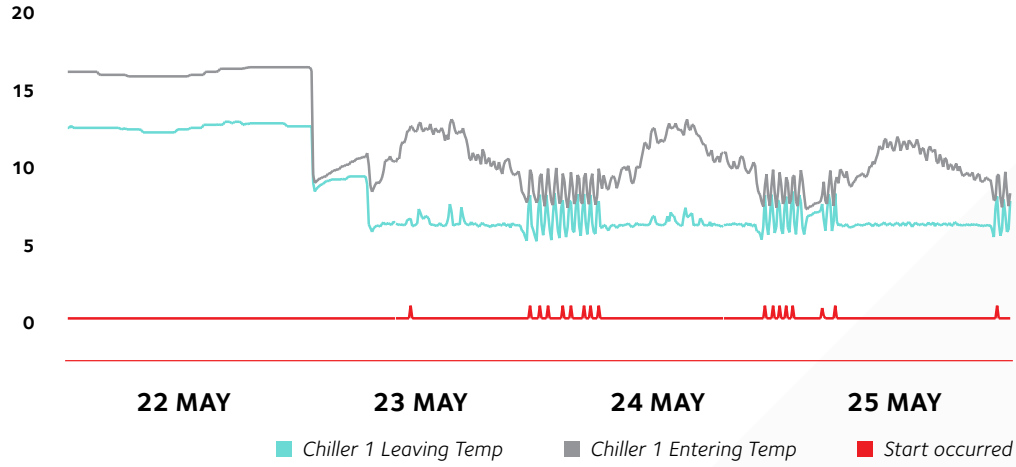
This 4-day period shows Chiller 1 starting once each day and delivering 6-degree water (leaving temperature) during the hours the Campus was scheduled to be open. This is the sort of plant behaviour that delivers room conditions with minimum energy consumption.

Chiller 1 Logan maintaining 6 to 7 degree water during the day



By contrast over the same period Chiller 2 at South Bank was poorly matched to the load with multiple starts during the day.

Chiller 2 South Bank Multiple starts per day - temperature less controlled



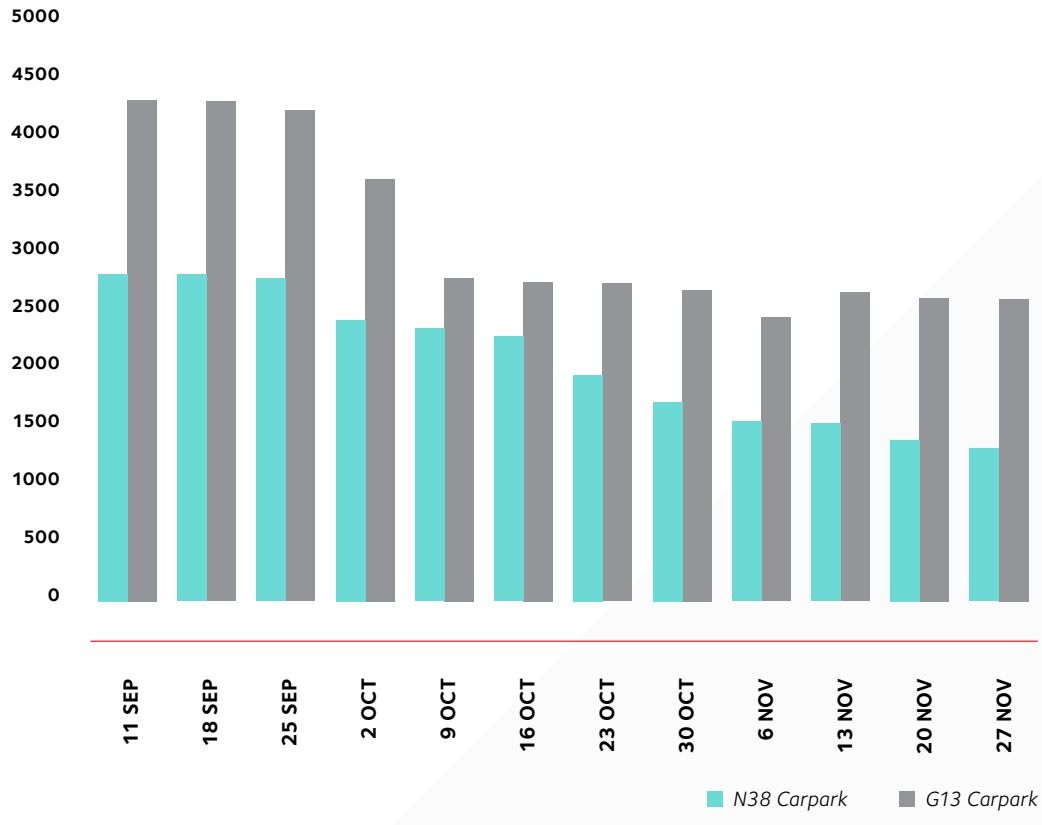
LED Lighting

In October 2016 we carried out a pilot replacing fluorescent tubes with LED lamps in the Gold Coast and Nathan multi-storey carparks (G13 and N38).

The data showed approximately a 1/3 reduction in energy consumption for the carparks.

As a result Campus Life are actively pursuing, where possible, retrofitting of LED lamps to aid in energy reduction.

kWh's per week ending for carparks



Waste

Managing our waste

During the 2016/17 reporting year our total waste increased by just under 280.2 tonnes, an 18% increase on the previous reporting year.

On average the total waste produced by each staff and student FTE has increased from 52.7kg per year 60.7kg.

2016/17 Progress

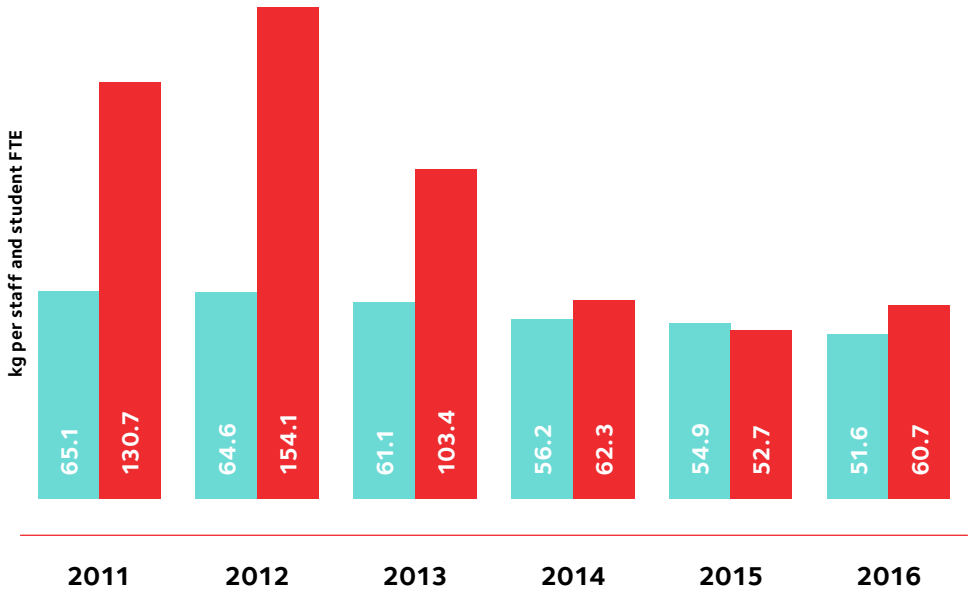
2,104.4 tCO_2-e, -55.6% on the 2010/11 base.

TEFMA benchmark data

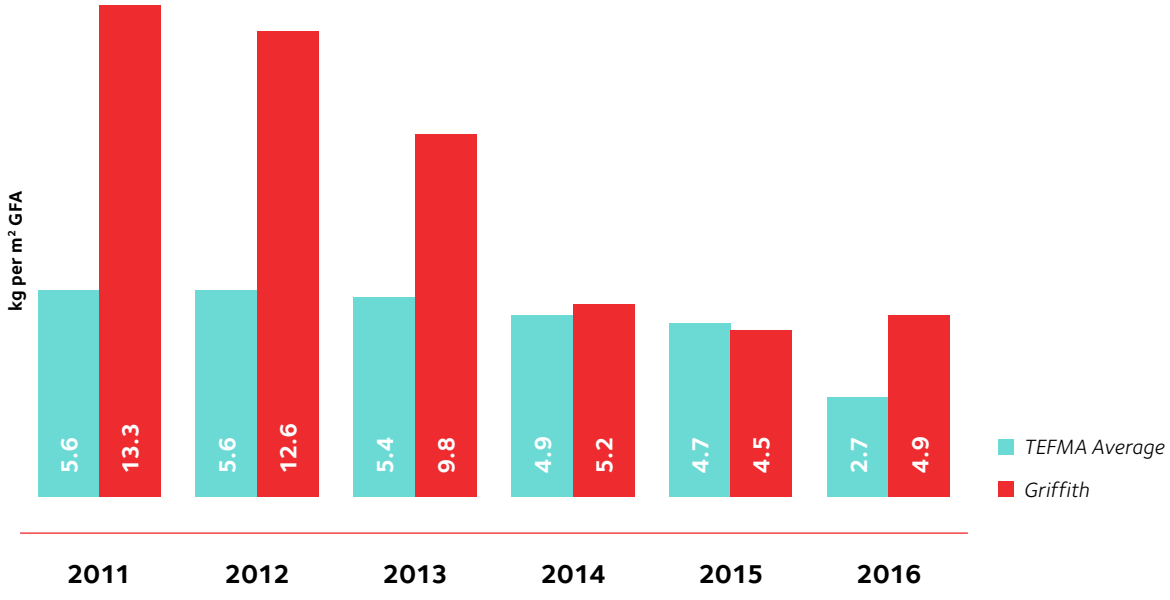
Waste performance within the higher education sector

A comparison of the TEFMA Benchmarks indicates our total waste to landfill is above the sector average on a kg/EFTSL and FTE and kg/m^2 GFA basis.

Total waste produced (landfill and recyclables)

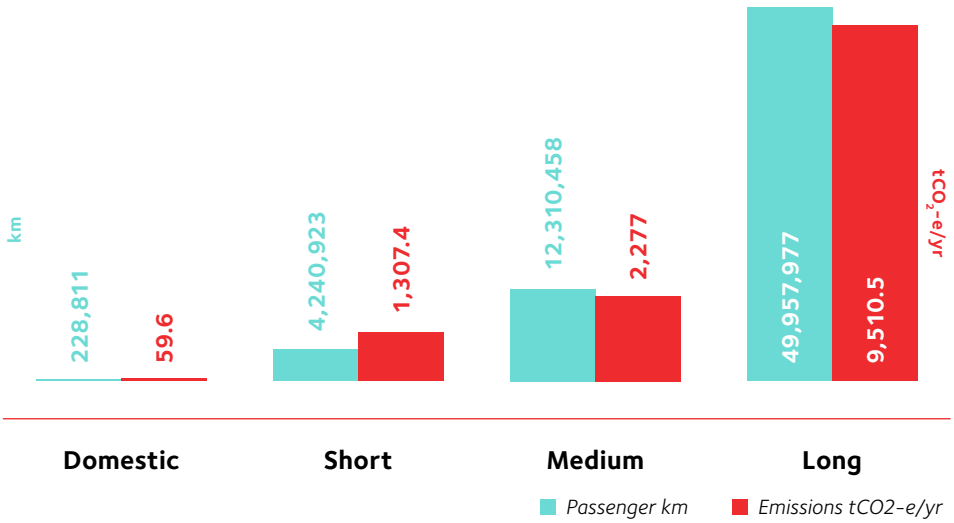


Total waste produced (landfill and recyclables)



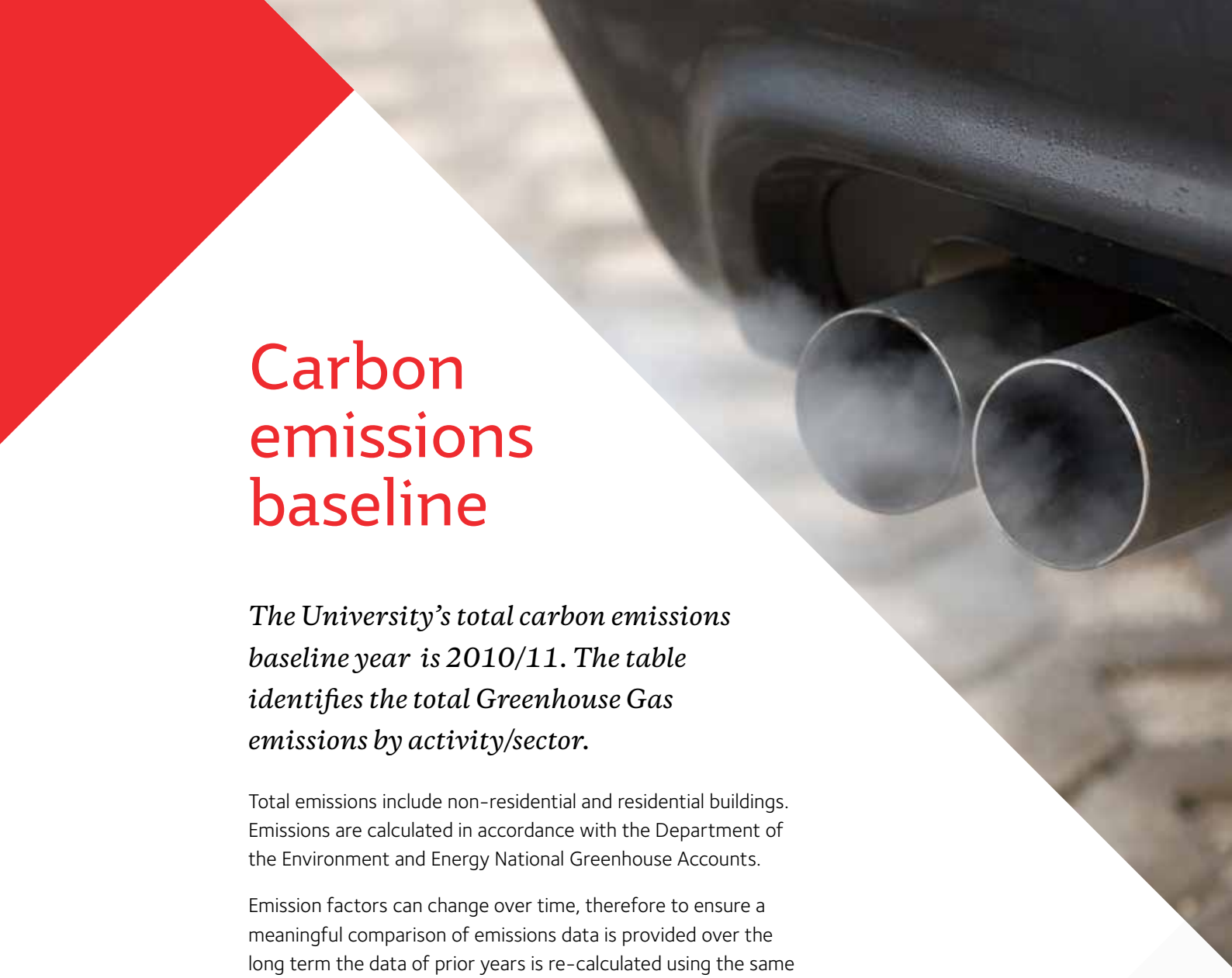
Managing our business flights

In the 2016/17 reporting year our total passenger kilometres were 66,738,168, equating to 13,154.5 tCO_2-e. This represented an increase of 629.5 tonnes, a 5.02% increase on the previous reporting year.



Griffith breakdown of business travel

Haul	Passenger km	Emissions (tCO_2-e/yr)
Domestic *Under 400km*	228,811	59.6
Short *401 - 1,000km*	4,240,923	1,307.4
Medium *1,001 - 3,700km*	12,310,458	2,277
Long *3,701 - 16,000km*	49,957,977	9,510.5
Total	**66,738,168**	**13,154.5**



Carbon emissions baseline

The University's total carbon emissions baseline year is 2010/11. The table identifies the total Greenhouse Gas emissions by activity/sector.

Total emissions include non-residential and residential buildings. Emissions are calculated in accordance with the Department of the Environment and Energy National Greenhouse Accounts.

Emission factors can change over time, therefore to ensure a meaningful comparison of emissions data is provided over the long term the data of prior years is re-calculated using the same factors employed in the current year's assessment (when and where applicable).

University carbon emission baseline FY 2010/11

Activity Sector	Emissions tCO_2-e/yr	Emissions %
Utilities	62,855.1	72.35%
Equipment	3,758	4.33%
Flights	10,851.7	12.49%
Transport fuels	1,153.8	1.33%
Stationary fuels	170	0.20%
Third party services	2,483.7	2.86%
Synthetic gases	856.9	0.99%
Waste	4,746.5	5.46%
Total	**86,875.7**	**100%**

Estimated data

Emissions were calculated from the following:

- *Utilities:* direct emissions – data is collected from utility bills from each service provider this includes electricity generation and transmission and distribution losses
- *Equipment:* expenditure on IT equipment and paper by type
- *Flights:* business flights – data is collected from the university service provider for corporate travel
- *Transport fuels:* Post 2004 gasoline, diesel oil and LPG - data is collected from utility bills from each service provider
- *Stationary fuels:* LPG data is collected from utility bills from each service provider
- *Third party services:* cleaning expenditure and food and beverage expenditure by campus
- *Synthetic gases:* refrigerant data collected from contractor
- *Waste:* tonnage estimates of waste sent to landfill, disposed of by other means and waste recycled provided by the waste contractor

Reduced emission scenarios

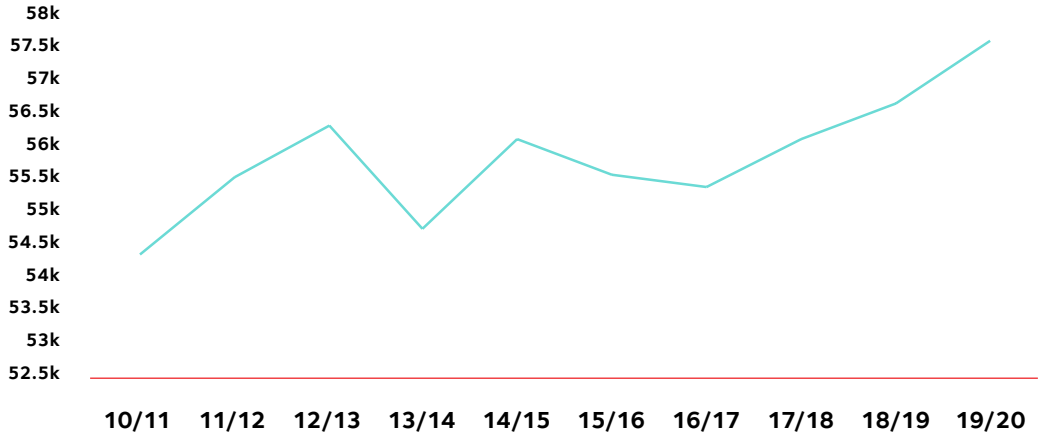
The Carbon Management Plan identified a number of opportunities to reduce carbon emissions. These focussed on energy, waste and flights.

Electricity

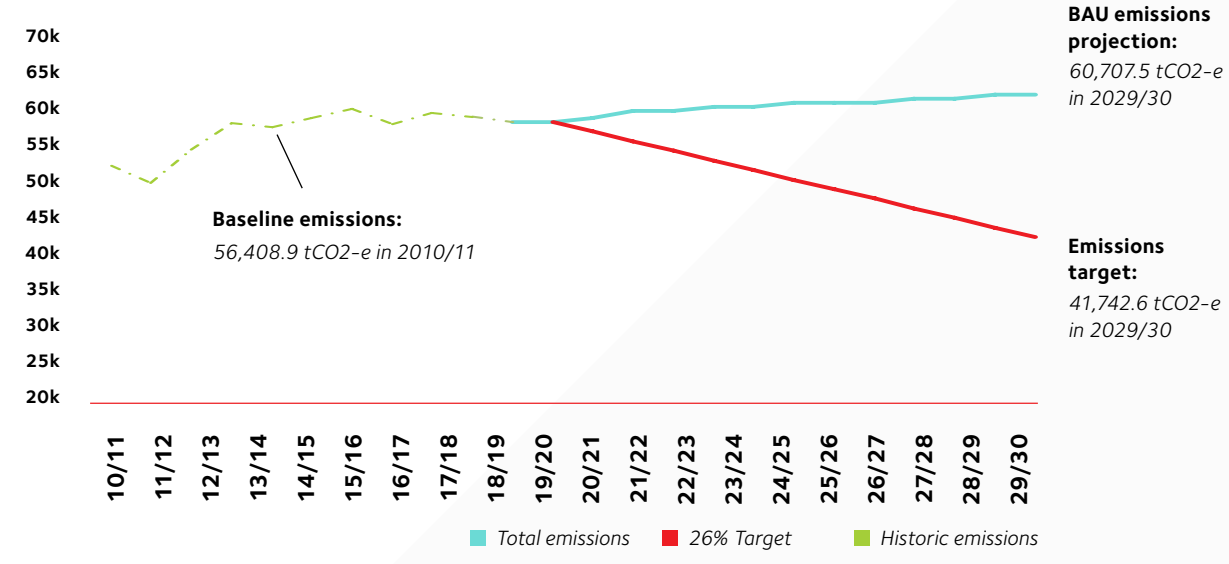
An update of the Business as Usual graphs using current emissions and projected growth rates (GFA and EFTSL) indicates that Greenhouse Gas emissions will increase moderately, from 54,294.3 tCO_2-e in FY 2010/11 to 57,444.5 tCO_2-e in FY 2020/30. This is primarily due to limited projected building activity over period.

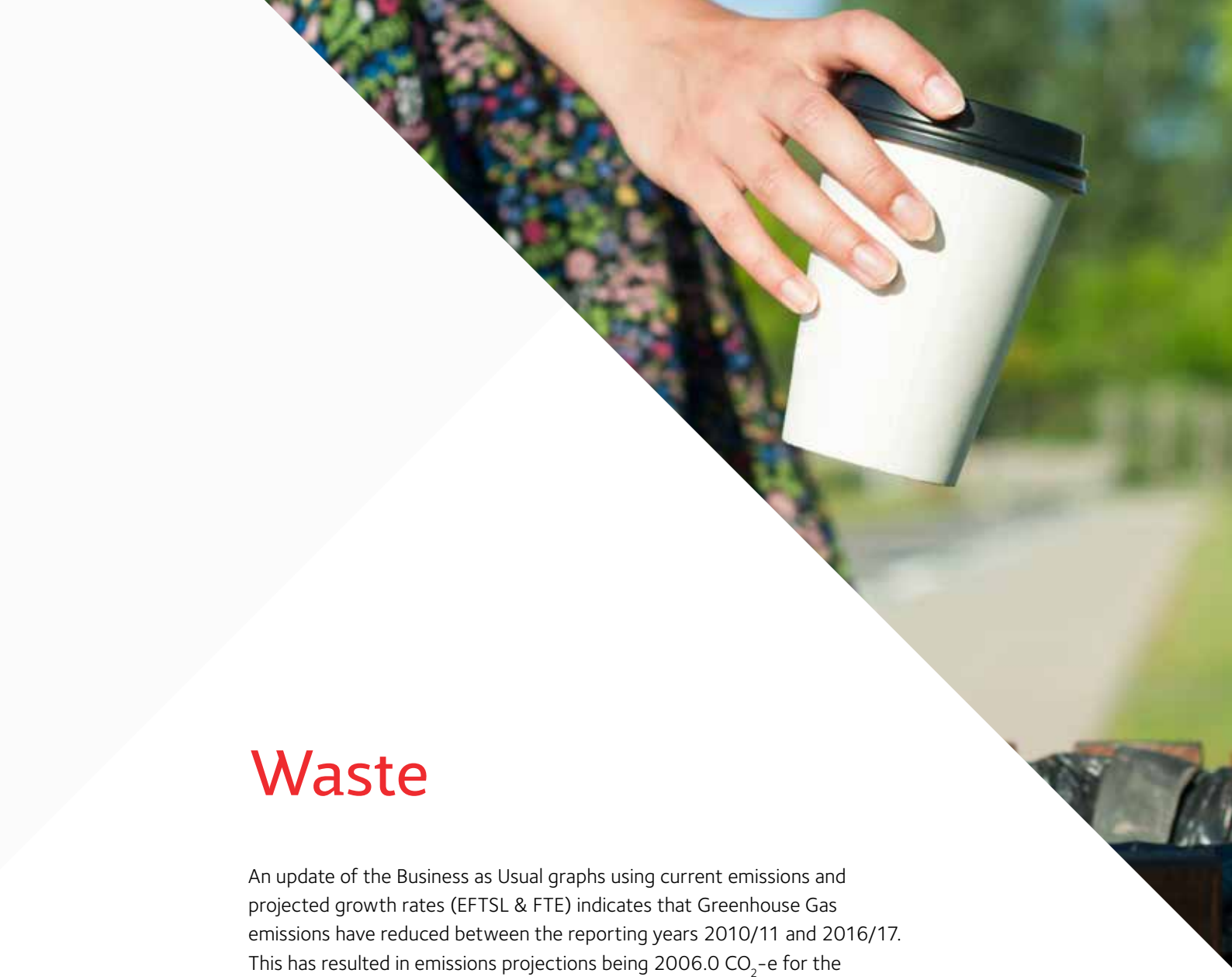
In order for the university to achieve the goal of 26% reduction on 2010/11, emissions due to electricity consumption will need to drop by 7.0% of current levels.

Electricity emissions (tCO_2-e) based on a BAU scenario



26% target for overall GHG emissions

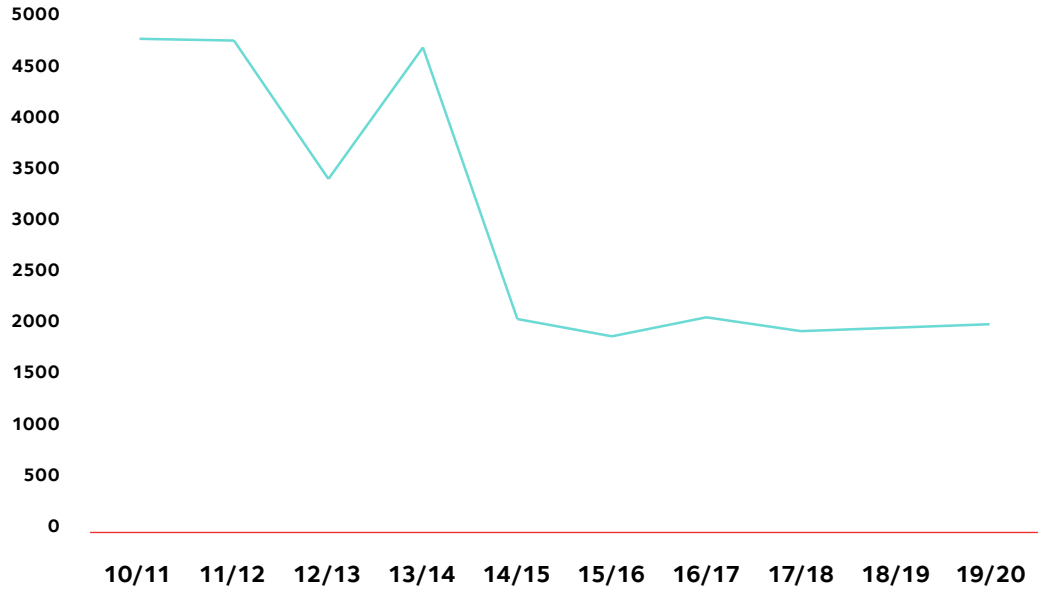




Waste

An update of the Business as Usual graphs using current emissions and projected growth rates (EFTSL & FTE) indicates that Greenhouse Gas emissions have reduced between the reporting years 2010/11 and 2016/17. This has resulted in emissions projections being 2006.0 CO_2-e for the FY 2019/20 under the BAU scenario.

Waste GHG emissions (tCO_2-e) in BAU scenario



Appendix 1

Calculation methodology and emission factor sources

Emission source	Methodology	Factor	Factor Source
Electricity	Method 1 from NGER Technical Guidelines 2010	Scope 2 = 0.878 kgCO_2-e/kWh Scope 3 = 0.119 kgCO_2-e/kWh	National Greenhouse Accounts (NGA) Factors July 2011
Natural Gas	Method 1 from NGER Technical Guidelines 2010	Scope 1 = 51.33 kgCO_2-e/GJ Scope 3 = 8.60 kgCO_2-e/GJ	NGA Factors July 2011
Telecommunications	Methodology as in Balancing Act Report. A Triple Bottom Line Analysis of the Australian Economy and updated to 2009-2010 financial year. Corrections are applied for inflation, major changes in the economy and state variations.	0.17 kg CO_2-e/$	Input-Output Analysis calculator developed by the Integrated Sustainability Analysis (ISA) Research Team at the University of Sydney (isa.org.usyd.edu.au).
Internet	As above	0.17 kg CO_2-e/$	ISA ibid.
IT Equipment	As above	0.37 kg CO_2-e/$	ISA ibid.
Food & Catering	As above	0.69 kg CO_2-e/$	ISA ibid.
Cleaning Services	As above	0.48 kg CO_2-e/$	ISA ibid.
Business Flights	Calculation based on GHG activity data multiplied by GHG emission factor	Defined by seating class and flight haul length. Average 0.353 kg CO_2-e/passenger.km	DEFRA 2010 Guidelines to GHG Conversion Factors by passenger seating class (economy, business, first) and flight type (short, medium and long haul). RFI 1.9: TRAEOFF FP5 EU Project: Aircraft emissions: contribution of different climate components to changes in radiative forcing-tradeoff to reduce atmospheric impact. cordis.europa.eu/home_en.html
Post 2004 Diesel Oil	Method 1 from NGER Technical Guidelines 2010	Scope 1 = 2.7 kgCO_2-e/L Scope 3 = 5.3 kgCO_2-e/L	NGA Factors July 2011
Post 2004 Gasoline	Method 1 from NGER Technical Guidelines 2010	Scope 1 = 2.3 kgCO_2-e/L Scope 3 = 5.3 kgCO_2-e/L	NGA Factors July 2011
Post 2004 LPG	Method 1 from NGER Technical Guidelines 2010	Scope 1 = 1.6 kgCO_2-e/L Scope 3 = 5.0 kgCO_2-e/L	NGA Factors July 2011
Diesel oil (Stationary)	Method 1 from NGER Technical Guidelines 2010	Scope 1 = 2.68 kgCO_2-e/L Scope 3 = 5.3 kgCO_2-e/L	NGA Factors July 2011
LPG (Stationary)	Method 1 from NGER Technical Guidelines 2010	Scope 1 = 1.54 kgCO_2-e/L Scope 3 = 5.0 kgCO_2-e/L	NGA Factors July 2011
Waste to Landfill	Calculation based on GHG activity data multiplied by GHG emission factor	1.10 tCO_2-e/tonne	NGA Factors July 2011
Leakage of refrigerants	Direct emissions (tCO_2-e)= equipment charge (kg)/1000 x leakage factor (%) x global warming potential of refrigerant gas	Leakage Rates: Commercial A/C 9% GWP: HCFC R123: 120; HFC R134a: 1,300; HCFC R22: 1,810; HFC Blend R-407c: 1,525	Leakage rates: NGA Factors 2011, Table 25, page 47; Greenhouse Warming Potential (GWP) for Kyoto refrigerants: National Greenhouse Accounts (NGA) Factors (Australian Government, July 2011), Appendix 1 Table 26, page 58; GWPs for non-Kyoto refrigerant gases: ghgprotocol.org/files/ghgp/tools/Global-Warming-Potential-Values.pdf (IPCC 2nd Assessment Report)
Paper	Calculation based on GHG activity data multiplied by GHG emission factor	0% recycled = 7.310 kgCO_2-e/ream; 80% recycled = 5.143 kgCO_2-e/ream; 100% recycled = 4.601 kgCO_2-e/ream	Paper Task Force calculator available at: calculator.environmentalpaper.org/resources_and_tools