COMPANY NAME

Austral Bricks Tasmania Ltd

BASE YEAR:

01/07/2012 – 30/06/2013

FIRST CARBON NEUTRAL PERIOD:

01/07/2013-30/06/2014

Declaration

To the best of my knowledge, the information provided in this Public Disclosure Summary is true and correct and meets the requirements of the National Carbon Offset Standard Carbon Neutral Program.

S. Mouzakis

STEVEN MOUZAKIS

NATIONAL ENERGY + SUSTAINABILITY MANAGER

Type of carbon neutral certification: ***Product***

Verification

Date of most recent external verification/audit:

Auditor:

Auditor assurance statement link:

1. Carbon neutral information

1A. Introduction

Brickworks Ltd (Brickworks) is one of the major players in the Australian brick industry.

Brickworks has been transformed from originally a New South Wales state based operation to a national organisation with manufacturing operations in NSW, Victoria, Tasmania, South Australia, Western Australia and Queensland. Austral Bricks is a subsidiary of Brickworks. Austral Bricks manufactures and markets clay products such as bricks and pavers. The manufacturing process involves mining clay and shale and mechanically processing it prior to shaping and firing the bricks in kilns fuelled predominately by natural gas.

As stated on the NCOS website, Products are carbon neutral when its net greenhouse gas emissions (emissions) are equal to zero. To become carbon neutral, organisations must calculate their emissions, reduce these emissions as much as possible, and then purchase and cancel carbon offsets or carbon credits equivalent to the remaining emissions. This process results in emissions being offset and leads to net zero emissions or being carbon neutral.

This NCOS inventory concerns bricks manufactured at Brickworks' operation in Longford, Tasmania – Austral Bricks Tasmania (see Figure 1). At this site Austral Bricks Tasmania produces a range of bricks and pavers for the Tasmanian, other Australian markets and overseas markets (see Figure 2). This inventory has been prepared and verified based on the NCOS, the ISO14040:2006 and ISO14044:2006 standard and emissions are offset in accordance with the NCOS. The greenhouse gases considered in this inventory are shown in Figure 7.

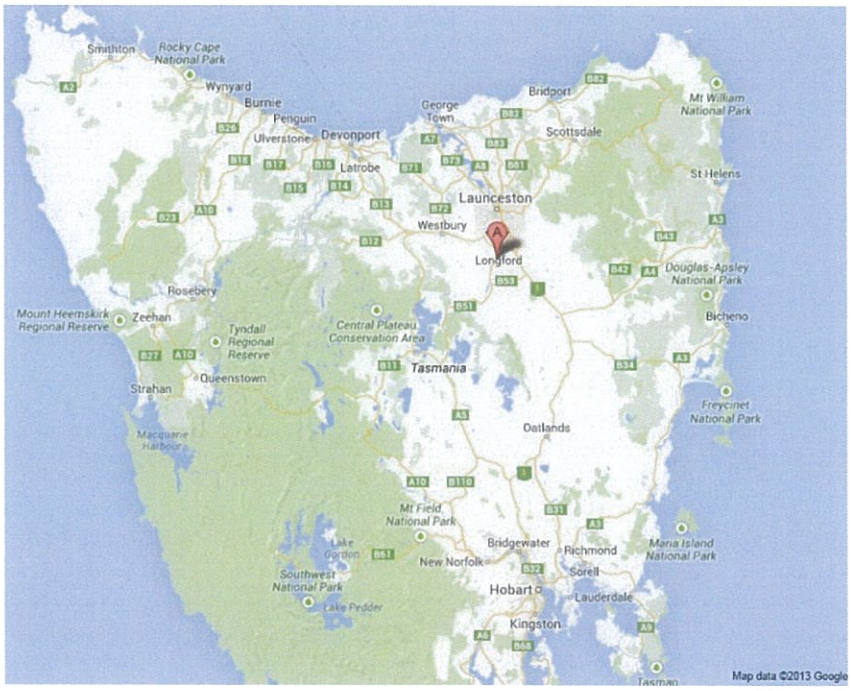


Figure 1: Plant location in Longford, Tasmania (Source: Google maps)

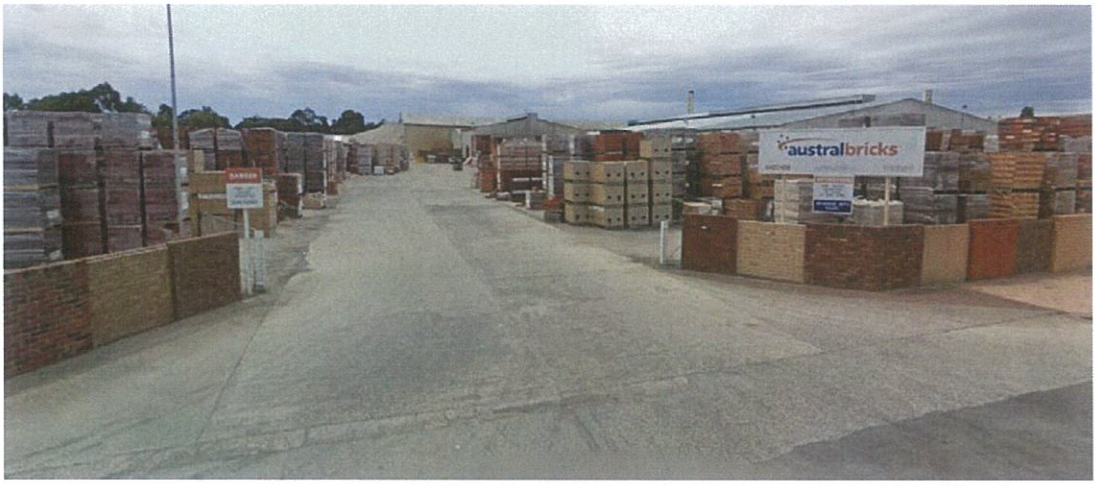


Figure 2: View of Longford plant storage yard (Source: Google maps)

Austral Bricks Tasmania intend to have all of the clay products manufactured at their Longford plant certified as carbon neutral under the NCOS program. These products can be classified as bricks and pavers:

1) **Bricks**. Clay bricks are a common building material used predominantly for wall systems in residential buildings.
2) **Pavers**. Clay pavers are used for paving and landscaping in residential, commercial and industrial applications.

Bricks are used for a number of reasons:

- load-bearing capacity; this makes bricks suitable for load-bearing walls,
- aesthetics; bricks are available in a large range of colours, tones and textures,
- durability; bricks perform their function for the duration of the service life of the building, and
- bricks require relative little maintenance and cleaning.

Pavers are similar in appearance and characteristics to bricks, although they are used for paving rather than wall applications.

Table 1 and Table 2 present examples of the products studied in this LCA.

Table 1: Typical brick product configurations (Source: Austral Bricks)

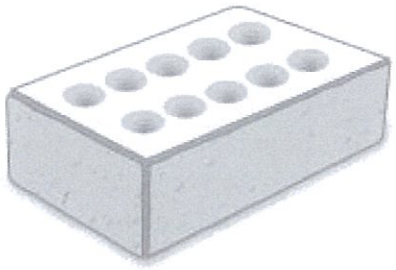
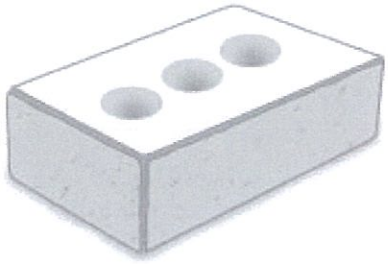
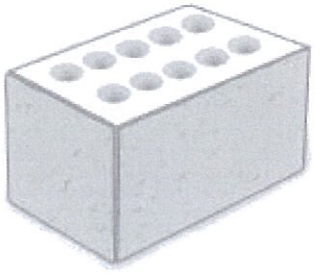
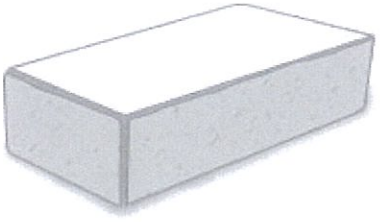
Brick shape & core hole configuration	Examples - bricks in wall application
Standard brick with 10 core holes 	
Standard brick with 3 core holes 	
Twin brick 	

Table 2: Typical paver product configuration (Source: Austral Bricks)

Paver shape	Example - pavers in paving application
Classic paver (no core holes) 	

The functional unit for this study is:

1,000 Single Brick Equivalents (SBEs) of bricks or pavers manufactured in Longford and used in various applications throughout Tasmania, interstate and overseas.

Single Brick Equivalent is a common unit of measurement across the clay brick industry for a brick. An SBE refers to the fired product and has the dimensions of 230x110x76mm (Think Brick Australia 2010). The products covered in this study come in a range of different sizes, which have been converted to SBEs for the purpose of this LCA.

Clay bricks are used in (residential) construction; typically walling systems, planter boxes, etc. Clay pavers are used in paving and landscaping applications.

The functional unit covers the whole life cycle of the products, including cradle-to-gate manufacturing (including packaging), delivery to site, application, cleaning and maintenance and disposal at end-of-life.

Note: Mortar and/or other materials used to bond bricks in their application are excluded from the carbon footprint assessment. The reasons for this exclusion are:

- Brickworks does not supply the mortar to clients, and therefore has no control over the composition and quantity of mortar used.
- Furthermore, the bricks and pavers are used in a range of applications that have varying requirements regarding ancillary materials. Any attempt to capture these requirements within the scope of this study would introduce additional uncertainty.

1B. Emission sources within certification boundary

The items included in this chapter cover all mandatory issues from the ISO14044:2006 standard – Goal and scope definition section (International Organization for Standardization 2006b).

Product system description

This NCOS LCA encompasses the complete life cycle of bricks and pavers:

- Raw material extraction
- Transport of raw materials to Longford
- Brick and paver manufacturing at Longford
- Packaging of fired products
- Transport to customers
- Application in works
- Use and maintenance during their life time
- Demolition and disposal at end-of-life

Other attributable processes include non-production related company facilities at Longford (i.e. offices), company vehicles and business travel of staff based in Longford.

The bricks and pavers can be applied in a range of construction works. Ancillary items that might be required for the application, such as mortar, have been excluded as these items are not supplied by Austral Bricks Tasmania.

A description of the processes in each life cycle stage is provided hereafter. This section refers mostly to bricks only. Unless specifically stated, the process is identical for pavers.

Raw materials

Natural clay minerals, including shale, make up the main body of brick. Small amounts of manganese and other additives (sawdust, coal) are blended with the clay to produce different colours. Production waste (brick batts) is ground and recycled back into the clay mixture, resulting in a situation where no production waste leaves the Longford facility.

A variety of coating materials and methods are used to produce brick of a certain colour or surface texture. To create a typical coating, sand is mechanically mixed with some type of colorant (e.g. manganese, red oxide, char, sawdust, etc.). Sometimes frit (a glass containing colorant) is added to produce surface textures.

Extraction of raw materials

Clay and other minerals are extracted from the earth using typical mining equipment. Some clay pits require removal of a top layer before the clay can be extracted.

Diesel used to power equipment is the main greenhouse gas emission source.

Land use and Land Use Change emissions related to clay extraction have been excluded from this assessment as these are likely negligible. Clay pits typically operate for many years, with limited annual change in land use. Furthermore, any attempt to determine the land use emissions would be impractical due to the lack of verifiable data.

Transport of raw materials to Longford

All raw materials are transported to Longford by truck. Materials sourced from outside Tasmania require additional shipping. Raw materials such as clay and shale are 'stock piled' in proportioned layers for a desired mixture.

The brick manufacturing process

The initial step in producing bricks is crushing, followed by grinding. The raw materials are crushed by a crusher and then go through a pan mill for grinding. Particle size is controlled by a screen installed in the grinding machinery. The raw materials are mixed homogeneously in the crushing and milling process. Next, the blend of ingredients desired for each particular batch is sent on to the brick shaping processes (extrusion). Once the bricks are formed, they are dried to remove excess moisture that might otherwise cause an explosion during the ensuing firing process. The bricks are fired in a tunnel kiln and then cooled. Finally, they are dehacked —automatically stacked on pallets and particleboard, wrapped with plastic bands, plastic corner protectors and potentially shrink film.

The Longford plant uses mainly sawdust to fire the kiln.

Transport of bricks to the customer

Packaged bricks are transported to Tasmanian customers using Austral Bricks Tasmania's own fleet of trucks. These trucks have specific booms to unload the bricks safely (see Figure 3). Contractors are used to transport bricks to customers in other states (mainly Victoria), overseas and parts of North-West Tasmania.

Austral Bricks Tasmania has provided fuel consumption data for its own trucks. Literature data have been used to estimate fuel use by contractors based on transport volumes (mass) and distances. Shipping has been included for all transport to the Australian mainland (via Port of Melbourne, Victoria) and bricks that have been exported to Yokohama (Japan), Pusan (Korea) and Auckland (New Zealand). Exported bricks are assumed to travel 100 km by truck from the port of destination to the end-use.

Figure 3: Typical delivery truck

Application of bricks and pavers in their application

Bricklaying is mostly a manual exercise. Therefore there are no emissions associated with the application of bricks and pavers.

Note that ancillary materials, such as mortar, are not included within the system boundaries.

Use and maintenance of bricks and pavers

Bricks and pavers are inert. Therefore there are no (greenhouse gas) emissions directly associated with the products during use.[1]

Bricks do not require regular, extensive cleaning under normal circumstances. However there are a number of mechanisms that can lead to stains or damaged bricks. Examples[2] are:

- Mortar smears. These are the result of the bricklaying process and can be easily wiped off with water before they have hardened. Removing hardened mortar smears requires a hydrochloric acid based cleaner.
- Stains – Efflorescence (see Figure). Crystallised salts on the surface of bricks can mostly be removed with a dry brush.
- Stains – Insoluble white deposits (e.g. Calcium). These deposits can be removed with particular acids.
- Stains – Iron oxide, manganese, vanadium stains. These stains can occur for various reasons when the mineral or oxide is present in the bricks. They can be removed with specific *acid based cleaning solutions.*

Apart from these examples walls might also be stained with organic growths, soils, timber and soots and smoke. It is clear that there is not a single or typical scenario for cleaning of bricks, especially given that many of the causes for smears or stains are external.

It is also not practical to define a cleaning scenario related to a single brick (or 1,000 Single Brick Equivalents – SBEs) as illustrated by Figure 4: many problems are restricted to minor areas on a wall.

For these reasons, cleaning of bricks has been excluded from the carbon footprint assessment.

[1] When bricks are used in the wall of a building they become part of the functional unit of that building. The operational energy used by the building depends on many factors and cannot be related to the bricks alone. Therefore, operational energy is outside the system boundary of this LCA.

[2] Source: Think Brick Australia, Industry Reference Guide, Fifth Edition 2009

Figure 4: Efflorescence; the result of soluble salts that migrated to the surface
(Source: Think Brick Australia, Industry Reference Guide, Fifth Edition 2009)

The service life of bricks depends on the application. However, their durability means that under normal circumstances replacements are not required. The carbon footprint presented in this report is expressed for 1,000 SBEs and excludes any replacements.

Maintenance of bricks during their service life is not required under normal circumstances.

Therefore, we believe it justifies for exclusion from the LCA and it is in line with NCOS section 4.2.3 (f).

Demolition of bricks and pavers

Demolition is excluded from the life cycle of a brick or paver as it is assumed that demolition only takes place when the structure (e.g. house) is demolished. Given the scarcity of reliable data on demolition processes and their limited estimated impact (<5%) on the overall environmental impacts of a building, it was deemed not useful to try to allocate demolition impacts to a single brick, brick wall or paved area. This is in line with NCOS section 4.2.3 (f).

Disposal at end-of-life

In Tasmania, bricks are currently not recycled. Therefore, all bricks and pavers are assumed to go to landfill. In Victoria, 56% of masonry products is recycled(Hyder Consulting 2012). This percentage is likely an overestimate for clay bricks, although this detail is not available. Bricks can be recycled into rubble for landscaping, road foundations, pathways, etc. Only a very small percentage of bricks get recycled into new bricks. The recycled products typically replace sand, crushed rocks or clay. The environmental impacts and benefits from recycling have not been taken into account in this study, as a cut-off has been applied after transport to the recycling facility.

We assume bricks are transported 50 km from the building site to the landfill site (or recycling facility) by truck.

Sawdust

Sawdust is a low-value by-product from sawmills. Detailed information on the contribution of sawdust to a mill's total income is not available. For the purpose of this LCA the sawdust has been treated as a zero-value (waste) material, which means no embodied emissions (scope 3 emissions resulting from energy use and land use change) are associated with the production of sawdust. We note that scope 3 emissions factors for biomass fuels are not available through the NGA factors workbook.

Sawdust is supplied from a number of different sawmills. We have used sawdust supply data from March 2014 to determine the weighted average transport distance (105km) between sawmills and Longford. The impact of this simplification is less than 1% on the total footprint.

1C. Diagram of certification boundary

The system boundary (key processes and flows shown in Figure 5) describes which processes are included and excluded in the LCA. This LCA for Austral Bricks Tasmania covers the full life cycle of clay bricks and pavers manufactured in Longford, Tasmania.

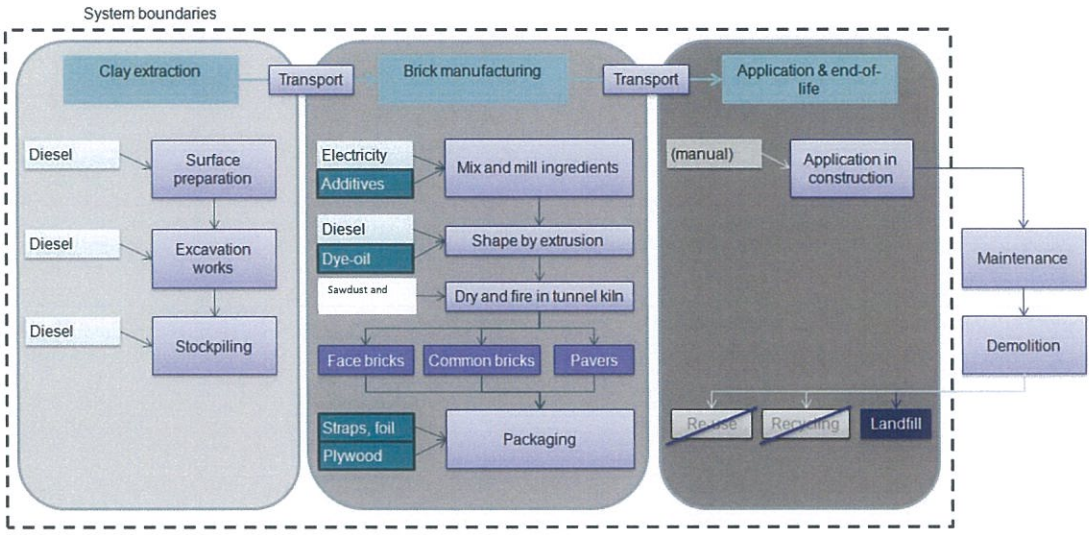


Figure 5: LCA System Boundary Diagram according to ISO14044 principles

For each life cycle stage, all attempts have been made to identify and quantify material flows to and from the environment. The inputs include materials, fuels and energy while the outputs include products, emissions and waste.

For the purposes of this study, the embodied energy incorporated in the infrastructure (buildings, plant, equipment, roads, vehicles, etc.) associated with manufacturing bricks and pavers is excluded from the product system. Other capital goods (e.g. power lines) are excluded as well. This is due to the long lifetime of capital goods in the brick lifecycle and the impact of this exclusion on the footprint is small.

Austral Bricks Tasmania has applied a cut-off for flows smaller than 1% (mass and expected environmental impact). This means it has estimated environmental impacts, instead of collecting detailed information for these smaller emission sources.

Figure shows how a product footprint is related to a company's emission reporting. Austral Bricks Tasmania reports its scope 1 & 2 emissions under the National Greenhouse and Energy Reporting Act 2007 (Commonwealth of Australia 2007). The footprint of bricks and pavers includes upstream and downstream emissions as well.

Figure [1.1] The relationship between the *Corporate, Scope 3, and Product Standards* for a company manufacturing product A

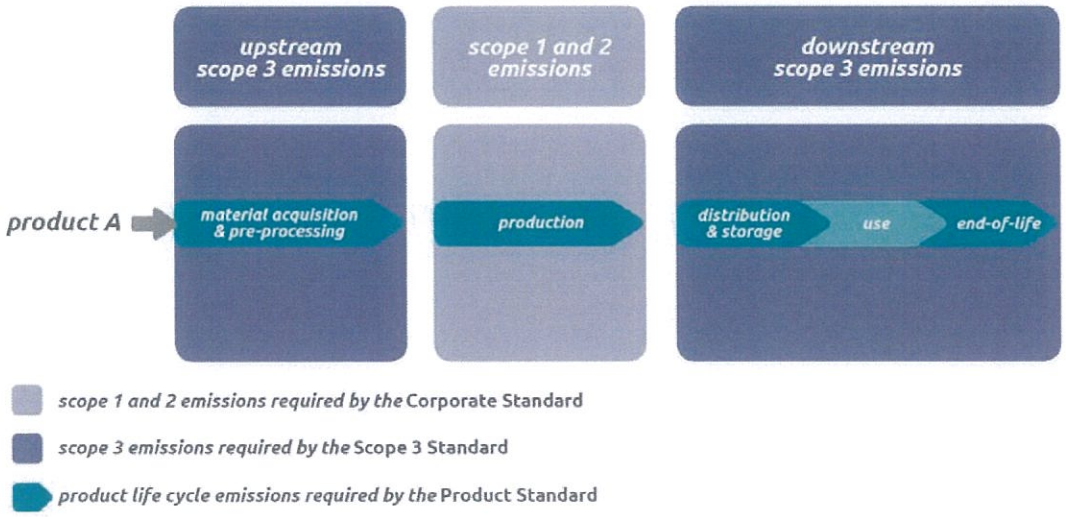


Figure 6: Relationship between GHG Protocol standards (Source: World Resources Institute and World Business Council for Sustainable Development 2011)

Austral Bricks Tasmania has checked the definition of the system boundary in this study with requirements from the GHG Protocol Product Life Cycle Accounting and Reporting standard (World Resources Institute and World Business Council for Sustainable Development 2011, Chapter 7). The system boundaries as defined by the GHG Protocol are slightly different from the ISO 14040 and ISO 14044 standards.

Based on this evaluation we have decided to add two emission sources to the footprint:

- Business travel of employees based in Longford
- Company vehicles of employees based in Longford.

The system boundaries according to the GHG Protocol are depicted in Figure 7.

After inclusion of these additional items we believe all relevant requirements have been met.

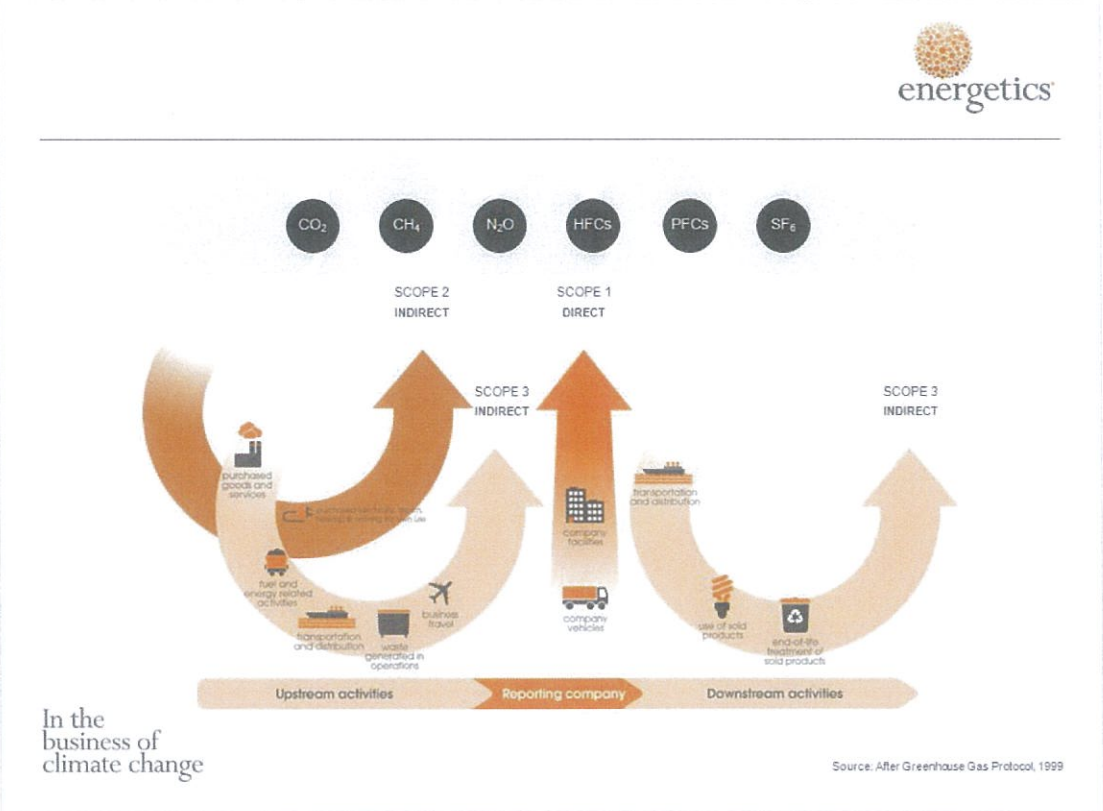


Figure 7: Emission sources covered by this LCA, GHG Protocol

2. Emissions reduction measures

2A. Emissions over time

Table 1 shows the total emissions and Table 2 shows the emissions/1000 SBE (Single brick equivalent) since the base year.

Table 1. Emissions since base year (t *CO2-e*)

	Base Year 2012-2013	Year 1 2013-2014	Year 2 2014-2015	Current Year 2015-2016
Scope 1	1,140	1,279	1,188	2,091
Scope 2	782	677	338	359
Scope 3	1,480	1,573	1,718	2,229
Total	3,402	3,529	3,245	4,679

Table 2. Emissions/1,000 SBEs since base year (t *CO2-e*)				
	Base Year 2012-2013	**Year 1 2013-2014**	**Year 2 2014-2015**	**Current Year 2015-2016**
Scope 1	0.10	0.11	0.13	0.15
Scope 2	0.07	0.06	0.04	0.03
Scope 3	0.14	0.13	0.19	0.16
Total	0.31	0.29	0.36	0.34

2B. Emissions reduction strategy

Austral Bricks Tasmania understands and accepts its responsibility for environmental protection which is integral to the conduct of its commercial operations. Austral Bricks Tasmania's objective is to comply with all applicable environmental laws, regulations and community standards in a commercially effective way. We are committed to encouraging concern and respect for the environment and emphasising every employee's responsibility for environmental performance.

Reducing energy consumption, emissions and associated costs are key issues organisations are facing in a carbon constrained world with increasing energy prices. Austral Bricks Tasmania actively participates in greenhouse gas reporting scheme such as National Greenhouse and Energy Reporting (NGER) Act 2007. This programme requires organisations to measure and report their energy consumption, production and greenhouse gas emissions under strict protocols. The data is subsequently collated and reported to Senior Management and the Board.

Austral Bricks Tasmania produces low embodied carbon bricks fired in traditional kilns fuelled by saw dust at over 1000°C. The management team has implemented numerous initiatives to reduce energy consumption and greenhouse gas emissions as below. These initiatives will drive down energy consumption per unit of production.

2C. Emissions reduction actions

New lighting system:

In order to reduce electricity use in the plant, the metal halide lighting system is being replaced with more efficient induction lighting system. 24 units have been replaced in this reporting period (15-16FY).

Changing of 500W sodium vapour lighting system to 250W induction system reduced the consumption by 250W/unit. 23 units were replaced during this reporting period and estimated total energy saving was 24 units X 250W X 24 (hours/day) X 350 (operation days) = 50,400 kWh which equates to 5.8t $CO_{2\text{-}e}$ based on NGA factors 2016.

Reduction of fan speed by VSD:

Four centrifugal fans, are used as part of the Kiln, Dryer and Sawdust Preparation process. In order to provide the required flow rates inlet guide vane dampers have been installed to reduce the actual output of fans.

These inlet guide vane dampers were replaced by the VSD unit and the power demand of fan motors can be significantly reduced by reducing the fan speed. List of fans which are planned to replaced with the VSD units (3 fans out of 4 fans used) are as below. This project started during the current reporting period (15-16FY) period and it is expected to be completed during the 16-17FY period due to financial reasons.

- Current kiln exhaust fan (34kW) will be replaced with a 20kW VSD unit, a reduction of 14kW
- Current saw dust induction fan (28kW) will be replaced with a 13kW VSD unit, a reduction of 15kW
- Current saw dust exhaust fan (7kW) will be replace with a 4kW VSD unit, a reduction of 3kW

Considering the fans would operate 8,400hours per year, anticipated energy saving is;

(14kW + 15kW + 3 kW (reduction of electric motor capacity)) X 8400 hours = 269MWh

and the anticipated CO_{2-e} reduction is 34.9t CO_{2-e} based on NGA factors 2016.

3. Emissions summary

Table 3. Emissions Summary

Scope	Emission source	t CO_2-e
Scope	Emission source	141.1
1	Truck vehicle fleet (diesel); on-site vehicles	533.8
1	Truck vehicle fleet (diesel); transport to customers, delivery trucks and company cars	0.0
1	Truck vehicle fleet (petrol); transport to customers, delivery trucks and company cars	1.1
1	Company cars (petrol)	25.1
1	Kiln fuel (bituminous coal) use	1,093.6
1	Kiln fuel (natural gas) use	176.4
1	Kiln fuel (saw dust) use	110.9
1	Body additive (coal) use	8.9
1	Body additive (sawdust) use	358.5
2	Longford plant electricity use	7.2
3	Truck vehicle fleet (diesel extraction & distribution); on-site vehicles	27.3
3	Truck vehicle fleet (diesel extraction & distribution); transport to customers, delivery trucks and company cars	0.0
3	Truck vehicle fleet (petrol extraction & distribution); transport to customers, delivery trucks and company cars	0.1
3	Company cars (petrol extraction & distribution)	0.8
3	Kiln fuel (bituminous coal) production	165.5
3	Kiln fuel (natural gas) production and distribution	0.0
3	Kiln fuel (saw dust) production	0.1
3	Kiln fuel (bituminous coal) distribution	45.6
3	Kiln fuel (saw dust) distribution	3.7
3	Body additive (coal) production and distribution	0.0
3	Body additive (sawdust) production and distribution	2.9
3	Body additive (manganor) production and supply	17.7
3	Body additives transport to Longford	46.8
3	Longford plant electricity transmission and distribution losses	33.3
3	Clay, sand & shale extraction	139.8
3	Clay, sand & shale transport to Longford	79.4

Table 3. Emissions Summary		
Scope	Emission source	t CO_2-e
3	Various face additives - extraction / production	2.5
3	Various face additives - transport to Longford	2.8
3	Overhead - water use	3.9
3	Overhead - waste water	0.0
3	Overhead - Cardboard to recycling	15.4
3	Overhead - Solid waste to landfill	3.7
3	Overhead - business travel	38.9
3	Packaging - Plastic Wrap - polyester strap	1.5
3	Packaging - Austral labels - PP film	0.0
3	Packaging - DR labels - PP film	0.0
3	Packaging - Pallets FUM -EXPORT	0.4
3	Packaging - Pallets -930 X 940	1.1
3	Packaging - Export plastic strap - polyester	736.1
3	Contractor vehicle fleet; off-site vehicles; transport to customers	503.1
3	Third party shipping; off-site; transport to customers	349.7
3	End-of-life - transport to landfill	0.0
3	End-of-life - bricks in landfill	141.1
Total Gross Emissions		4679
GreenPower or retired LGCs		0
Total Net Emissions		4679

4. Carbon offsets

4A. Offsets summary

Table 4. Offsets Summary			
Offset type and registry	Year retired	Quantity	Serial numbers
VCU – APX VCS Registry (Surplus offset from the 14-15FY period)	2016	17 tons	4093-174484197-174486396-VCU-003-APX-CN-1-1490-01122010-31122010-0 (Refer to Offset report 2016)
VCU – APX VCS Registry	2017	200 tons	2646-115115406-115115605-VCU-016-MER-AU-14-641-01072011-15042012-0 (https://vcsregistry2.apx.com/myModule/rpt/myrpt.asp?r=206&h=15972)
VCU – APX VCS Registry	2017	150 tons	2646-115079251-115079400-VCU-016-MER-AU-14-641-01072011-15042012-0 (https://vcsregistry2.apx.com/myModule/rpt/myrpt.asp?r=206&h=15674)

Table 4. Offsets Summary			
Offset type and registry	Year retired	Quantity	Serial numbers
VCU – APX VCS Registry	2017	50 tons	3291-148271643-148271692-VCU-016-MER-AU-14-641-16042012-15042013-0 (https://vcsregistry2.apx.com/myModule/rpt/myrpt.asp?r=206&h=15529)
VCU – APX VCS Registry	2017	3,000 tons	4079-173927646-173930645-VCU-041-APX-CN-1-1126-25122007-24122008-0 (https://vcsregistry2.apx.com/myModule/rpt/myrpt.asp?r=206&h=15710)
VCU – APX VCS Registry	2017	1,300 tons	4093-174496397-174497696-VCU-003-APX-CN-1-1490-01122010-31122010-0 (https://vcsregistry2.apx.com/myModule/rpt/myrpt.asp?r=206&h=14217)
Total offsets retired			4,717 tons
Net emissions			0 tons
Total offsets held in surplus for future years:			38 tons Serial Number: 4079-173927646-173927646-VCU-041-APX-CN-1-1126-25122007-24122008-0)

4B. Offsets purchasing and retirement strategy

Upon determination of final tonnes of carbon emissions required to be offset, Brickworks has engaged an accredited provider (CTX Global) of carbon offsets (such as VCUs) to purchase and surrender the offsets as required under the NCOS at the end of the reporting period. The carbon emissions to be offset are determined based on the production volume of the bricks and pavers during the reporting period (15-16FY).

The purchase and surrender of the offsets will occur within 4 months of the each reporting period. It is Brickworks intention to purchase eligible offsets generated from Australia and NZ Projects as well as permits generated in overseas projects.

4C. Offset projects (Co-benefits)

5. Use of trade mark

Table 5. Trade mark register	
Where used	Logo type
Carbon Neutral Brick Brochure	Carbon Neutral Certificate Trade Mark (for product)
Austral Brick Website	Carbon Neutral Certificate Trade Mark (for product)
Austral Brick Tasmania Product Brochure	Carbon Neutral Certificate Trade Mark (for product)

6. Have you done more?