

# National Carbon Offset Standard Carbon Neutral Program Annual Report



An Australian Government Initiative

Qantas Airways Limited (Qantas Group)

01 July 2013 – 30 June 2014

## Public Disclosure Summary

### 1. Carbon neutral information

Certification is for	The Qantas Group Carbon Offset Program (Fly Carbon Neutral Program)
Gross emissions this reporting year <sup>1</sup>	11,073,707 t CO <sub>2</sub> -e
Total product sold this reporting year	187,024 t CO <sub>2</sub> -e
Base year period	From 1/07/2012 To 30/06/2013
Emissions in the base year	13,671,015 t CO <sub>2</sub> -e

Founded in regional Queensland in 1920 – as the Queensland and Northern Territory Aerial Service – Qantas is one of Australia's most iconic brands and has played a central role in the development of the Australian and international aviation industry. Today the Qantas Group is a diverse global aviation business, comprising Qantas Domestic, Qantas International, the Jetstar low-cost carrier group and Qantas Loyalty.

In total, the Qantas Group operates more than 7,300 flights each week and, together with its codeshare and oneworld partners, offers flights to more than 1000 destinations around the world. The Qantas Group carries 47 million passengers each year and employs more than 30,000 people. The Qantas Group's aircraft fleet age averages 7.6 years – the youngest in two decades – including the acclaimed Qantas A380 and the Jetstar Boeing 787 Dreamliner. Qantas is ranked the world's safest airline by AirlineRatings.com, one of the top 10 airlines in the world by Skytrax, and holds many major awards for service, food and wine, technology and innovation.

<sup>1</sup> Total Qantas carbon footprint from which the amount of carbon offsets is calculated.



## **PRODUCT DESCRIPTION**

The Qantas Group's product offering is the provision of carbon neutral passenger flight services to both customers and staff.

### **Functional Unit**

The functional unit for the purposes of this LCA is:

*The transport of a single passenger from entry into the airport terminal at origin to exiting the airport terminal at destination for domestic passengers and exiting the plane at destination for overseas passengers (i.e., kg CO<sub>2-e</sub> per passenger-kilometre).*

### **Scope**

To accurately calculate the volume of emissions attributable to a passenger flying a sector (from one airport to another), Qantas has undertaken a comprehensive life cycle assessment (LCA) of energy usage in flight (aviation fuel), on ground activities (catering centres, engineering facilities, airport terminals, office and ground transport vehicles), and the embodied energy of the aircraft. The LCA excludes all freight related activity.

The LCA has been prepared to fulfil the requirements for the Qantas Group to continue to be a National Carbon Offset Standard Carbon Neutral (NCOS-CN) certified provider for Qantas Airlines, Qantas Airlines codeshare, Jetstar Airlines, Jetstar Airlines codeshare flights and other non-Qantas Group flights. Codeshare flights are those with a Qantas Airlines or Jetstar Airlines flight number but operated by another airline. The LCA has been prepared in accordance with the NCOS-CN Guidelines and in accordance with international standards ISO 14040:2006 and ISO 14044:2006 and is updated each financial year. Qantas have selected emission factors that are geographically specific to the emission sources accounted for in the product LCA.

The purpose of the LCA is to define the required scope and boundaries of the proposed NCOS-CN service to assess an emissions footprint in sufficient detail that supports the global warming potential attributable to a passenger on a Qantas Group and/or an average emissions footprint per distance km to be applied to codeshare and other non-Qantas Group flights for carbon neutral certification under the NCOS-CN Program.

Using Qantas Group activity data over the previous 12 months and 'full fuel cycle' emission factors published by the Australian Government (National Greenhouse Accounts), the passenger's specific portion of emissions produced by a given Qantas Group fleet are added to the related emissions released from ground activities and divided by the total distance travelled for that fleet. For each Qantas Group sector, these rates are weighted by the fleet utilisation and using the sector distance (in km), the emissions per passenger are calculated.

## CERTIFICATION BOUNDARY

### Organisation Boundary

Qantas Airlines is a domestic and international airline including regional airlines QantasLink and Network Aviation and international airline Jetconnect. Qantas Airlines' main Australian hubs are Sydney Kingsford Smith Airport, Melbourne Airport, Brisbane Airport and Perth Airport, with a strong presence in Adelaide, Cairns and Canberra Airports. Major international hubs include Singapore Changi Airport, Los Angeles International Airport, Hong Kong, Dallas, Bangkok and London Heathrow Airport.

Jetstar Airlines is a network of value based carriers providing low fares across Australia, New Zealand and the Asia Pacific region, with headquarters in Melbourne. Jetstar Airlines consists of:

- Jetstar Airways in Australia and New Zealand (wholly owned by the Qantas Group);
- Jetstar Asia based in Singapore. The company is managed by Newstar Holdings, majority owned by Singapore company Westbrook Investments (51 per cent), with the Qantas Group holding the remaining 49 per cent;
- Jetstar Pacific based in Vietnam (majority owned by Vietnam Airlines with the Qantas Group holding 30 per cent);
- Jetstar Japan, a partnership between the Qantas Group Japan Airlines, Mitsubishi Corporation and Century Tokyo Leasing Corporation; and
- Jetstar Hong Kong, a partnership between China Eastern Airlines and the Qantas Group (subject to regulatory approval).

Jetstar Airlines targets the leisure and value based markets whilst Qantas Airlines targets the premium and business markets.

The following organisational diagram represents the reporting structure for the purpose of NCOS accreditation and does not reflect the legal corporate structure of the Qantas Group:

Figure 1: Organisational diagram representing the reporting structure for the purpose of NCOS accreditation.

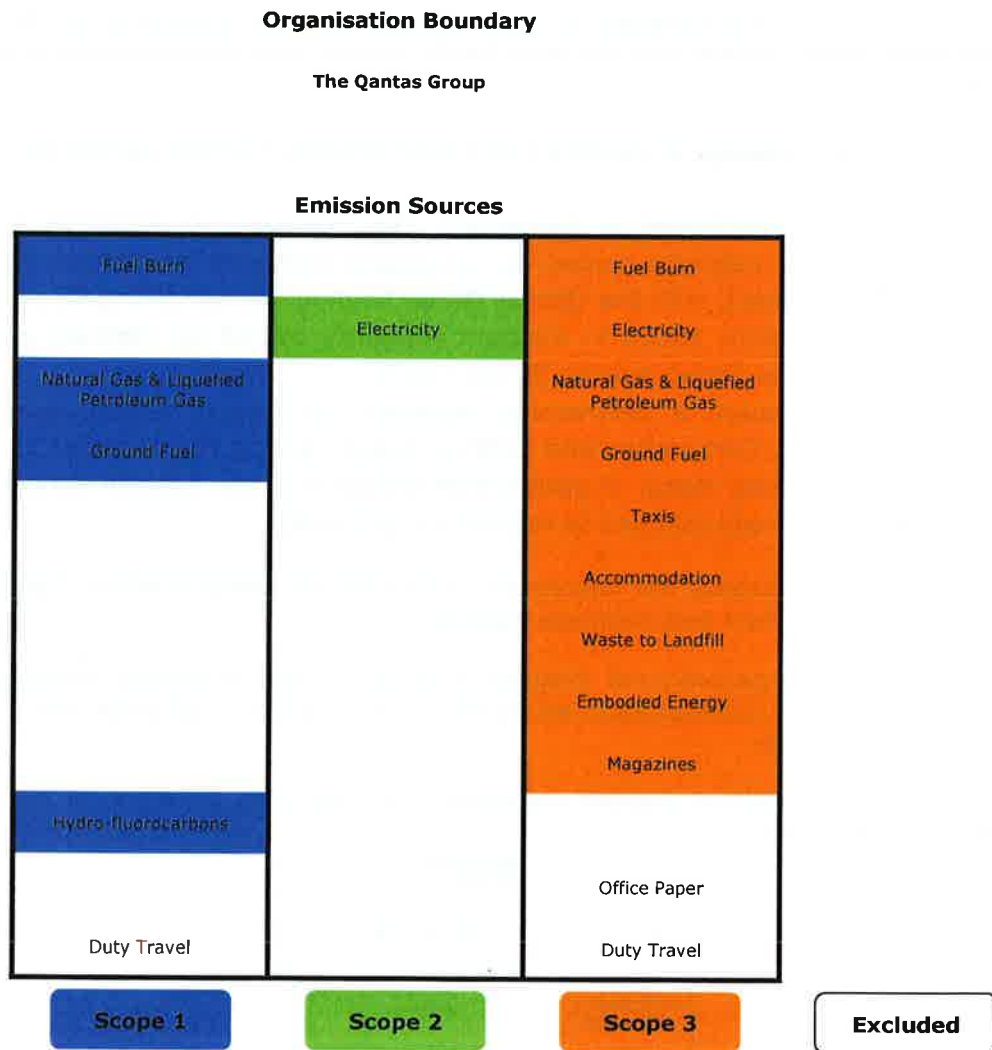


\* These organisation activities have been excluded from the carbon footprint assessment that forms the basis for calculating emissions per passenger-kilometre rates that are subsequently used to estimate emissions per passenger for each sector (from airport to another) the product is offered.

**Emission Sources Quantified (Included)**

The life cycle stages in the transport of passengers are shown in Figure 2. Care has been taken to ensure that all inputs to, and outputs from, the service are included.

Figure 2: The Qantas Group LCA source of emission boundaries.



## Emission Sources Not Quantified (Excluded)

The following emission sources have not been quantified in line with the provisions in the NCOS-CN program. The impact of excluding these sources is not expected to affect the overall total emissions.

Emission source	Scope	Justification for exclusion & overall implications for footprint
Office Paper	3	It requires significant effort to gather the set of data needed for assessing the total emissions associated with office paper. It is expected these emissions are negligible (relative to other Scope 3 emissions) and the administrative burden involved in collating the data is considered to outweigh the benefit.
International scope 2 emissions	2	International scope 2 emissions are deemed immaterial and beyond operational control and thus excluded.
International scope 3 emissions (except for fuel burn and embodied energy related emission sources)	3	International scope 3 emissions are deemed immaterial and beyond operational control and thus excluded.
Airline Related Business Travel (Duty Travel)	2 & 3	Airline related business travel (duty travel) has been excluded. Since September 2007, the Qantas Group made a voluntary commitment to carbon offset 100 per cent of duty travel employee flight emissions every year by retiring carbon offsets. This occurred from financial year 2009 and represents a recurring budget item. For this reason, duty travel has been excluded from the emission items that contribute to the fixed component of the per passenger-tonne emission factor to prevent double counting.

## Assumptions / Limitations

Emission source / activity	Assumption/limitation and justification
Emission Factors	Qantas have selected emission factors that are geographically specific to the emission sources accounted for in the product's LCA. Australian greenhouse emission factors have been used where possible; however, where Australian factors were not available, additional sources have been used.
Fare Class	Qantas do not distinguish between different types of fare classes in the product's LCA.
Jetstar Joint Ventures Exclusion	Jetstar Joint Ventures have been excluded from the product's LCA. The average emissions footprint per distance km calculated in accordance with Qantas Group flights is applied to the relevant sectors.
Codeshare and non-Qantas Group Flights	For codeshare and other non-Qantas Group flights, which are not flown by Qantas aircraft, actual fuel consumption is unknown. This includes sectors such as Albuquerque to Los Angeles operated by American Airlines. The average emissions footprint per distance km calculated in accordance with Qantas Group flights is applied in these instances.

Emission source / activity	Assumption/limitation and justification
Freight Exclusion	<p>In order to exclude Freight from flight activities, the available pax-km data was converted to Revenue Passenger Tonne Kilometre (RPTK) using a passenger weight conversion factor of 96 kg.</p> <p>The percentage difference between the available Revenue Tonne Kilometre (RTK) data and the resulting RPTK data represents the Freight activity excluded from the emissions from the combustion of jet fuel.</p> <p>Using a conversion factor of 96 kg is in alignment with internal Board reporting procedures.<sup>2</sup></p>
Great Circle Distance (GCD)	<p>In previous years, the distance between sectors was obtained from the Australian Government Department of Transport and Regional Services. In FY11, these figures were no longer provided for all the sectors required for the LCA. The Qantas Group therefore moved to the use of Great Circle Distances (GCDs) calculated using the Vincenty method. A review of the available methodologies was undertaken, and the Vincenty method was chosen. This method is accepted by the EU for use in the EU Emissions Trading Scheme. Airports and sectors are inputted to the Vincenty algorithm to calculate the corresponding GCD.</p>
Magazines	<p>The mass of each individual magazine was assumed to be 0.5 kg. The paper used in magazine production was assumed to be recycled paper and sourced domestically (references available in the calculations).</p> <p>It requires significant effort to gather a fresh set of data and reassess the total emissions associated with the production of in-flight magazines estimated for the LCA for FY11. These do not represent a material inventory item. Significant changes are not expected as part of magazine production; therefore, the total emissions associated with the production of in-flight magazines estimated in the LCA for FY11 will be carried through into this update.</p>
Embodied Energy	<ul style="list-style-type: none"> <li>• The material for the basic empty weight of all planes is assumed to be 100 per cent Aluminium and constructed in France.</li> <li>• Embodied energy per tonne of Al: 170 GJ/t Al (reference available in the calculations).</li> <li>• Emission factor for electricity used in France: 0.146 t CO<sub>2-e</sub>/MWh (reference available in the calculations).</li> <li>• Lifetime for all planes is assumed to be 20 years.</li> </ul> <p>The Qantas Group operates a fleet of aircraft, some of which are owned and some of which are leased. Given that information about the embodied energy of each aircraft is not available, the calculations are based on the assumption that each aircraft is made entirely from Aluminium. Assuming that each aircraft is made of Aluminium will give an adequate indication of the order of magnitude of emissions associated with their manufacturing. The embodied emissions per aircraft on a per annum basis assuming a lifetime of 20 years is not material on a per passenger basis.</p>
Taxis	<p>As with the previous LCA, the methodology is based on the Victorian EPA's methodology from Greenhouse Gas Inventory Management Plan 2010-11.</p>

<sup>2</sup> The International Civil Aviation Organisation (ICAO) defines *passenger weight* as: to convert aircraft passenger loads into weight loads, the number of passengers carried is multiplied by a factor representing the average weight of the passenger plus both normal baggage allowance and excess baggage. This conversion factor is left to the discretion of the operator. However, if no conversion factor is available, it is recommended that 90 kg be used.



## **Assessment of Uncertainty**

The LCA utilises a conservative methodology throughout, the intent being to ensure that the total emissions estimated will, with a high degree of probability, match or exceed actual emissions. This is particularly the case where uncertainty is greatest.

Australian greenhouse emission factors have been used, where applicable, in all cases. Australian greenhouse emission factors for electricity are amongst the highest in the world, so this is a conservative position for related activities.

Emission factors used in the emissions inventory calculations are from the NGER Technical Guidelines 2013. Full fuel cycle factors are used.

Qantas acknowledges that despite best endeavours there is always unavoidable uncertainty associated with Scope 1 emissions. As a result, Qantas includes in its calculations consideration to Part 8.3 of the NGER Measurement Determination.

## **Policy of Changes to Emissions in the Base Year**

The emissions in the base year will not be adjusted unless there has been a material change to the business upon which an adjustment to these needs to be considered. The assessment and application of any adjustment requirement to the emissions in the base year is the responsibility of the Group Fuel and Environment Management team.

## **2. Summary of changes to the carbon footprint**

### **Improvements in methodology**

In previous years, the emissions associated with the fuel burn emissions source had been calculated by estimating the fuel consumed by sector. Where average fuel consumed data was not available for a particular fleet-sector pair, the maximum average fuel consumed figure for that sector was used. This approach ensures a conservative estimation of total fuel consumed because it takes into account the fleet type that consumes the most fuel for the given sector.

The LCA analysis was improved by using the Qantas Group aggregated fuel burn data and weighing these by the fleet utilisation. For a given sector, the associated emissions were then calculated using the sector distance. This approach improves the accuracy of resulting emissions by ensuring these are a direct result of the total fuel consumed by the Qantas Group.

### **Improvements in data quality**

The LCA analysis was improved by reconciling the total fuel data by fleet to the total fuel uplift data available that is subject to other internal and external assurance reviews. The result of this reconciliation is an improvement of the accuracy of the functional unit that is subsequently applied to sectors and fleet utilisation to quantify the emissions per passenger.

### 3. Emission Reduction Measures

The Qantas Group is targeting an average improvement in fuel efficiency of 1.5 per cent per annum to 2020 measured as litres of fuel per revenue tonne kilometre (RTK). This goal is consistent with that set by the International Air Transport Association (IATA) for the industry. In addition, the Qantas Group has committed to achieve carbon neutral growth by 2020 and to achieve a 50 per cent reduction in carbon emissions by 2050, relative to 2005 levels. The Qantas Group believes this goal is achievable by embracing technological innovation in efficiency and by securing commercially viable alternative fuel sources that are genuinely sustainable.

The Qantas Group's long-term energy strategy is based on:

- Robust measurement and transparent reporting of our environmental footprint.
- Investment in advanced technologies and fuel efficient aircraft.
- Leading fuel optimisation and airspace management activities that represent best practice and leadership.
- Early adoption and persistence in innovative fuel and carbon management.

Fuel efficiency and fleet renewal offer the greatest opportunities to decrease aviation fuel use. For the first time in approximately 20 years the Qantas Group's average passenger fleet age is below eight years.

Table 1. Emissions Reduction Measures in this reporting period

Emission source	Reduction Measure	Scope	Status	Reduction t CO <sub>2-e</sub>
Fuel burn	Group Fuel Management Program	1 & 3	Implemented in this reporting period	[Redacted]
Fuel burn	Group Fuel Management Program	1 & 3	Expected in future reporting periods	
Total emission reductions implemented in this reporting period				[Redacted]
Total expected emissions reductions in future reporting periods				



## 4. Carbon emissions summary

Table 2. Emissions Summary

Scope	Emission source	t CO <sub>2-e</sub>
1 & 3	Aviation Fuel	10,795,174
2 & 3	Electricity	205,345
1 & 3	Natural Gas & Liquefied Petroleum Gas	15,214
1 & 3	Ground Fuel	16,531
1	Hydrofluorocarbons	1,198
3	Taxis	798
3	Accommodation	164
3	Waste to Landfill	30,942
3	Embodied Emissions	6,656
3	Magazines	1,687
3	NCOS certified carbon neutral product- X kg	0
Total Gross Emissions		11,073,707
GreenPower or RECs reductions <sup>1</sup>		0
Total Net Emissions <sup>2</sup>		<b>11,073,707</b>

<sup>1</sup> The Qantas Group does not currently purchase, nor do they have plans to purchase, GreenPower or renewable energy certificates. However, the Qantas Group has constructed Australia's largest commercial scale tri-generation operation in Australia with an installed capacity of approximately 12 megawatts.

<sup>2</sup> The total net emissions are not the carbon offset cancellations required in the context of the product offering. As aforementioned, the goal of the LCA is to assess an emissions footprint in sufficient detail that supports the global warming potential attributable to a passenger on a Qantas Group and/or an average emissions footprint per distance kilometre to be applied to codeshare and other non-Qantas Group flights for carbon neutral certification under the NCOS-CN program.

Therefore, the total net emissions coupled with the total passenger-kilometres travelled by the Qantas Group, provides the following updated functional unit (average emissions footprint per distance kilometre):

Passenger-Kilometres [pax-km]	<b>101,851,376,088</b>
Total Net Emissions [t CO <sub>2-e</sub> ]	<b>11,073,707</b>
Functional Unit [kg CO <sub>2-e</sub> per pax-km]	<b>0.1087</b>

The emissions for each sector (e.g., Sydney to Melbourne) vary as a function of the sector distance and fleet utilisation. The emissions for each sector are found on the 'Sector Emissions per pax' tab in the calculations.

The following is an indicative representation of how the LCA supports the volume of emissions attributable to a passenger flying a sector as per the LCA scope.

	Passenger-Kilometres [pax-km]	Total Tonnes of Carbon Neutral Flights Sold [t CO <sub>2-e</sub> ]
Qantas Customers	854,912,382	92,929
Jetstar Customers	493,388,936	53,631
Duty Travel	372,254,821	40,464
<b>Qantas Group</b>	<b>1,720,556,139</b>	<b>187,024</b>

The total tonnes of carbon neutral flights sold equate the total offsets purchased.

## 5. Carbon offsets for this year

This reporting year, carbon credits were purchased and retired through Qantas' carbon credit supplier by the following process:

*A preliminary assessment of uptake for voluntary carbon offsets is communicated to the voluntary carbon offsets' supplier. The supplier then prepares a portfolio that is, once approved by Qantas, purchased and retired (assigned to Qantas).*

The details of the credit retirement are provided in Table 3 below.

Table 3. Offset cancellations

Offset type	Registry	Serial number	Quantity (t CO <sub>2</sub> -e)
VCU	Markit	1610-67313634-67313950-VCU-006-MER-AU-14-587-01032010-28022011-0	317
VCU	Markit	1610-67311408-67313243-VCU-006-MER-AU-14-587-01032010-28022011-0	1,836
VCU	Markit	1301-56357554-56357603-VCU-006-MER-AU-14-587-01032010-28022011-0	50
VCU	Markit	1301-56357604-56357665-VCU-006-MER-AU-14-587-01032010-28022011-0	62
VCU	Markit	1301-56364746-56364886-VCU-006-MER-AU-14-587-01032010-28022011-0	141
VCU	Markit	1301-56355252-56355553-VCU-006-MER-AU-14-587-01032010-28022011-0	302
VCU	Markit	1301-56357666-56357975-VCU-006-MER-AU-14-587-01032010-28022011-0	310
VCU	Markit	2657-116642933-116644414-VCU-016-MER-AU-14-587-01032011-29022012-0	1,482
VCU	APX VCS Regsitry	2759-119478366-119502365-VCU-008-MER-TH-4-403-01012010-31122010-0	24,000
VCU	APX VCS Regsitry	3506-156245389-156262988-VCU-016-APX-PG-14-1122-22052009-31122012-0	17,600
VCU	APX VCS Regsitry	3092-136940769-136943168-VCU-006-MER-PE-14-868-01012010-31122012-0	2,400
VCU	APX VCS Regsitry	2906-127155662-127161261-VCU-008-MER-KH-3-181-01012012-31122012-0	5,600
VCU	APX VCS Regsitry	3503-156144876-156171111-VCU-028-APX-CN-1-1301-30062010-24122010-0	26,236
VCU	APX VCS Regsitry	3504-156171112-156171275-VCU-028-APX-CN-1-1301-25122010-21062011-0	164
VCU	APX VCS Regsitry	3556-157931057-157945630-VCU-016-APX-PG-14-1122-22052009-31122012-0	14,574
VCU	APX VCS Regsitry	2657-116647420-116650231-VCU-016-MER-AU-14-587-01032011-29022012-0	2,812
VCU	APX VCS Regsitry	2285-95254551-95259187-VCU-008-MER-KH-3-181-01012011-31122011-0	4,637
VCU	APX VCS Regsitry	2759-119507366-119527238-VCU-008-MER-TH-4-403-01012010-31122010-0	19,873
VCU	APX VCS Regsitry	3092-136943169-136944168-VCU-006-MER-PE-14-868-01012010-31122012-0	1,000
VCU	APX VCS Regsitry	3350-150138147-150139133-VCU-006-MER-PE-14-868-01012010-31122012-0	987
VCU	APX VCS Regsitry	3504-156171276-156193136-VCU-028-APX-CN-1-1301-25122010-21062011-0	21,861
VCU	APX VCS Regsitry	3312-148849568-148890031-VCU-003-APX-CN-1-1200-01012010-31122010-0	40,464
VCU	APX VCS Regsitry	2657-116656551-116656645-VCU-016-MER-AU-14-587-01032011-29022012-0	95
VCU	APX VCS Regsitry	2285-95264045-95264139-VCU-008-MER-KH-3-181-01012011-31122011-0	95
VCU	APX VCS Regsitry	3312-148890032-148890127-VCU-003-APX-CN-1-1200-01012010-31122010-0	96

VCU	APX VCS Regsity	2657-116656646-116656655-VCU-016-MER-AU-14-587-01032011-29022012-0	10
VCU	APX VCS Regsity	2285-95264140-95264149-VCU-008-MER-KH-3-181-01012011-31122011-0	10
VCU	APX VCS Regsity	3312-148890128-148890137-VCU-003-APX-CN-1-1200-01012010-31122010-0	10
Total offsets purchased			<b>187,024</b>

The Qantas Group has no surplus carbon offsets.

## 6. Declaration

To the best of my knowledge and having met the requirements of the National Carbon Offset Standard Carbon Neutral Program (NCOS CNP), the information provided in this Public Disclosure Summary is true and correct.

09/02/2015

Megan Flynn
Qantas Group Manager – Carbon Strategy

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## 7. Use of Trade Mark

The NCOS-CN trademarked logo was used by the Qantas Group during the course of the year (1 July 2013 - 30 June 2014) on communications and marketing material related to the NCOS-CN certified carbon offset programs of the Qantas Group.

Table 4. Trademark register

Where used	Logo type
Qantas Airlines website ( <a href="http://www.qantas.com.au/travel/airlines/fly-carbon-neutral/global/en">http://www.qantas.com.au/travel/airlines/fly-carbon-neutral/global/en</a> )	National Carbon Offset Standard
Jetstar Airlines website ( <a href="http://www.jetstar.com/mediacentre/sustainability">http://www.jetstar.com/mediacentre/sustainability</a> )	National Carbon Offset Standard Carbon Neutral Certified An Australian Government Initiative

## 8. Record Keeping and Quality Control

The Group Fuel and Environment Management Team is responsible for reviewing on an annual basis this LCA and incorporate changes in the nature of the parameters monitored.

In accordance with Section 22 of the *National Greenhouse and Energy Reporting Act 2007* (Cth), the Qantas Group is required to keep records of the activities of the members of its group for compliance purposes. These records are retained for five years from the end of the year in which the activities take place.

As recommended in the NGER Measurement Technical Guidelines, the Qantas Group retains details of the calculation and data analysis methods used for greenhouse gas emissions and energy production and consumption, including, where possible, the following:

- a list of all sources monitored;
- the activity data used for calculation of greenhouse gas emissions for each source, categorised by process and fuel or material type;
- documentary evidence relating to calculations—for example, receipts, invoices and details of payment methods;
- documentation of the methods used for greenhouse gas emissions and energy estimations;
- documents justifying selection of the monitoring methods chosen;
- documentation of the collection process for activity data for a facility and its sources; and
- records supporting business decisions, especially for high-risk areas relating to reporting coverage and accuracy.

Table 5: Records Established and Maintained for NCOS.

Name of record	Purpose of record	Person (and position) responsible for establishing and maintaining the record	Date last reviewed	Name/position of reviewer
<p>NCOS Annual Report, inclusive of:</p> <ul style="list-style-type: none"> <li>• LCA;</li> <li>• Public Disclosure Summary (PDS); and</li> <li>• Emissions Management Plan (EMP).</li> </ul>	<p>Summarises GHG footprint, GHG emission reduction measures, offset strategy, changes to calculations, and marketing of carbon neutrality.</p> <p><b>LCA:</b> Identifies &amp; quantifies GHG emissions.</p> <p><b>PDS:</b> Publicly discloses information on GHG measurement, reduction, offsetting and audit activities.</p> <p><b>EMP:</b> Describes systems in place to monitor, reduce and offset GHG emissions.</p> <p>All activity data used for calculation of GHG emissions categorised by emissions source; inherently inclusive of methods used for these calculations, citations and justifications for scoped activities.</p>	<p>William Reveron (Qantas Group Fuel and Environment Management Senior Analyst)</p>	<p>29/01/2015</p>	<p>Megan Flynn (Qantas Group Manager – Carbon Strategy)</p>
<p>EMP NCOS Central Data File FY14 Qantas Group.xlsx spreadsheet, inclusive of:</p> <ul style="list-style-type: none"> <li>• GHG Inventory.</li> </ul>	<p>Consolidation of the voluntary carbon offsets' uptake from the various channel the product is offered.</p>	<p>William Reveron (Qantas Group Fuel and Environment Management Senior Analyst)</p>	<p>29/01/2015</p>	<p>Megan Flynn (Qantas Group Manager – Carbon Strategy)</p>
<p>Carbon Offset Uptake Report</p>	<p>Initial LCA methodology defined by external consultants Energetics for Qantas. This provides the basis and context of the initial state of the LCA.</p>	<p>William Reveron (Qantas Group Fuel and Environment Management Senior Analyst)</p>	<p>29/01/2015</p>	<p>Megan Flynn (Qantas Group Manager – Carbon Strategy)</p>
<p>LCA Framework</p>		<p>William Reveron (Qantas Group Fuel and Environment Management Senior Analyst)</p>	<p>29/01/2015</p>	<p>Megan Flynn (Qantas Group Manager – Carbon Strategy)</p>

## 9. Emission Calculations, Emission Factors and Methodologies

Table 6: Emission Calculations.

Scope	Emission source	Source of activity data	Methodology reference	Energy content factor	Emission factor	Activity data	Unit	t CO <sub>2</sub> -e
<b>FLIGHT ACTIVITIES</b>								
Aviation Fuel 1 & 3	Fuel Burn	<p><b>Domestic fuel:</b> FY14 data reported under the <i>National Greenhouse and Energy Reporting (NGER) Act 2007</i>.</p> <p><b>International fuel:</b> FY14 Flight schedule data inclusive of the total fuel burn / uplift.</p> <p><b>Traffic and capacity statistics data:</b></p> <ul style="list-style-type: none"> <li>FY14 passenger-kilometres (pax-km) data publicly available (released to the ASX).</li> <li>FY14 Revenue Tonne Kilometres (RTKs) statistics that support the pax-km data made publicly available.</li> </ul>	<p>NGER's method.</p> <p>NGER's approved prescribed alternative approach for the scope 1 emission factor for CO<sub>2</sub> from the combustion of the jet fuel (67.539 kg CO<sub>2</sub>-e/GJ).</p> <p>Scope 1 default emission factors: CH<sub>4</sub> and N<sub>2</sub>O from the combustion of the fuel: NGA Factors 2013, Table 2.4.2B.</p> <p>NGA Factors 2013, Table 40 (Scope 3 emission factors).</p> <p>All Freight was excluded from flight activity by converting the available pax-km data to Revenue Passenger Tonne Kilometre (RPTK) using a passenger weight conversion factor of 96 kg.</p> <p>The percentage difference between the available Revenue Tonne Kilometre (RTK) data and the resulting RPTK data represents the Freight activity excluded from the emissions from the combustion of jet fuel.</p>	36.8 GJ/kl	<p><b>Scope 1:</b> 67.539 + 0.01 + 0.70 = 68.249 kg CO<sub>2</sub>-e/GJ</p> <p><b>Scope 3:</b> 5.30 kg CO<sub>2</sub>-e/GJ</p> <p><b>Total:</b> <b>73.55 kg CO<sub>2</sub>-e/GJ</b></p>	3,988,458	kl	10,795,174
<b>GROUND ACTIVITIES</b>								
Electricity 2 & 3	Purchased electricity from a grid	FY14 data reported under the <i>National Greenhouse and Energy Reporting (NGER) Act 2007</i> .	<p>NGER's method.</p> <p>Scope 2 emission factor: NGER (Measurement) Technical Guidelines July 2013, Table 7.2.</p> <p>Scope 3 emission factor: NGA Factors 2013, Table 41.</p>	Not applicable	kg CO <sub>2</sub> -e/kWh	kWh	kWh	205,345
					<p>NSW: 1.06 VIC: 1.32 QLD: 0.96 SA: 0.73 WA: 0.84 TAS: 0.22 NT: 0.77 NSW (Tri-generation): 0.72</p>	<p>NSW: 72,636,359 VIC: 43,080,754 QLD: 38,358,320 SA: 3,918,423 WA: 13,510,472 TAS: 1,322,952 NT: 688,028 NSW (Tri-generation): 27,263,663</p>		



Scope	Emission source	Source of activity data	Methodology reference	Energy content factor	Emission factor	Activity data	Unit	t CO <sub>2</sub> -e
<b>Natural Gas &amp; LPG</b>								
1	Natural gas distributed in a pipeline	FY14 data reported under the <i>National Greenhouse and Energy Reporting (NGER) Act 2007</i> .	NGER's method. Scope 1 emission factor: NGER (Measurement) Technical Guidelines July 2013, Table 2.3.2A.	39.3 GJ/KL	51.33 kg CO <sub>2</sub> -e/GJ	228,351	GJ	11,721
3	Natural gas distributed in a pipeline	FY14 data reported under the <i>National Greenhouse and Energy Reporting (NGER) Act 2007</i> .	NGER's method. Scope 3 emission factor: NGA Factors 2013, Table 37.	39.3 GJ/KL	kg CO <sub>2</sub> -e/GJ Metro – NSW: 12.80 Metro – ACT: 12.80 Metro – VIC: 3.90 Metro – QLD: 8.70 Metro – SA: 10.40 Metro – WA: 4.00 Metro – TAS: 0 Metro – NT: 0	GJ NSW: 74,966 ACT: 7,529 VIC: 99,977 QLD: 20,775 SA: 0 WA: 25,104 TAS: 0 NT: 0	GJ	1,727
1	Liquefied petroleum gas (Stationary)	FY14 data reported under the <i>National Greenhouse and Energy Reporting (NGER) Act 2007</i> .	NGER's method. Scope 1 emission factor: NGER (Measurement) Technical Guidelines July 2013, Table 2.4.2A.	25.7 GJ/KL	59.9 kg CO <sub>2</sub> -e/GJ	1,054	KL	1,622
3	Liquefied petroleum gas (Stationary)	FY14 data reported under the <i>National Greenhouse and Energy Reporting (NGER) Act 2007</i> .	NGER's method. Scope 3 emission factor: NGA Factors 2013, Table 40.	25.7 GJ/KL	5.0 kg CO <sub>2</sub> -e/GJ	1,054	KL	135
1	Liquefied petroleum gas (Transport)	FY14 data reported under the <i>National Greenhouse and Energy Reporting (NGER) Act 2007</i> .	NGER's method. Scope 1 emission factor: NGER (Measurement) Technical Guidelines July 2013, Table 2.4.2B.	26.2 GJ/KL	60.8 kg CO <sub>2</sub> -e/GJ	4	KL	7
3	Liquefied petroleum gas (Transport)	FY14 data reported under the <i>National Greenhouse and Energy Reporting (NGER) Act 2007</i> .	NGER's method. Scope 3 emission factor: NGA Factors 2013, Table 40.	26.2 GJ/KL	5.0 kg CO <sub>2</sub> -e/GJ	4	KL	1

Scope	Emission source	Source of activity data	Methodology reference	Energy content factor	Emission factor	Activity data	Unit	t CO <sub>2-e</sub>
<b>Ground Fuel</b>								
1	Gasoline (other than for use as fuel in an aircraft) (Transport)	FY14 data reported under the <i>National Greenhouse and Energy Reporting (NGER) Act 2007</i> .	NGER's method. Scope 1 emission factor: NGER (Measurement) Technical Guidelines July 2013, Table 2.4.2B.	34.2 GJ/kL	69.6 kg CO <sub>2-e</sub> /GJ	498	kL	1,185
3	Gasoline (other than for use as fuel in an aircraft) (Transport)	FY14 data reported under the <i>National Greenhouse and Energy Reporting (NGER) Act 2007</i> .	NGER's method. Scope 3 emission factor: NGA Factors 2013, Table 40.	34.2 GJ/kL	5.3 kg CO <sub>2-e</sub> /GJ	498	kL	90
1	Gasoline (other than for use as fuel in an aircraft) (Stationary)	FY14 data reported under the <i>National Greenhouse and Energy Reporting (NGER) Act 2007</i> .	NGER's method. Scope 1 emission factor: NGER (Measurement) Technical Guidelines July 2013, Table 2.4.2A.	34.2 GJ/kL	67.10 kg CO <sub>2-e</sub> /GJ	4	kL	8
3	Gasoline (other than for use as fuel in an aircraft) (Stationary)	FY14 data reported under the <i>National Greenhouse and Energy Reporting (NGER) Act 2007</i> .	NGER's method. Scope 3 emission factor: NGA Factors 2013, Table 40.	34.2 GJ/kL	5.3 kg CO <sub>2-e</sub> /GJ	4	kL	1
1	Diesel oil (Transport)	FY14 data reported under the <i>National Greenhouse and Energy Reporting (NGER) Act 2007</i> .	NGER's method. Scope 1 emission factor: NGER (Measurement) Technical Guidelines July 2013, Table 2.4.2B.	38.6 GJ/kL	69.9 kg CO <sub>2-e</sub> /GJ	4,933	kL	13,310
3	Diesel oil (Transport)	FY14 data reported under the <i>National Greenhouse and Energy Reporting (NGER) Act 2007</i> .	NGER's method. Scope 3 emission factor: NGA Factors 2013, Table 40.	38.6 GJ/kL	5.3 kg CO <sub>2-e</sub> /GJ	4,933	kL	1,009
1	Diesel oil (Stationary)	FY14 data reported under the <i>National Greenhouse and Energy Reporting (NGER) Act 2007</i> .	NGER's method. Scope 1 emission factor: NGER (Measurement) Technical Guidelines July 2013, Table 2.4.2A.	38.6 GJ/kL	69.5 kg CO <sub>2-e</sub> /GJ	1	kL	2
3	Diesel oil (Stationary)	FY14 data reported under the <i>National Greenhouse and Energy Reporting (NGER) Act 2007</i> .	NGER's method. Scope 3 emission factor: NGA Factors 2013, Table 40.	38.6 GJ/kL	5.3 kg CO <sub>2-e</sub> /GJ	1	kL	0
1	Kerosene (other than for use as fuel in an aircraft)	FY14 data reported under the <i>National Greenhouse and Energy Reporting (NGER) Act 2007</i> .	Scope 1 default emission factors: CH <sub>4</sub> and N <sub>2</sub> O from the combustion of the fuel: NGA Factors 2013, Table 2.4.2A. NGER's approved method 2 of the scope 1 emission factor for CO <sub>2</sub> from the combustion of the jet fuel (67.539 kg CO <sub>2-e</sub> /GJ).	37.5 GJ/kL	67.75 kg CO <sub>2-e</sub> /GJ	338	kL	858
3	Kerosene (other than for use as fuel in an aircraft)	FY14 data reported under the <i>National Greenhouse and Energy Reporting (NGER) Act 2007</i> .	NGER's method. Scope 3 emission factor: NGA Factors 2013, Table 40.	37.5 GJ/kL	5.3 kg CO <sub>2-e</sub> /GJ	338	kL	67

Scope	Emission source	Source of activity data	Methodology reference	Energy content factor	Emission factor	Activity data	Unit	t CO <sub>2</sub> -e
<b>Hydrofluorocarbons</b>								
1	HFCs – commercial air conditioning	FY14 data reported under the <i>National Greenhouse and Energy Reporting (NGER) Act 2007</i> .	NGER's method. Leakage rates for synthetic gases: NGA Factors 2013, Table 24.	Not applicable	Not applicable	Not applicable	Not applicable	140
1	HFCs – industrial refrigeration	FY14 data reported under the <i>National Greenhouse and Energy Reporting (NGER) Act 2007</i> .	NGER's method. Leakage rates for synthetic gases: NGA Factors 2013, Table 24.	Not applicable	Not applicable	Not applicable	Not applicable	1,057
3	Taxis	Data based on taxi expenditure provided by Qantas Finance Department	NGER's method. Scope 1 emission factor: NGER (Measurement) Technical Guidelines July 2013, Table 2.4.2B.  Methodology based on the Victorian EPA's methodology from the EPA <i>Greenhouse Gas Inventory Management Plan 2010-11</i> .  Taxi emissions = (distance travelled by taxis) x (average fuel (LPG) consumption by taxis per distance travelled) x (LPG emission factor).  Distance travelled by taxis = Expenditure on taxis [\$] / average taxi fare per kilometre rate [\$/km]).  Average taxi fare per kilometre rate is \$1.27/km (inclusive of GST) or \$1.15/km (exclusive of GST). <b>Reference:</b> <i>ATO &gt; Business &gt; Consultation: Business &gt; In detail &gt; Transport and taxi &gt; Publications</i> ( <a href="http://ato.gov.au/Business/Consultation--Business/In-detail/Transport-and-taxi/Publications/Taxi-cents-per-kilometre-rates/?keepThis=true&amp;TB_iframe=true&amp;height=650&amp;width=960&amp;caption=ATO+-+SiteIA">http://ato.gov.au/Business/Consultation--Business/In-detail/Transport-and-taxi/Publications/Taxi-cents-per-kilometre-rates/?keepThis=true&amp;TB_iframe=true&amp;height=650&amp;width=960&amp;caption=ATO+-+SiteIA</a> ).  Average fuel consumption (LPG) by taxis per distance travelled is 0.18 kL/km. <b>Reference:</b> <i>ATO &gt; Business &gt; Small business benchmarks &gt; Previous years &gt; Benchmarks by business type A-Z &gt; R-Z</i> ( <a href="https://www.ato.gov.au/Business/Small-business-benchmarks/Previous-years/Benchmarks-by-business-type-A-Z/R-Z/Taxi-drivers-and-operators---issued-2013/">https://www.ato.gov.au/Business/Small-business-benchmarks/Previous-years/Benchmarks-by-business-type-A-Z/R-Z/Taxi-drivers-and-operators---issued-2013/</a> ).  <b>Note:</b> <i>Scope 1 emission factor was used for the direct emissions as a result of the fuel consumed due to taxi travel. However, these emissions represent part of our scope 3 emissions.</i>	26.20 GJ/kL	60.80 kg CO <sub>2</sub> -e/GJ	501	kL	<b>Taxis</b> 798

Scope	Emission source	Source of activity data	Methodology reference	Energy content factor	Emission factor	Activity data	Unit	t CO <sub>2</sub> -e
3	Accommodation	Data based on duty travel costs (excluding taxis and hire cars) provided by Qantas Finance Department.	<p>A cost of \$120 per hotel room per night was assumed.</p> <p>The total number of hotel nights for the year was determined. All cost data was assumed to be for hotel nights.</p> <p>The average kWh/night rating for a typical hotel room was determined. This was calculated from a previous energy audit conducted at a hotel by Energetics (71 kWh/day/room).</p> <p>The total number of hotel nights for the given period was multiplied by the average kWh/day/room to give the total consumption for this period.</p> <p>The emission factor for electricity end use of 1.17 kg CO<sub>2</sub>-e/kWh for Victoria (highest emission factor for electricity) from NGER (Measurement Technical Guidelines July 2013, Table 7.2 (Scope 2 emission factor))</p> <p><b>Note:</b> Scope 2 emission factor was used for the direct emissions as a result of the electricity consumed due to hotel accommodation. However, these emissions represent part of our scope 3 emissions.</p>	Not applicable	1.17 kg CO <sub>2</sub> -e/kWh	140,025	kWh	164
<b>Waste to Landfill</b>								
3	Waste – Food waste	FY14 data reported under the sustainability report.	<p>NGER's method.</p> <p>Scope 3 emission factor: NGA Factors 2013, Table 42 (Waste mix methane conversion factors).</p> <p>NGER's method.</p>	Not applicable	1.6 t CO <sub>2</sub> -e/t waste	13,972	t	22,354
3	Waste – All other Waste	FY14 data reported under the sustainability report.	<p>Scope 3 emission factor: NGA Factors 2013, Table 44 (Waste emission factors for total waste disposed to landfill by board waste stream category).</p>	Not applicable	1.1 t CO <sub>2</sub> -e/t waste	7,807	t	8,587

Scope	Emission source	Source of activity data	Methodology reference	Energy content factor	Emission factor	Activity data	Unit	t CO <sub>2</sub> -e
<b>Embodied Energy</b>								
3	Embodied Energy	Fleet stocktake: FY14 Annual Report.  Aircraft basic empty weight provided by Qantas Engineering department.	The embodied energy of aluminium (Al) was multiplied by the French electricity emissions factor to give an emissions factor for embodied energy in aluminium of 6.89 t CO <sub>2</sub> -e/t Al.  Embodied energy of Al is 170 GJ/t. <b>Reference:</b> YourHome. <i>Australia's guide to environmentally sustainable homes. Embodied energy for common building materials.</i> ( <a href="http://www.yourhome.gov.au/sites/prod.yourhome.gov.au/files/pdf/YOURHOME-3-Materials-1-EmbodiedEnergy-(4Dec13).pdf">http://www.yourhome.gov.au/sites/prod.yourhome.gov.au/files/pdf/YOURHOME-3-Materials-1-EmbodiedEnergy-(4Dec13).pdf</a> )  French electricity emission factor is 0.146 t CO <sub>2</sub> -e/MWh. <b>Reference:</b> Covenant of Majors. <i>Committed to local sustainable energy. Technical annex to the SEAP template instructions document: The Emission Factors</i> ( <a href="http://www.eumajors.eu/IMG/pdf/technical_annex_en.pdf">http://www.eumajors.eu/IMG/pdf/technical_annex_en.pdf</a> )  Conversion factor of 3.6 GJ/MWh.  The aircraft basic empty weight was multiplied by the number of each aircraft in the fleet to give the total weight of aluminium. This figure was then multiplied by emission factor for embodied energy in aluminium and divided over the lifespan of the fleet (20 years) to estimate the resulting annual emissions.	170 GJ/t (embodied energy of aluminium)	6.89 t CO <sub>2</sub> -e/t Al	965	t	6,656
<b>Magazines</b>								
3	Magazines	Data based on Qantas prior year's LCA.	The quantity of magazines produced per month (184,930) was multiplied by 12 to give the total magazines for the period.  The mass of an individual magazine was multiplied by the total number of magazines for the period to provide total mass of magazines produced (kg). The paper used in magazine production was assumed to be recycled paper and sourced domestically (references available in the calculations).	Not applicable	1.52 kg CO <sub>2</sub> -e/kg	1,110	t	1,687

**Total footprint**

**11,073,707**

