Zero Carbon Development

What is zero carbon development and how do I make my project zero carbon?

What's included in this fact sheet:

Zero carbon developments are new buildings that have no net carbon emissions. They not only produce significantly less carbon emissions over the lifecycle of the building, but they generate and drive demand for renewable energy and are avoid the use of fossil fuels.

Effective design strategies, technologies and construction techniques are being incorporated into leading residential and commercial developments to reach a zero carbon standard. Use this fact sheet to help you deliver a zero carbon in your next development project.

Why do our developments need to change?

The role of cities in stepping up to act on climate change has been recognised by international climate agreements. National and state governments, cities, investors, businesses and communities alike have all taken action to reduce greenhouse gas emissions to help avoid global temperature increases. The Victorian Government has set a target of achieving net zero emissions by the year 2050.

Buildings make up 66% of Victoria's carbon emissions and as such, the built environment and the push for net zero buildings will play a big role in achieving this target.

Net zero carbon buildings are cheaper in operation, healthier and more resilient than average buildings and deliver environmental, social and economic benefits to the community. We know the built environment can deliver rapid and cost-effective reductions to emissions and energy consumption using technologies and approaches that are widely available today.

We need to work together to take advantage of the benefits that zero carbon buildings deliver to the environment, the economy and the community. After all, the buildings that are being designed and constructed today will determine the future climate that our children and future generations will experience.

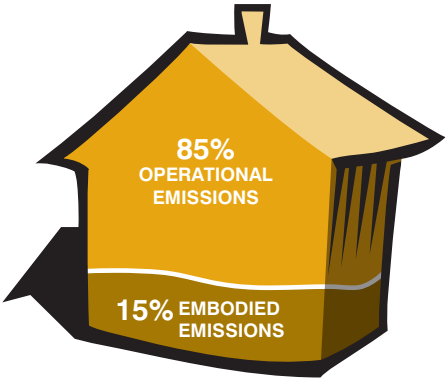
Victoria's net zero carbon emissions target

The Victorian State Government has committed to the long-term target of net zero greenhouse gas emissions by 2050. This sets a clear goal for industry, regulators and the community.

Leading businesses and organisations have already taken significant steps towards this goal.

Net zero carbon emissions - A commitment from government and industry alike.

Where do carbon emissions come from?



Embodied carbon vs Operational carbon

For the purpose of this factsheet we have defined the following:

Embodied carbon: Carbon emissions associated with materials and construction processes throughout the whole lifecycle of a building, including emissions associated with the production and transport of building products that are specified for use on a project. These are part of Scope 3 emissions (see below)

Operational Carbon: Are the carbon emissions (Scope 1 and 2) associated with the operation of the building, such as those used in heating, cooling and all other energy uses as well as carbon emissions resulting from operational waste.

To help differentiate between different emissions sources, emissions may be classified into the following scopes:

Carbon emissions from waste water, waste to landfill and transportation are also considered Scope 3 emissions that are not a focus of this fact sheet.

Scope 1

Scope 1 emissions include all direct greenhouse gas emissions from sources within a building's site boundary, such as burning gas for cooking.

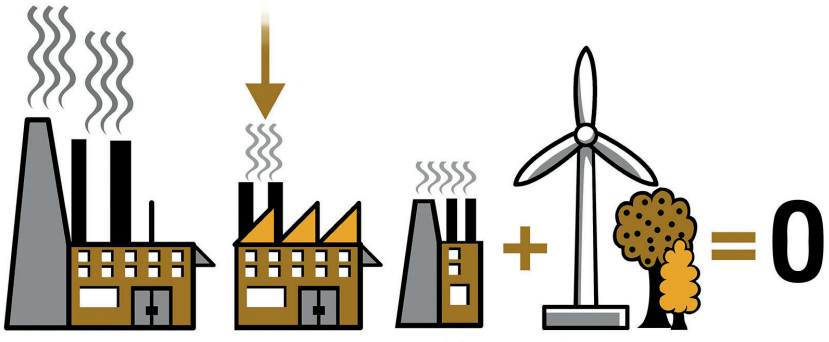
Scope 2

Scope 2 emissions include offsite emissions from purchased electricity, heat, cooling and steam (i.e. energy produced outside the geographic boundary of the building but consumed within the building).

Scope 3

Scope 3 emissions include all indirect emissions that occur as a result of the activities of the building but occur from sources outside the building's geographic boundary, such as operational waste going to landfill.

What does it mean to be carbon neutral



Emission Factors

Emission factors are used to convert a unit of activity into its emissions equivalent.

The National Greenhouse Accounts Factors (NGA Factors, Department of the Environment and Energy), is an annual publication by the Department and includes factors for Scopes 1 and 2 emissions sources and Scope 3 emission factors for waste including solid, liquid and gaseous fuels and electricity.

Further guidance on emission factors is available on the NGA website. You'll find its address in the 'Where can I find out more' section of this factsheet.

What is zero net carbon in operations and how does it relate to your development?

Emissions from building operations are those generated from the day-to-day running of the building; for example, (lighting, heating and cooling, occupant energy use, refrigerants, maintenance vehicles and machinery.

Net zero for operational energy is achieved when the amount of carbon emissions associated with the building's operational energy on an annual basis is zero or negative. A net zero carbon building is highly energy efficient and powered from on-site and/or off-site renewable energy sources, with any remaining carbon balance offset.

The concept of zero net carbon and zero net energy has many different definitions in the context of the built environment, however by following the key principles listed below you can progress your development towards being zero net carbon in operation:

1. Optimise the development's energy efficiency through architectural and landscape design strategies, such as passive design and insulation. Reduce energy demand of your development through systems efficiency and electrification.
2. Reduce energy demand of the building's systems such as the heating, cooling and hot water and opt for electricity as opposed to gas for the energy mode.
3. Generate the remaining energy needs from renewables.

Offsets should be used for any remaining carbon balance including embedded carbon within the building's fabric, using certified Climate Active offsets.

www.climateactive.org.au

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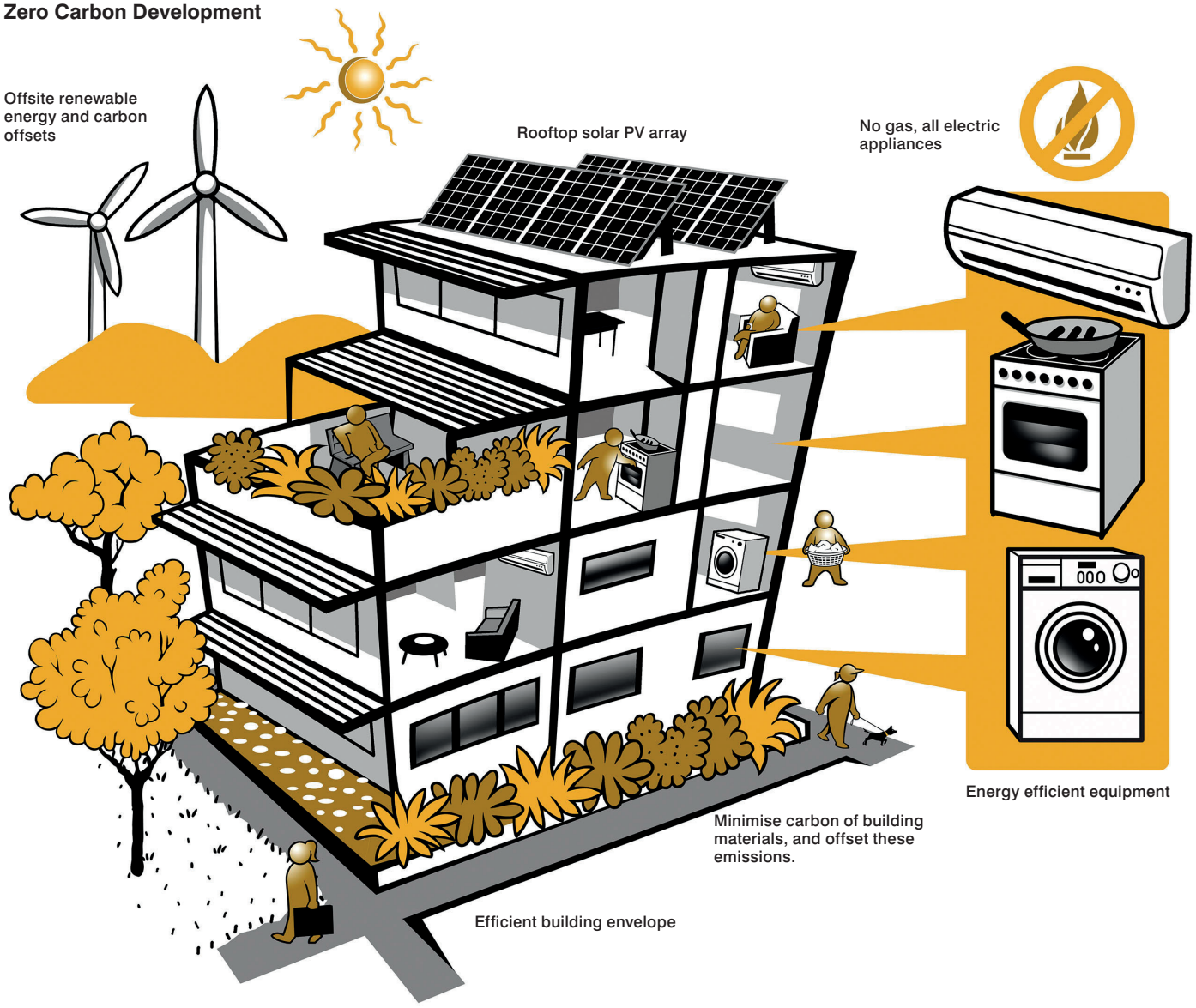
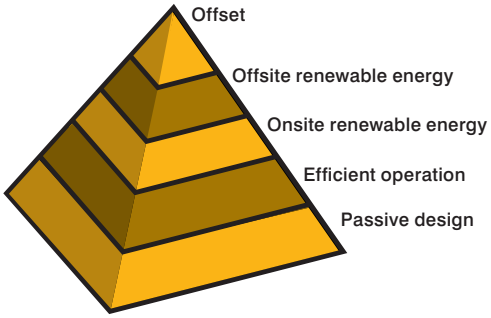


Electrification and embodied carbon



Electrification

The term “electrification “describes shifting to using only electricity as a source of energy within our buildings. Typically, buildings in Victoria run on a combination of electricity and gas. The goal of such a transition towards all-electric buildings provides for the transition of developments that are powered by 100% renewable sources of zero-carbon electricity.

Replacing fossil fuel-powered systems such as space heating, water heating, cooking and laundry with electricity is a necessary step for developments to achieve zero net carbon in operation.

Embodied carbon

The carbon dioxide emissions associated with constructing a building are referred to as embodied carbon. More precisely, embodied carbon covers greenhouse gas (GHG) emissions that arise from the energy and industrial processes used in the processing, manufacture and delivery of the materials, products and components required to construct a building.

Considerations for Embodied Carbon

Carbon emissions are released not only during operational life but also during the manufacturing, transportation, construction and end of life phases of all built assets – buildings and infrastructure. These emissions, commonly referred to as embodied carbon, have largely been overlooked historically but contribute around 11%
of all global carbon emissions.

A net zero embodied carbon building is highly resource efficient with upfront carbon minimised to the greatest extent possible and all remaining embodied carbon reduced or, as a last resort, offset in order to achieve net zero across the lifecycle.

The best way to reduce embodied carbon is through applying the following key principles:

1. **Prevent:** Consider embodied carbon emissions and reduction strategies from the outset, whether for a whole project of for a single product. Question the need to use materials at all, considering alternative strategies for delivering the desired function, such as increasing utilisation of existing assets through renovation or reuse.
2. **Reduce and optimise:** Use low carbon design guidance and calculation tools and benchmarks to evaluate each design choice in terms of upfront emission reductions and as part of a whole life-cycle approach.
   - Apply design approaches that minimise the quantity of new material required to deliver the desired function.
   - Prioritise materials which are low or zero carbon, responsibly sourced, and which have low lifecycle impact in other areas, including the health of the occupant, as determined through a product specific environmental product declaration where available.
   - Choose low or zero carbon construction techniques that maximise energy and material efficiency and minimum waste.
3. **Plan for the future:** Consider future use scenarios and end of life, maximising the potential for maintenance, repair and renovation, and ensure flexibility for future adaptation.
   Design for disassembly and deconstruction to facilitate future reuse, selecting materials which can be recycled, and which can be extracted and separated easily for processing.
4. **Offset:** As a last resort, offset residual embodied carbon emissions either within the project boundary or through verified offset schemes.

> “Making our project zero carbon was a cost neutral exercise for us after we took out the gas reticulation throughout the building, however the results for the marketing team were enormous. This single decision set our project apart from everything else on the market and attracted owner-occupiers to this project.”

Zero carbon certification and standards

Peak bodies and certification

If your development is looking to certify as a net zero energy or carbon building, there are a number of peak bodies that can provide third party certification for developments. They include::

Climate Active Carbon Neutral Certification
The Climate Active Carbon Neutral Standard for Buildings, provides industry a recognised, streamlined and agreed way to claim a building is carbon neutral during operation.

Climate Active certification is an extension of a NABERS Energy rating or through integration in Green Star – Performance v1.2 rating. It measures a building's carbon emissions, then aims to offset these by purchasing carbon offset projects to achieve net zero emissions.

The Living Building Challenge (LBC)
The LBC is the built environment's most rigorous performance standard. It calls for the creation of building projects at all scales that operate as cleanly, beautifully and efficiently as nature's architecture.

To be certified under the Challenge, projects must meet a series of ambitious performance requirements, including net zero energy, waste and water, over a minimum of 12 months of continuous occupancy.

Further information on the above peak bodies and certification pathways can be found at the links provided in the 'Where can I find out more' section of this fact sheet.

Council's Best Practice Standards

To deliver development that produces net-zero carbon emissions, through:

- Optimised passive design to deliver an energy efficient building envelope.
- Maximised energy efficiency standard of all appliances, systems and lighting.
- No fossil fuel consumption onsite, such as natural gas or LPG.
- Maximised onsite renewable energy generation.
- Residual electricity demand purchasing from local and/ or offsite renewable energy generation.
- Select materials that minimises carbon emissions, and offset these emissions onsite or through a verified carbon offset scheme.

Where can I find out more?

Living Future Institute Net Zero Carbon Certification
living-future.org/zero-carbon-certification/

NABERS
www.nabers.gov.au/ratings/climate-active-certification

NGA Emission factors
www.environment.gov.au/carbon-neutral

Climate Active
www.climateactive.org.au/

Technical Manual Passive Design, Your Home
www.yourhome.gov.au

BESS Tool Notes Energy Efficiency
bess.net.au/tool-notes/

Sustainability Victoria, Energy Smart Housing Manual
www.sustainability.vic.gov.au/You-and-your-home/Building-and-renovating/Energy-Smart-Housing-Manual

Green Building Council of Australia, Green Star for New Buildings submission guidelines
new.gbca.org.au/

Other Fact Sheets in this series are available to provide guidance on progressing towards a zero carbon future. Those Fact Sheets are entitled:

- 2.0 Energy Efficiency
- 5.0 Building Materials
- 7.0 Waste Management

ACKNOWLEDGEMENT: The MAV acknowledges the five IMAP (Inner Melbourne Action Plan) councils – the Cities of Yarra, Port Phillip, Melbourne, Stonnington and Maribyrnong – for their leadership in producing this suite of Fact Sheets to enable a more liveable and sustainable built environment.