Attachment A7

ESD Concept Report
187 Thomas Street, Haymarket

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187 Thomas Street, Haymarket
ESD Concept Report

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187 THOMAS STREET, HAYMARKET

ESD CONCEPT REPORT

MARCH 2020

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	NAME	DATE	SIGNATURE
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EXECUTIVE SUMMARY

The Project (187 Thomas Street) is a hybrid tower, which combines multiple uses each with their own identity and requirements but sharing common facilities in the way that a horizontal series of buildings would share a street. The development is envisioned as a vertical innovation hub where people come to work, stay, play, learn, rest, invent.

This document has been prepared as part of the Stage 1 Development Application for a reference design that will be submitted to the City of Sydney for approval. The proposal is for a 'vertical village' conceived to provide a destination for the innovation and technology sectors within an integrated community of building users. The mixed-use building will comprise approximately 50,000m^2 of floor space including innovation areas, commercial office spaces, retail areas and a hotel. The innovation hub consists of private offices, shared work spaces, IT labs and conference rooms to foster collaboration between groups and individuals in the technology and innovation industry.

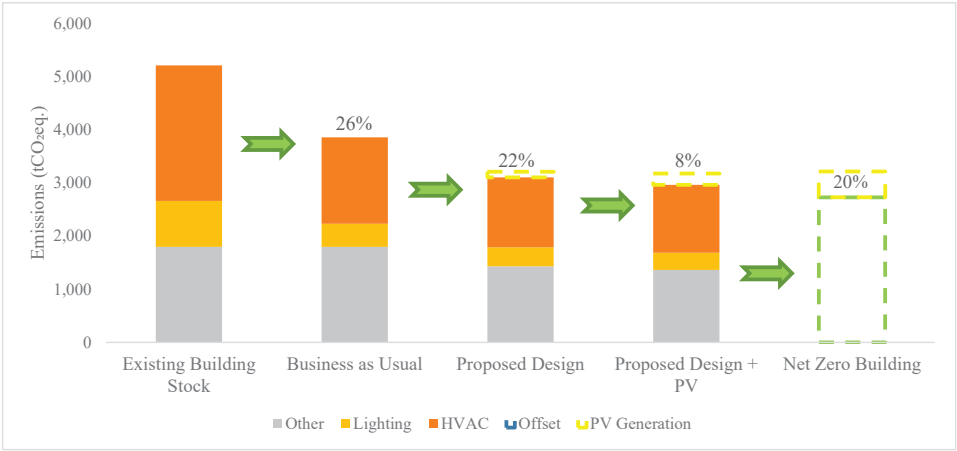
The proposed building consists of 49 storeys with a maximum height of RL209.80) plus 5 basement levels. The Project will demonstrate "design excellence" and will be subject to competitive design processes including external design review. The Project will also need to pass the ESD site test outlined in the draft Central Sydney Planning Strategy, which represents extremely high standards of sustainable design and energy performance.

This Ecologically Sustainable Development (ESD) Concept Report details the initiatives that the Project will be implementing to deliver the objectives of the Sydney Development Control Plan (DCP) 2012 along with several other policies influencing development in the Sydney CBD. The Draft Guidelines for Site Specific Planning Policies in Central Sydney contains the most stringent sustainability requirements, and achieving these is a key focus of the sustainability strategy set out in this Concept Report. Specifically, the Guidelines requires the following is achieved:

- Net zero carbon
- Zero waste
- NABERS Energy 5.5 in office areas
- NABERS Energy 4.5. in the hotel areas

Therefore, the project team have worked to ensure the development will reduce its energy consumption as far as possible and target net zero carbon performance in operation, as far as practical through onsite strategies. The energy strategy will be underpinned by achieving very high standards within the Office and Environment and Heritage (OEH) National Australian Built Environment Rating System (NABERS), achieving 5.5 stars and 4.5 stars in the commercial and hotel areas of the building respectively.

The energy strategy for the Project indicates that it is possible to achieve a 25% reduction in carbon emissions. Carbon savings beyond this level are likely to be either cost prohibitive, technically impractical or a combination of both. The graph opposite shows the step change in emissions as energy consumption is reduced, followed by the application of renewable energy such as photovoltaics.



In addition, the entire development will implement a range of other sustainability initiatives including a strategy to reduce waste as far as possible towards zero-waste. A range of initiatives are proposed to contribute to the goal of diverting waste from landfill including using eco compactors for general waste and cardboard, installing a food waste processor, providing storage for bulky goods and strip-out waste, educating tenants, and through best practice source separation.

Beyond these exceptionally high targets, the development will also include other measures to ensure a holistic sustainable strategy for the development, such as the following:

- Highly efficient water fittings and fixtures to ensure water consumption is reduced as far as possible, and supplemented with rainwater harvesting and/or greywater recycling where feasible;
- Procurement of materials that have low environmental impacts;
- Enhanced site ecology through high quality landscape design;
- Ensuring design that mitigates or adapts to climate change impacts; and
- Incorporating social sustainability initiatives

The following section of the report describes the project proposal in more detailed, along with detailing the planning policies which have helped shape the sustainability strategy for the development. The ESD concept strategy then details the specific measures and initiatives that are proposed for the building to deliver a high performing, highly sustainable development that meets policy compliance requirements.

As the Project progresses, how the targets are met may alter slightly to provide the best possible design outcomes for the development. At this early stage, however, the project team are satisfied that the ESD initiatives, which are beyond current best practice, are achievable within the scheme.

1 INTRODUCTION

1.1 PROJECT DESCRIPTION

The proposal seeks to amend planning controls applying to the Site to allow a future development that will comprise an integrated community and destination for the innovation and technology sectors in the form of a vertical innovation village with an overall maximum height of 49 storeys (RL 209.80) and approximate commercial GFA of 51,700m^2.

The Site is ideally suited to the proposed use, being strategically located within the identified Haymarket Activity Node and Camperdown-Ultimo Collaboration Area and at the point of confluence between the health, education and research axis along Parramatta Road and Broadway, the information, communications and technology cluster of Ultimo and Pyrmont, the financial and professional heart of the city through the CBD, and the creative and design district across Surry Hills, Chippendale and Eveleigh. Its development as proposed will support both the State government and City of Sydney vision for the growth of the collaboration area as an innovation district.

The vision for the Site is to establish a community of innovators who recognise the potential and possibility presented by leveraging future technologies. The integrated vertical innovation village will be a home for people and businesses working in technology-driven growth industries, offering a mix of spaces, services and equipment to encourage convergence, collaboration and cross-disciplinary research and development. More than just a workplace, it will be an inclusive and energetic destination, anchored by Sydney's first publicly accessible technology fabrication lab, and complemented by a mix of practical and lifestyle amenity. It will be a place that nurtures talent and scales up new ideas by offering a variety of workspaces, tools and equipment, skills, knowledge and support, for a like-minded community.

The proposed vertical innovation village will comprise a bold new proposition for a mixed-use building, bringing together on a single site a world-class co-working hub and fabrication laboratory for innovation and technology, a diverse range of commercial space for emerging, growing and established technology businesses, a hotel tailored to tech workers, as well as a range of retail, hospitality and service amenities to support the community working, staying and visiting the site.

Within a hybrid tower the concept will deliver approximately 51,700m^2 of GFA to a maximum height of RL 207. As illustrated in the reference scheme the hybrid tower will comprise flexible interconnected floorplates of approximately: 1000m^2 on the ground level; 1,700m^2 within the podium; 610 - 760m^2 within the void tower; 1,200m^2 within the low and high rise tower; and 900m^2 GFA within the sky rise tower thereby catering to the full range of enterprises within the sector.

Key components of the reference scheme for the hybrid tower include:

- Innovation tech hub (approximately 8,600m^2 GFA) within the basement, podium and void tower with lobby off Valentine Street including:
    - tech workshop with shared equipment, facilities and services (including education, business support, programming, safety management and training)
    - co-working space for the innovation industries that utilise provided technology and equipment, that changes in space and floor plate design to accommodate growing businesses, and
    - terrace on Level 4 of the Void Tower providing an indoor / outdoor workspace
    - facilities and services shared with the tech hotel.
- Commercial office space (approximately 33,100m2 GFA) for the corporate tech sector within the low and high rise tower with lobby off Quay Street
- 4-star Tech Hotel (approximately 9,800m2 GFA / 234 keys with 26 rooms per floor) within the sky rise tower with sky lobby, pool and bar with drop off and lobby off Thomas Street
- Meeting, forum, gym, pool, hospitality and other spaces integrated throughout the building and shared (and co-managed) between the innovation hub, commercial tenancies and tech hotel
- A retail offering of approximately 220m2 GFA, including food and beverage which will be located on the ground level
- Upgraded (and widened) through site connection connecting Thomas Street to the west with George Street to the east via an activated retail arcade connection
- Redeveloped public space on Thomas, Quay and Valentine Street including an expanded pedestrian plaza at the corner of Thomas and Quay Streets and widening of the Valentine Street footpath
- Integration with the proposed Quay Street public domain works to accommodate increased pedestrian movement from existing and future pedestrian connections to various modes of transport, and
- Five (5) basement levels beneath the building with access off Thomas Street in the north west of the site.

The proposed basement levels will provide:

- Reduced car park provision totalling 79 car parking spaces (including 23 small car spaces,2 car share spaces and 1 electric charging station)
- (Note: maximum parking allowed 107 spaces however reduced provision proposed as transport demand strategy. 86 spaces currently provided on site)
- 14 motorbike parking spaces
- 382 bicycle parking spaces for staff and visitors as well as end of trip (EoT) facilities
- Hotel back of house areas
- loading dock and waste storage room, and
- plant and equipment areas.

It should be noted that while the reference scheme represents one design for the proposed hybrid tower, the project will be subject to a full competitive design process in accordance with the requirements of Sydney LEP 2012.

A more detailed breakdown of proposed uses throughout the reference scheme building is provided in the Schedule below.

SCHEDULE	
SKY Tower:	**Tech Hotel** Hotel Room levels, together with a Sky Arrival Lobby and Roof Top Hotel facilities including restaurant / bar / lounge / gym / pool. The 4-star Hotel is to be branded as a "Tech Hotel" (there are a number of International operators that are now positioning one of their models as a "tech hotel") connected functionally and practically to the Innovation Tech Hub 10 levels total / 9 levels Hotel Rooms 234 Hotel Room bays Approx. 9,800m2 GFA Approx. 9,800m2 GFA
TOWER: (High Rise & Low Rise)	**Commercial Offices** Promoted for large companies that operate in the innovation / technology sector to complement and benefit from co-location with the Innovation Tech Hub including flexible floor plates to accommodate large and scale up ventures 27 levels total / 26 levels Office floors 1,120 / 1,160m2 NSA typical floors Approx. 33,100m2 GFA
VOID Tower: (reduced floors adjacent to the VOID)	**Innovation Tech Hub** Bookable project rooms, bookable meeting rooms, tech workshop and fabrication lab with shared access equipment and tools, common space for access and reception, co-working space with communal desks and private offices 5 levels total / 4 levels Innovation floors 580 / 700 m2 NSA Approx. 2,750m2 GFA
PODIUM:	**Innovation Tech Hub** Outdoor workspace, shared flexible 'forum' space, bookable project rooms, bookable meeting rooms, tech workshop and fabrication lab with shared access equipment and tools, common space for access and reception, co-working space with communal desks and private offices, 3 levels total 1,100 / 1,600 m2 NSA Approx. 4,600m2 GFA
MEZZANINE:	**Tech Hotel Facilities & Services** Lobbies and plant 1 level total Approx. 300m2 GFA
GROUND:	**Lobbies & Retail**
	Innovation Tech hub lobby, Commercial lobby, Hotel lobby, hospitality – café / bar / restaurant, retail – convenience, retail – concept tech store… 1 level total 200m2 NSA plus lobbies and though site link Approx. 1,000m2 GFA

Table 1-1 Building Schedule

Table 1-1 outlines the usage of the Project, its building class under the NCC 2019 Building Code of Australia and the approximately percentage of floor space of these uses.

USAGE	BUILDING CLASS	PERCENTAGE OF FLOOR SPACE
Retail	Class 6	1%
Commercial	Class 5	64%
Innovation	Class 5	17%
Hotel	Class 3	19%

Table 1-2 Usage of the proposed development

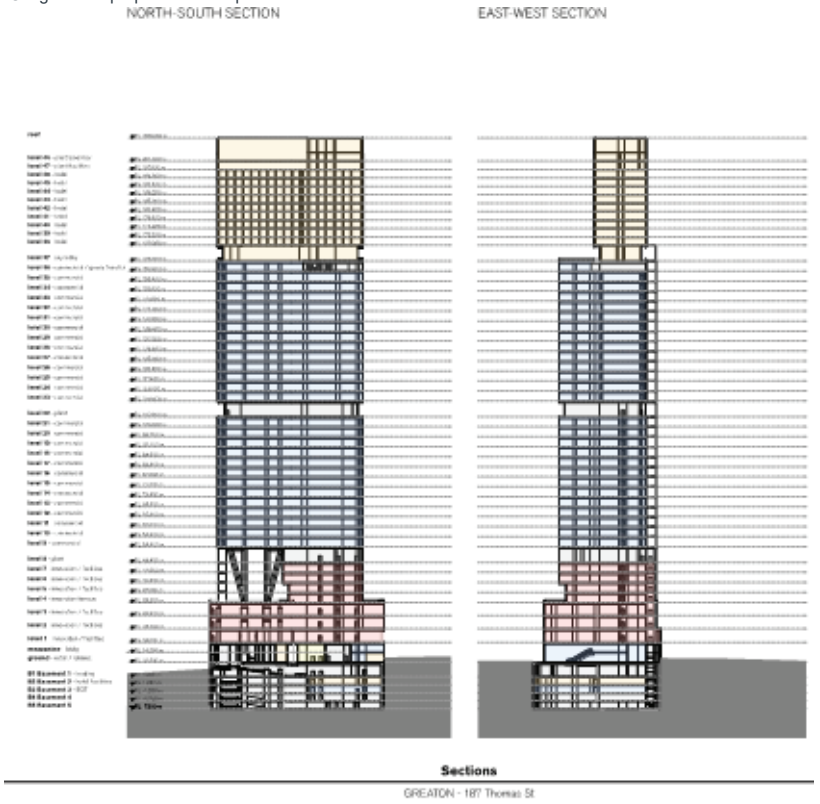


Figure 1 - 187 Thomas Street Section Drawing

2 ESD POLICY AND DRIVERS

Several sustainability frameworks exist at a global, federal, state and local level that have been used to provide the context for goals, objectives and targets for the ESD approach for the Project.

2.1 GLOBAL

2.1.1 UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS

The United Nations prioritises 17 Sustainable Development Goals as part of a Sustainable Development Agenda with the purpose of transforming our world by ending poverty, protecting the planet and ensuring prosperity for all. Each goal has specific targets to be achieved by 2030 with six of these seventeen goals advocating for climate change and resource demand reduction initiatives. To achieve these goals, change is sought for from governments, the private sector and civil society. The main goals relevant to the proposed development include:

- Goal 7: Affordable and clean energy
- Goal 11: Sustainable cities and communities
- Goal 12: Responsible consumption and production
- Goal 13: Climate action

2.2 FEDERAL

The Paris Agreement is an international agreement with a central aim to:

> *"Strengthen the global response to the threat of climate change by keeping global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue other efforts to limit the temperature increase even further to 1.5 degrees Celsius." (United Nations, 2017)*

Australia became a signatory to the Paris Agreement on 22 April 2016, which came into force on 9 November 2016. Ratification occurred thirty days after the date that parties which make up an estimated 55% of the total global Greenhouse Gas (GHG) emissions chose to become signatories. Under the Paris Agreement, Australia has committed to reducing emissions to 26-28% on 2005 levels by 2030. The Australian government aims to meet these commitments by 'Direct Action Policies' created with the objective of reducing emissions, increasing energy productivity and improving environmental health. These reduction targets have set the benchmark in which each state has developed their own climate positive strategies with an emphasis on either meeting or exceeding this target.

2.3 STATE

The policy framework for considering sustainability outcomes for the 187 Thomas Street development includes the following:

- NSW Climate Change Policy Framework, which seeks to achieve net zero emissions by 2050 and for NSW to be more resilient to a changing climate;
- Smart Cities Plan call for us to become smarter investors in out cities' infrastructure through the coordination and driving of smarter city policy and smart technology to improve the sustainability of our cities and to drive innovation; and
- Future Transport strategy which sets the framework to working towards environmental sustainability, securing energy reliability and affordability and managing a resilient transport system.

2.4 LOCAL

The City of Sydney have set very high standards for sustainable development. There are several policies at the local level that are applicable to the Project, which are discussed below.

2.4.1 SUSTAINABLE SYDNEY 2030 VISION

The Sustainable Sydney 2030 program is driving sustainable development to achieve the cities commitment to a Green, Global and Connected City. The Community Strategic Plan 2017-2021 outlines the community's aspirations and the City's commitment to achieve their vision through ten overarching sustainability targets for 2030 and beyond. The targets focus on reducing greenhouse gas emissions, increasing renewable energy production to meet electricity demands, encouraging more sustainable travel through cycling and walking along with other drivers for economic growth and diverse housing opportunities.

2.4.2 GREATER SYDNEY COMMISSION EASTERN CITY DISTRICT PLAN

The Greater Sydney Commission Eastern City District Plan is a 20-year plan to manage growth in the context of economic, social and environmental matters designed to achieve the 40-year vision for Greater Sydney. The District Plan contains the planning priorities and actions for implementing the Greater Sydney Region Plan, A Metropolis of Three Cities, at a district level and is a bridge between regional and local planning. It outlines a city in landscape, an efficient city, and a resilient city as the sustainability directions for the District. The table below summarises the key priorities of the District Plan.

A CITY IN LANDSCAPE	AN EFFICIENT CITY	A RESILIENT CITY
• Protecting and improving the health and enjoyment of Sydney Harbour and the District's waterways • Protecting and enhancing bushland and biodiversity • Protecting and enhancing scenic and cultural landscapes • Increasing urban tree canopy cover and delivering Green Grid connections • Delivering high quality open space	Reducing carbon emissions and managing energy, water and waste efficiently	Adapting to the impacts of urban and natural hazards and climate change

2.4.3 LOCAL ENVIRONMENT PLAN 2012 (LEP)

The Project is located within the City of Sydney LGA and zoned as B8 Metropolitan Centre under the City of Sydney LEP. Permitted land use activities for the Metropolitan Centre include commercial and community facilities (centre-based childcare, educational establishments, recreational activities etc.).

One of the main aims of the LEP is to promote ecologically sustainable development. The LEP also describes the requirements surrounding "design excellence" which apply to developments planning to exceed height and floor space ratio restrictions outlined in the Sydney DCP 2012. In considering whether the development exhibits design excellence, the consent authority must have regard to the following:

- Whether a high standard of architectural design, materials and detailing appropriate to the building type and location will be achieved.
- Environmental impacts, such as sustainable design, overshadowing and solar access, visual and acoustic privacy, noise, wind and reflectivity.
- The achievement of the principles of ecologically sustainable development.
- Pedestrian, cycle, vehicular and service access and circulation requirements, including the permeability of any pedestrian network.

2.4.4 SYDNEY DEVELOPMENT CONTROL PLAN 2012

The Sydney development control plan sets out objectives and controls to provide a framework for the application of ESD principles in the design, construction and operation of buildings across Sydney local government area. Section 3-6 of the DCP details the specific areas that must be addressed by development proposals to demonstrate a sustainably designed building. Implementing these principles means that the development will be designed and constructed so that it complies with the following objectives:

(a) Greenhouse gas emissions will be reduced

(b) The use of cogeneration and tri-generation systems will be increased

(c) Energy that is used will be renewable and low carbon

(d) Potable water use will be reduced

(e) Development can adapt to climate change

(f) Waste will be reduced

(g) Recycling of waste and use of products from recycled sources will be increased

(h) Indoor environmental quality will be improved

(i) The environmental impact from building materials will be reduced through reduction, re-use and recycling of materials, resources and building component

(j) The biodiversity will be improved.

To help achieve these objectives, the City of Sydney provides the following voluntary benchmarks for new developments.

REQUIREMENT	ENERGY AND EMISSIONS	WATER EFFICIENCY*
RETAIL	Materially exceed section J of the Building Code	Shopping centres: 1.35kL/m2/year Supermarkets: 2.79kL/m2/year Installation of rainwater harvesting tanks
HOTEL	Materially exceed section J of the Building Code	With cooling tower and laundry 0.43 kL/m2/year Without cooling tower and laundry 0.17 kL/m2/year Installation of rainwater harvesting tanks
OFFICE	Materially exceed section J of the Building Code >1000sqm subject to Mandatory Commercial Buildings Disclosure programme and NABERS Energy of 5.5 stars	Proposals without cooling towers 0.47 kL/m2/year Proposals with cooling towers: 0.84 kL/m2/year) Installation of rainwater harvesting tanks Highest Water Efficiency Labelling Scheme (WELS) star rating available for all fittings and fixtures

*Sydney Water's Good Practice Standard

Note: Under the energy amendments to the DCP 2012 applications for new developments containing office premises with a net lettable area of 1,000sqm or more are to be submitted with documentation confirming that the building will support a base building NABERS Energy Commitment Agreement of 5.5 stars with the NSW Office of Environment and Heritage.

In addition, all new water fittings and fixtures such as showerheads, water tap outlets, urinals and toilet cisterns using best practice Water Efficiency Labelling Scheme (WELS) star rating available at the time of development.

2.4.5 DRAFT CENTRAL SYDNEY PLANNING STRATEGY

The Central Sydney Planning Strategy (CSPS) is a draft strategy prepared by City of Sydney to ensure strong planning controls are in place to guide the growth of Central Sydney. The strategy applies to land use areas designated as B8 Metropolitan Centre Zone under the Sydney Local Environment Plan (LEP) 2012.

Objectives and actions from the draft CSPS relevant to the ESD strategy of the Project include:

- Requiring office developments to achieve at least a 5 Star NABERS rating
- Driving net-zero energy precinct outcomes
- Ensure growth sites demonstrate design excellence with attention to the skyline and the principles of ecologically sustainable development.

2.4.5.1 GUIDELINE FOR SITE SPECIFIC PLANNING PROPOSALS IN CENTRAL SYDNEY

As part of the Draft Central Sydney Planning Strategy, “minimum site tests” are provided for all new developments that are subject to a Request to exceed Sydney LEP restrictions. As the Project seeks to exceed height restrictions of the Sydney LEP it will be subject to the following minimum ESD site test requirements.

- 5.5 Star NABERS Energy Commitment Agreement for Offices
- 4.5 Star NABERS Energy Commitment Agreement for Hotel
- Net-zero carbon
- Zero waste
- Water efficient outcomes

These standards represent a significant step beyond current best practice for delivering sustainable buildings. And these standards are therefore the focus of this ESD Concept Report. The initiatives outlined in section 5 have been included to best support the Project in passing the minimum ESD site test, and are considered to be, beyond best-practice.

2.4.6 DESIGN EXCELLENCE AND BETTER PLACED

The term “design excellence” is often used within LEP’s and elsewhere to describe an expected or required level of design quality of a building or project. In these cases, the definition of design excellence is consistent across planning legislation where it is often summarized as ‘the highest standard of architectural, urban and landscape design”. More recently, design excellence has been used within statutory regulations to describe or trigger other processes, including competitive review of a project by an established Design Review Panel.

‘Design excellence’ emerged as a term in the City of Sydney in 2000, where it was used to describe competitive design process to be undertaken at the concept design stage of new projects in return for additional Floor Space Ratio or building height. The competitive process is aimed at both lifting the design quality of significant buildings and diversifying the field of architectural practices engaged in their design.

The Project intends to exceed height restrictions of the Sydney LEP 2012. Under these circumstances, it is mandatory that the building demonstrate “design excellence”. The design policy “Better Placed” developed by the Government Architect department of NSW sets the standard for “design excellence” for NSW developments including projects that are required to undertake competitive design excellence processes. Better Placed provides a set of objectives, encouraging good design outcomes including those aimed at environmental sustainability and responsiveness such as:

- Effective design that can create ongoing savings through reduced energy and water demand
- Adaptable buildings that adjust to changing requirements over time, without requiring significant changes or replacement
- Energy-efficient buildings that are more comfortable for people, in temperature, air quality, access to natural light and fresh air
- Spaces and buildings which use locally sourced materials encompass less energy in transport and production, reducing the environmental impact

The environmental initiatives to assist the Project in achieving these targets are outlined in Section 5 of this report.

3 ESD RATING TOOLS

3.1 TOOLS TO DRIVE SUSTAINABLE OUTCOMES

To achieve the goals, objectives and targets of the sustainability frameworks outlined in Section 2, the following compulsory and voluntary initiatives and programs have been considered:

- NCC 2019 Section J
- NABERS
- Green Star Design and As Built

3.1.1 NCC 2019 SECTION J COMPLIANCE

Section J Energy Efficiency of The National Construction Code (NCC) has recently been revised and the updated version was released in May 2019. A package of measures for Volume One focusses on delivering ~ 35% reduction in energy consumption across commercial buildings. The focus shifts from energy-based metrics to a greenhouse-gas metric to provide a more holistic view of a building's environmental impact.

The 2019 updates to Section J also include Green Star and NABERS pathway options for demonstrating NCC compliance to reflect the broad use of these rating tools and reduce the level of duplication of similar assessment processes across the industry. Section J Energy Efficiency is relevant to the Project and sets mandatory requirements for:

- The design of the building envelope and services, and provision of equipment and appliances to minimise energy use and greenhouse gas consumption.
- The design of the building envelope to maximise thermal comfort performance.
- The provision of adequate facilities for energy monitoring.

The Council encourages development to exceed these mandatory requirements, where feasible.

3.1.2 NABERS

Launched in 1999, NABERS is a voluntary[1] rating tool that may be used to measure a building's energy consumption, carbon emissions, water consumption, and waste production for comparison against similar buildings.

The key principles of NABERS are divided into metrics, including calculation methodologies and rating scales that make up a NABERS rating; methods, including the system for managing the rating process, rules and quality assurance; and governance, including responsibilities for the oversight of the scheme, and stakeholder engagement principles (NABERS, 2016).

As outlined in Section 2.4.4 a revision to Sydney's DCP 2012 will require the commercial office component of the development to achieve a NABERS rating of 5.5 stars. In addition, the Draft Guidelines for Site Specific Planning Policies in Central Sydney, requires that a NABERS Energy Commitment Agreement of at least 5.5 stars for office and 4.5 star for hotel is achieved in all new development exceeding the FSR and/or height limits. A Commitment Agreement is a contract signed by a developer or owner to commit to design, build and commission a building to achieve a specific NABERS energy rating and involves measuring actual energy consumption during the first year of operation, which ensures performance aligns more closely with design. This is demonstrated in the graphic below.

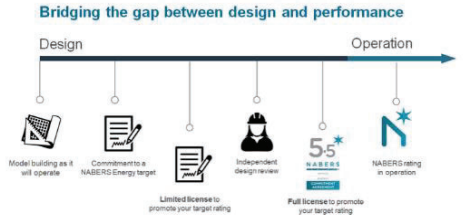


Figure 2 - Commitment Agreement Process

3.1.3 GREEN STAR DESIGN AND AS BUILT

Green Star is a voluntary environmental rating system that assesses holistic sustainability attributes in the design, construction and operation of buildings, fit outs and communities. Administered by the Green Building Council of Australia (GBCA), it provides third party certification of the environmental design and operation of buildings in Australia. Points are awarded to the project when it complies with a range of credits and sums them up to achieve a final star rating. The Green Star tool considers the following key sustainability attributes:

- Energy
- Water
- Transport
- Indoor Environment Quality
- Materials
- Land Use and Ecology
- Emissions
- Management
- Innovation

Projects target credits under each of these categories. Each credit is worth between 1 and 20 points, with the total number of points available being 100 (plus 10 innovation points). A star rating is awarded depending on the total number of points awarded to the completed project, as follows:

- 4 Star – Australian Best Practice: 45 - 59 points
- 5 Star – Australian Excellence: 60 - 74 points
- 6 Star – World Leadership: 75+ point

The DCP recommends the use of an environmental rating tool, such as Green Star, in the absence of comprehensive government standards however this is not a policy requirement. At this stage of the Project, a Green Star rating has not been pursued. The Green Star tool promotes a holistic approach to ESD, this is also achieved in the development through demonstrating compliance with section 3.6 of the DCP (2012) through addressing items a – j of the policy, as detailed in section 2.4.4 of this report. Furthermore, the Green Star tool is undergoing significant change and the version that would be applicable to the Project has not been confirmed creating additional complexity.

[1] Except for office spaces under the Commercial Building Disclosure (CBD) Program, which requires a Building Energy Efficiency Certificate (BEEC) as demonstrated using the NABERS Energy for offices rating.

4 ESD REQUIREMENTS SUMMARY

As mentioned, the Sydney DCP only provides mandatory benchmarks for commercial office buildings. However, to demonstrate "design excellence" as required by the Sydney LEP and comply with this minimum site test outlined in the Draft Guidelines for Site Specific Planning Proposals in Central Sydney, the development will also meet the benchmarks summarised below.

Table 4-1 Policy Summary

POLICY	TARGET	USE CLASS
Draft Guideline for Site Specific Planning Proposals in Central Sydney	NABERS Energy 5.5	Office
	NABERS Energy 4.5	Hotel
	Net Zero Carbon	All
	Zero Waste	All
	Water Efficiency	All
DCP 2012	NABERS Energy 5.5	Office
Central Sydney Planning Strategy (Draft)	NABERS Energy 5	Office
	Net Zero Carbon - commitment	All

5 ESD CONCEPT STRATEGY

As detailed in the previous sections, the proposed building is subject to the highest standards of ESD. The following section sets out the sustainability strategy for meeting these standards and for demonstrating design excellence from an environmental performance perspective.

5.1 BUILDING ELEMENTS

The Project's location in Sydney's CBD means it is surrounded by medium and high-rise buildings. The design considers the context of the building and its interaction with other buildings and public spaces and tower setbacks have been determined by environmental performance as well as other urban design considerations.

Wind and daylight studies have been central to the street wall and upper level setbacks and have contributed to maintaining amenity in the public domain. The proposed building envelope also minimises, where possible, shading of existing rooftop solar and public outdoor spaces surrounding the development.

5.2 ENERGY AND GHG EMISSIONS

The reduction of greenhouse gas (GHG) emissions in the built environment is a major focus at global, federal, state and local levels to curb the impacts of climate change. Improving energy efficiency leads to a reduction in carbon emissions and reduces the consumption of finite resources.

As outlined above, the proposed development will target net zero carbon emissions as far as practically achievable using on-site measures and renewable energy technologies to reduce energy consumption, and will considerably exceed NCC Section J requirements for energy efficiency, building fabric and glazing.

The following initiatives are proposed to ensure the Project reduces its carbon emissions as far as possible toward net zero.

- High efficiency HVAC
- High performance glazing
- High efficiency LED lighting
- Roof mounted PV systems in all locations where feasible, and consideration of façade integrated PV systems, to offset grid energy and minimise peak energy demands
- Incorporation of commissioning, maintenance and building tuning into the project programme
- Incorporation of ongoing monitoring trends from energy metering

Several options have been considered to ensure energy has been reduced as far as possible through the building design, building services and through the application of renewable energy technology. Cogeneration and tri-generation were also considered, but have been discounted as the baseload demand across the scheme is not sufficient for the system to run efficiently. Furthermore, as natural gas is the fuel source used to power the cogeneration engine, this is not a preferred low carbon option over the medium to long term. Future-proofing is discussed further in section 5.2.5 Adaptable Design.

The following analysis has been qualitatively and/or quantitatively assessed:

- Analysis of chilled beams compared to variable air volume (VAV) heating ventilation and air conditioning (HVAC) system
- Optimisation of window to wall ratio on NCC 2019 compliance
- Assessment of solar hot water (SHW) systems compared to solar photovoltaic (PV) systems
- Integration of PV systems

This analysis has been undertaken on the preliminary scheme issued by FJMT Architects dated 27/02/2020. And the results are discussed below.

5.2.1 COMPARISON OF CHILLED BEAMS AND VAV HVAC SYSTEMS

Two high performance HVAC systems have been investigated at this early stage of the project as they are both considered best practice systems for this type of building. The systems operate differently, however the key differentiator related to this analysis is that the variable air volume (VAV) system has higher spatial requirements than active chilled beams. The two designs developed for the comparison are:

1 Variable air volume (VAV) with high performance VAV central air handling units (AHUs) to perimeter and central zones.

2 Hybrid outside air only active chilled beams (ACBs) with preconditioned outside air to perimeter zones with high performance VAV central AHUs to central zones.

The analysis was conducted for a typical office floor in order to determine which mechanical system is more efficient and the results can be seen in Table 5-1 below.

Table 5-1 HVAC consumption across typical floor for VAV and ACB systems

	VAV SYSTEM	ACB SYSTEM	DIFFERENCE
Heating	4,616 kWh	4,342 kWh	-5.95%
Cooling	10,088 kWh	14,754 kWh	46.25%
Pumps	3,483 kWh	5,589 kWh	60.50%
Fans	12,934 kWh	6,660 kWh	-48.51%
HVAC Total	31,121 kWh	31,344 kWh	0.72%

The results of this assessment indicate that the ACB system and the VAV system are equally energy efficient systems with only 0.72% energy consumption difference between them, which is within the margin of error of the preliminary modelling.

Recommendation

Based on the assessment undertaken it is recommended that the project determine the system based on factors other than energy savings, such as spatial savings or increased amenity. This is due to the consumption of both system being relatively equal.

5.2.2 WINDOW TO WALL RATIO ANALYSIS

Analysis of window to wall ratios (WWR) has been undertaken for the office and hotel portions of the Project. This design has been analysed through the Beta NCC 2019 façade calculator as a 'deemed to satisfy' approach to determine the likely WWRs will be required to demonstrate a minimum level of performance and compliant glazing systems.

At this early stage of design, several assumptions have been made in regards to the window areas and shading extent on the facades. These are as follows:

- **Office window and wall area:** Walls (floor to ceiling) are assumed to be 3.5m tall with the maximum window height reaching 3.0m. The length of glazing is assumed to be the same length as the façade across all orientations, except where the core is against the façade.
- **Hotel window area:** Walls (floor to ceiling) are assumed to be 3.2m tall with the maximum window height reaching 2.8m. The length of glazing is assumed to be 80% of the façade across all orientations, except where the core is against the façade.

- **Shading extent:** Shading for both the office and hotel is assumed extent 400mm horizontally, 100mm above the window head. Should the shading extent increase beyond these dimensions the resulting SHGC values will become less stringent.

The following tables indicate the resulting glazing U-Values and SHGC requirements to demonstrate compliance with NCC 2019 Part J2, given the assumptions described above.

Table 5-2 Office Fabric Requirements

WINDOW HEIGHT	WWR	WALL U-VALUE[1]	GLAZING U-VALUE[2]	GLAZING SHGC
2.1m *(600mm off floor level with 300mm below ceiling lining)*	60%	1.00	2.67	0.23
2.5m *(500mm off floor level and level with ceiling lining)*	70%		2.40	0.20
3.0m *(on floor level and level with ceiling lining)*	80%		2.17	0.16

Table 5-3 Hotel Fabric Requirements

WINDOW HEIGHT	WWR	WALL U-VALUE[1]	GLAZING U-VALUE[2]	GLAZING SHGC
2.0m *(800mm off floor level and level with ceiling lining)*	50%	1.00	3.00	0.20
2.4m *(400mm off floor level and level with ceiling lining)*	60%		2.67	0.18
2.8m *(on floor level and level with ceiling lining)*	70%		2.43	< 0.16 *(Not possible)*

[1] The wall requirements are given in U-values as the methodology for the calculation of wall performance has changed to include thermal bridging and will need to be calculated as per the methodology presented in NZS 4214.

[2] Glazing and wall U-value requirements are interconnected and so performance can be traded between them. A higher performance in the glazing or wall U-value can result in a less stringent requirement in the other.

RECOMMENDATION

We recommend a WWR of 60% for the commercial areas and 50% WWR for the hotel elements of the development. This will allow the specification of practical glazing systems, even when pursuing JV1-3 compliance pathways. To achieve more favourable design conditions, it is recommended that greater than 400mm horizontal overhangs are provided to each window where possible on the north, east and west facades, to reduce loads and achieve 'design excellence' as well as a 'net zero ready' building design.

5.2.3 PHOTOVOLATIC ANALYSIS

PV systems will be integral in the 'design excellence' and 'net zero ready' design strategy for the Project. Currently, it has been estimated that a business-as-usual (BAU) approach will allow 700m^2 of roof space to be allocated for PV generation, equating to a system of ~88kW generating 125,577 kWh annually, with an estimated yield of 1,435kWh/kW.

It is estimated that this would offset ~1.6% of electricity use and 2.5% of operational carbon emissions associated with the development. To offset energy consumption and the associated emissions further it is recommended that additional areas are considered for the installation of PV systems. These areas are described below in order of preference of installation:

Table 5-4 Photovoltaic System Descriptions

SYSTEM	DESCRIPTION	AREA (SQM)	SIZE (KW)	OVERSHADOWING RISK
BAU roof area	Area of roof ~70% of roof top allowing for other services	700	87.50	None
Extended roof area	Remaining roof area, will require adapting or redistribution of services to other areas	350	43.75	None
Terrace shade	Area of terrace at sky lobby	600	75.00	Overshadowing from the building itself to the West reducing generation but with significant Northern exposure
Hotel façade shades	Area provided by installing PV panels on shading devices at above windows to 1m depth. *Does not include benefit provided by increased shading*	930	145.00	Overshadowing from the building itself on the East and West orientations reducing generation across the day. Very unlikely to be overshadowed by surrounding buildings
High rise office façade shades	Area provided by installing PV panels on shading devices at above windows to 1m depth. *Does not include benefit provided by increased shading*	1,290	201.50	Overshadowing from the building itself on the East and West orientations reducing generation across the day. Unlikely to be overshadowed by surrounding buildings
Low rise office façade shades	Area provided by installing PV panels on shading devices at above windows to 1m depth. *Does not include benefit provided by increased shading*	1220	190.75	Overshadowing from the building itself on the East and West orientations reducing generation across the day. Likely future developments will overshadow system.

These systems were analysed and produced the following results:

Table 5-5 Individual Generation and Energy and Emissions Reductions

SYSTEM	ANNUAL GENERATION	ENERGY REDUCTION	EMISSIONS REDUCTION
BAU roof area	125,577 kWh	3.91%	3.40%
Extended roof area	62,789 kWh	1.95%	1.70%
Terrace areas	67,901 kWh	2.11%	1.84%
Hotel façade shades	118,401 kWh	3.69%	3.20%
High rise office façade shades	169,012 kWh	5.26%	4.57%
Low rise office façade shades	162,740 kWh	5.07%	4.40%

Cumulatively, installing these one after another product the following results:

Table 5-6 Cumulative Totals of Generation and Energy and Emissions Reductions

SYSTEM	ANNUAL GENERATION	ENERGY REDUCTION	EMISSIONS REDUCTION
BAU roof area	125,577 kWh	3.91%	3.40%
+ Extended roof area	188,366 kWh	5.86%	5.10%
+ Terrace areas	256,266 kWh	7.98%	6.93%
+ Hotel façade shades	374,667 kWh	11.66%	10.14%
+ High rise office façade shades	543,680 kWh	16.93%	14.71%
+ Low rise office façade shades	706,420 kWh	21.99%	19.11%

Other building integrated PV systems have not been studied as the efficiencies on these systems is generally still very low.

RECOMMENDATION

We recommend installing façade integrated PV, at a minimum, from Level 22 and above. These sections are currently not overshadowed and unlikely to be overshadowed in the foreseeable future. This would allow for ~15% of operational carbon emissions to be offset using onsite renewable energy generation. This represents a significant achievement for a high-rise building, and would assist considerably in achieving the required NABERS Energy ratings, as well as making a strong case for 'design excellence' and 'net zero ready'. Battery storage was also considered, however due to significant uncertainty around the control strategy for the battery and therefore its' payback, this hasn't' been investigated further at this stage.

5.2.3.1 COMPARISON OF SOLAR HOT WATER AND SOLAR PV

Solar hot water and solar PV systems were investigated qualitatively to consider their respective potential contribution to reducing energy and carbon associated with the development operations. A brief investigation of two systems is outlined below:

Table 5-7 Solar System Descriptions

	SOLAR HOT WATER SYSTEM	SOLAR PHOTOVOLTAIC SYSTEM
System description	Rooftop evacuated tubes with hot water tank and electric or gas boost.	PV panels with inverter
Efficiency	~90-70%	~19-24%
Storage potential	Integrated storage	Storage considered separately
System losses	Significant across long pipe spans	Minimal within development
Design life	10 years	30 years

Considering the scale of the building it is unlikely that a solar hot water system would be suitable for use within the proposed development, primarily as it would involve a significant uplift in pumping energy. The notable exception to this could be for pool heating as the hotel pool is located on the roof, close to where the evacuated tubes would be installed minimising the deficits of the system.

RECOMMENDATION

From this high-level analysis, it is recommended that PV systems are prioritised over solar hot water systems. The exception to this would be for hotel pool heating due to the pools proximity to the roof and so would be able to take advantage of the significantly improved efficiency without significant losses associated with distance. The final determination of the potential for solar hot water for pool heating, can be determined as the project progresses through more detailed design stages. It is otherwise recommended in general to maximise installation of PV systems.

5.2.4 METERING

Electrical sub metering is to be provided for significant end uses that would consume more than 100kW. This may include plant rooms, car parks, lift and large areas that require high intensity lighting. Metering of energy consumption can assist considerably in ensuring that energy used in operation is measured, monitored and reduced. This is also an important aspect of the NABERS rating.

5.2.5 ADAPTABLE DESIGN

In addition, adaptability of the building through design that considers 'future-proofing' options have been included in the energy strategy. This allows for plant and equipment, that is efficient now, to be replaced with higher performing technology that may have a lower carbon impact in future. Specifically, this relates to the use of heat pumps, which are inherently more efficient than traditional gas fired boilers, however due to using electricity as the fuel source, can lead to a higher carbon impact than boilers as a result of the current carbon intensity of the grid. This will however change over time as the grid is decarbonised through the grid fuel mix changing to incorporate significantly more renewable energy sources.

At this early stage of the project, it is important to consider how HVAC / plant room design can allow for this in terms of spatial requirements along with access to enable removal and installation of different plant, and how this would link into the existing distribution systems.

A further option worthy of investigation for 'net zero ready' would be to install a central heat-pump domestic hot water system on plant levels in contact with the ambient temperature and electric boosters closer to end uses to minimise pipe losses. This initiative will result in energy savings, however will have a higher carbon footprint (with current carbon factors) and cost but with a building design ready for the transition to a low carbon economy and the increase in gas prices.

5.2.6 ENERGY AND EMISSIONS BENCHMARKS

Through this analysis we've established an indicative energy model of the development to investigate the potential for energy and emissions improvement. This model has been based on a NCC 2019 compliant reference building of the same construction and modelled per the following scopes for each building use:

- Office and Innovation: NABERS Office Base Building Rating (72% of GFA)
- Hotel including facilities: NABERS Hotel (Whole Building) Rating (19% of GFA)
- Retail: NCC 2019 (Base Building) (1% of GFA)

The energy consumption of the development has been established based on preliminary drawings by FJMT and has been compared against the reference building with the following improvements:

- Best practice variable air volume (VAV) system for office and innovation
- Best practice fan coil units (FCUs) in the hotel
- High efficiency chiller and cooling plant

- Condensing hot water heaters
- Procurement of 5 star appliances in hotel where available
- Installation of Class A efficiency lifts

Further improvements in lighting and heating plants for DHW and HHW are possible however at potentially large expense, reduced amenity and/or emissions increases against todays metrics. These measures are not recommended to implement in the design, however allowances should be considered for their implementation once they become viable:

- More efficient LED lighting design beyond standard practice LED design. Recommend consideration of adaptation of design once new generation of LEDs are developed or easily adjustable design to allow for efficient placement of light fittings and lighting controls.
- Heat pumps for HHW and DHW. Recommend consideration of supply temperatures and riser sizes to allow for the future installation of heat pumps once the grid becomes less emissions intensive and heat pump technology develops.

Based on the analysis of these models, a breakdown of energy and emissions intensities for the development has been determined. This can be seen for energy and emissions respectively in Figure 3 and Figure 4 below.

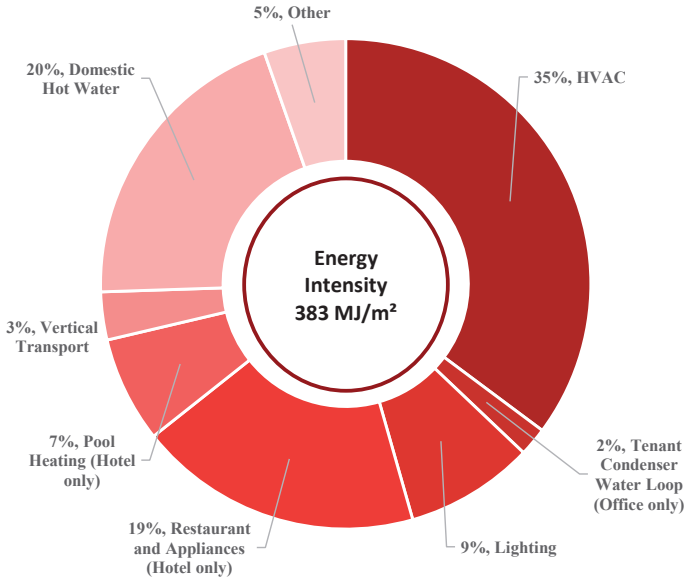


Figure 3 Energy Intensity Breakdown before Renewable Energy

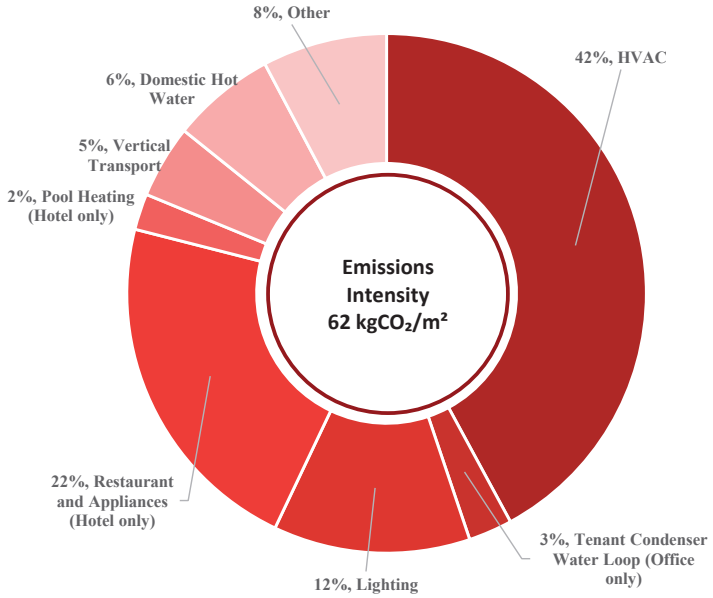


Figure 4 Emissions Intensity Breakdown before Renewable Energy

This is further represented in the table below indicating the energy and emissions intensity of each element within the development. This indicates that the most energy intensive aspects of the building are the HVAC, hotel restaurant and appliances and domestic hot water. However, considering the intensity of the grid in NSW today the more emissions intensive elements of the development are still HVAC and hotel restaurant and appliances, but lighting instead of domestic hot water due.

This is due to the higher emissions factor of the current grid compared to the burning of natural gas, which will change over time as the grid decarbonises through renewable energy contributions to the grid. It is recommended that these energy uses be prioritised for energy improvements in order to reduce the emissions associated with the development over time.

Table 5-8 Emissions Intensity Breakdown before Renewable Energy

BUILDING ELEMENT	ENERGY INTENSITY	PERCENTAGE OF TOTAL	EMISSIONS INTENSITY	PERCENTAGE OF TOTAL
HVAC	134.92 MJ/m²	35%	26.12 kgCO₂/m²	42%
Tenant Condenser Water Loop *(Office only)*	7.25 MJ/m²	2%	1.69 kgCO₂/m²	3%
Lighting	32.59 MJ/m²	9%	7.60 kgCO₂/m²	12%
Restaurant and Appliances *(Hotel only)*	71.85 MJ/m²	19%	13.60 kgCO₂/m²	22%
Pool Heating *(Hotel only)*	26.79 MJ/m²	7%	1.39 kgCO₂/m²	2%
Vertical Transport	12.12 MJ/m²	3%	2.83 kgCO₂/m²	5%
Domestic Hot Water	77.19 MJ/m²	20%	4.01 kgCO₂/m²	6%
Other	20.65 MJ/m²	5%	4.82 kgCO₂/m²	8%
Total	383.36 MJ/m²		62.07 kgCO₂/m²	

These results have also been benchmarked against the NABERS rating tools for base building offices and hotels (whole building) proportioning the generation of PV based on GFA to establish indicative results for each of these ratings. Table 5-9 below indicates the ratings achieved without PV, a BAU PV system (roof only) and through maximising the amount of onsite PV.

Table 5-9 NABERS and Green Star Results

RATING TOOL	WITHOUT PV	WITH BAU PV	WITH MAXIMISED PV
NABERS Office base building	5.5 Star with 18% buffer *15% additional improvement required for next star rating*	5.5 Star with 56% buffer *11% additional improvement required for next star rating*	6.0 Star with 21% buffer
NABERS Hotel (whole building)	4.0 Star with 1% buffer *18% additional improvement required for next star rating*	4.0 star with 3% buffer *16% additional improvement required for next star rating*	4.0 star with 11% buffer *8% additional improvement required for next star rating*

Further reductions on top of the proposed building have been investigated in terms of onsite renewable energy generation i.e. PV. These options have been investigated in the previous section 5.2.3 and are presented in Figure 5 below showing the individual and cumulative reduction of emissions attributed to the installation of each of the PV arrays on top of the efficiency achieved by the proposed energy efficiency measures against the reference building.

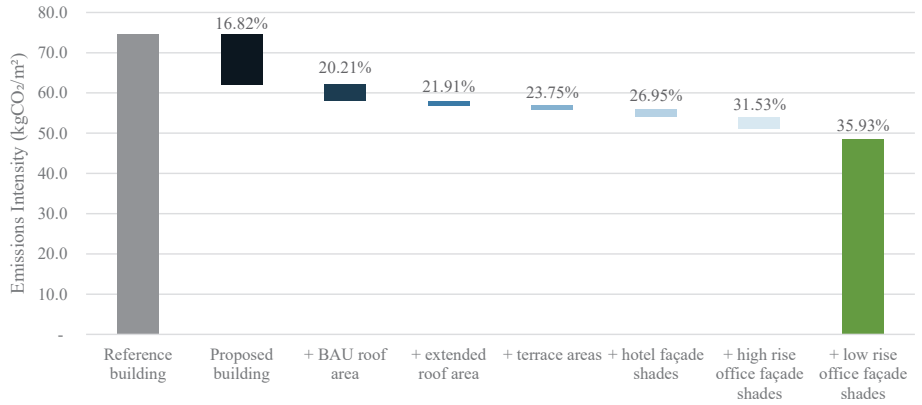


Figure 5 Cumulative Emissions Reductions across Proposed Building and PV options.

These same results can be seen below in Table 5-10 indicating the potential of the proposed development to achieve emissions reductions onsite.

Table 5-10 Emissions Intensity and Reductions across Proposed Building and PV options

MODEL	EMISSIONS INTENSITY	EMISSIONS REDUCTION	CUMULATIVE EMISSIONS INTENSITY	CUMULATIVE EMISSIONS REDUCTION
Reference building	74.6 kgCO₂/m²		74.6 kgCO₂/m²	
Proposed building	62.1 kgCO₂/m²	17.56%	62.1 kgCO₂/m²	16.82%
Proposed building + BAU roof area	58.0 kgCO₂/m²	2.51%	58.0 kgCO₂/m²	20.21%
Proposed building + extended roof area	59.0 kgCO₂/m²	1.25%	57.0 kgCO₂/m²	21.91%
Proposed building + terrace areas	58.9 kgCO₂/m²	1.36%	55.9 kgCO₂/m²	23.75%
Proposed building + hotel façade shades	58.1 kgCO₂/m²	4.49%	53.9 kgCO₂/m²	26.95%
Proposed building + high rise office façade shades	57.3 kgCO₂/m²	3.37%	51.2 kgCO₂/m²	31.53%
Proposed building + low rise office façade shades	57.4 kgCO₂/m²	2.32%	48.6 kgCO₂/m²	35.93%

This analysis has therefore shown that in terms of targeting net zero carbon, it is feasible to achieve at least a 20% reduction (~58 kgCO₂/m²) onsite. The maximum onsite reduction has been shown to be a 35% reduction (~58 kgCO₂/m²) with full façade PV exploitation, however there is a risk that it is not feasible to achieve this level of PV across the building. It is therefore recommended that 'design excellence' or a 'net zero ready' development be considered to have a 25% reduction (~55 kgCO₂/m²) onsite with potential to investigate further offsite emissions reductions measures in the future in order to achieve a net zero development.

5.3 WASTE

Reducing waste and increasing recycling rates are a key priority for the City of Sydney. The Project will achieve exceptionally high rates of resource recovery and will aim to achieve the zero waste requirements in the Guideline for Site Specific Planning Proposals.

The following initiatives have been designed to ensure waste generation is reduced as far as possible, and that recycling rates are maximised. They also exceed the relevant waste requirements in the Sydney DCP 2012.

- A waste management plan would be prepared for the construction phase of the project to inform and monitor the performance of waste management process and increase the diversion of waste from landfill. This would be prepared in accordance with the City of Sydney's requirements
- An operational waste management plan (OWMP) has been prepared to improve waste management practices at the site during operation. Some of the strategies included in the OWMP are:
  - Using eco compactors for general waste and cardboard,
  - installing a food waste processor,
  - providing storage for bulky goods and strip-out waste, and;
  - educating tenants through good communication and signage.
- The sizing, configuration and location of waste rooms in the development will ensure that waste is separated and collection locations are accessible to waste collection services.

This approach is expected to effectively diver approximately 70% of all operational waste, however is largely dependent on behaviours of those occupying the building. There will therefore be an emphasis on extensive and consistent training for all building occupants.

5.4 WATER

Water scarcity is a major concern for Australia's growing population due to changing weather patterns that are occurring because of climate change.

The following objectives are proposed to demonstrate policy compliance and to address Sydney DCP objectives d and e.

- The implementation of fittings and fixtures including showerheads, water tap outlets, urinals and toilet cisterns that have the highest Water Efficiency Labelling Scheme (WELS) star rating available at the time of development.
- A rainwater tank will be installed, from which rainwater can be feasibly collected and plumbed to appropriate end uses. For example, rainwater collection may be used for end of trip facilities use and landscape irrigation.
- Investigate whether surrounding non-residential building, the public domain, a public or private open space or a community facility is serviced by a dual reticulation system for permitted non-potable uses such as toilet flushing, irrigation, car washing, firefighting and certain industrial purposes and if so explore options to connect to this system.

METERING

- Separate waters metres would be installed for each individual tenancy in the commercial and retail components of the development where they are over 5,000sqm.
- Meters would also be installed for the make-up lines to cooling towers, swimming pools, on the water supply to outdoor irrigation, and other major uses.

COOLING TOWERS

Where cooling towers are used, they are to be connected to a:

- Recirculating cooling water loop; and
- Conductivity meter so that the blow down or bleed off system in a cooling tower can be automated based on conductivity. This ensures that the water is being re-circulated an optimum number of times before being discharged to the sewer.

5.5 MATERIALS

The targeted selection of materials with low environmental impacts can greatly contribute to sustainable outcomes and can also reduce total embodied carbon and improve indoor air quality for occupants.

The following initiatives are proposed for the Project. They would also help to address Sydney DCP objectives a, e, f, g, h and i.

- Encourage the re-use of products where possible including repairing and recovering if necessary
- Use building materials, fittings and finishes that: have been recycled; are made from or incorporate recycled materials; and have been certified as sustainable or 'environmentally friendly' by a recognised third party certification scheme.
- Use paints, sealants and floor coverings with low levels of volatile organic compounds (VOC) and wood products with low formaldehyde
- External materials and colour palette would be of light colours to minimise urban heat island effect.

5.6 INDOOR ENVIRONMENT QUALITY

Occupant comfort is a growing focal point of ESD policies both locally and internationally. ESD initiatives that support the improvement of indoor environment quality quite often go hand-in hand with ESD initiatives in other areas including energy, water and materials.

The following initiatives are proposed to address the Sydney DCP objectives a and h.

- Localised lighting control
- Flicker free lighting that accurately addresses the perception of colour
- Optimized building layout to ensure greater access to daylight and high quality external views
- Glare reduction from the installation of blinds or shading devices that can be controlled by the occupant
- Provide high rates of outdoor air to reduce the level of indoor pollutants
- Install acoustic partitions and absorption to reduce reverberation and cross-talk between spaces.

5.7 BIODIVERSITY AND LANDSCAPE

Appropriate landscaping can improve urban ecology and enhance the users experience of a space.

The following landscape design elements are proposed to address Sydney DCP objective j.

- Vertical gardens are proposed in suitable areas in the absence of available floor space for landscaping
- Plant resistant native vegetation is as opposed to exotic species in terraces and other applicable areas
- The implementation of vegetation to reduce the causes and impacts of the urban heat island effect and contribute to achieving the Government Architect NSW draft Tree Canopy Guide, that forms part of the Draft Greener Places Guide of 15% cover in CBD areas.

5.8 TRANSPORT

Reducing individual car use and promoting alternative means of transport minimising GHG emissions, reducing traffic congestion, improving air quality and encouraging active transport as a means of mobility. The Site is ideally suited to sustainable forms of transport due to its proximity to range of public transport services including an array of bus routes, rail and light rail options. The Site achieves a Public Transport Accessibility Level (PTAL) which translates to the best level of transport integration and public transport accessibility.

In addition, the site is conveniently located to various cycling infrastructure, along with footpaths providing safe and efficient connections for pedestrians.

The following initiatives will support Sydney DCP objectives and Sustainable Sydney 2030 targets which aim to increase the use of public and active modes of transport.

- The permissible car parking provision for the Site is 91, however the development includes for only 79 parking spaces, which will include electric vehicle charging stations - or allow for their implementation at a later stage.
- The development will provide significant bicycle racks and end of trip facilities for staff to encourage cycling and pedestrian travel.
- The development benefits from its proximity to excellent public transport services.

5.9 CLIMATE CHANGE

The impacts of climate change are starting to be seen and would become more extreme throughout the life of the development. The following initiatives would help to address Sydney DCP 2012 objectives a, c, d, e, f, g, i and j.

Design adaptations are to be embedded to improve the resilience of the development to climate change, this includes initiatives such as those set out below:

- Low carbon building design, including future proofing strategies for replacement of plant and equipment with technologies that may become more efficient in future
- Building design that is resilient to changing temperatures that may eventuate in future
- Reducing the urban heat island effect of the building
- Reduced use of resources and materials in the design of the building
- Reduced consumption of potable water
- Diversion of operational waste from landfill to more productive uses and reuse.

5.10 SOCIAL SUSTAINABILITY & COMMUNITY

The proposed vertical innovation village will comprise a bold new proposition for a mixed-use building, bringing together on a single site a world-class co-working hub and fabrication laboratory for innovation and technology, a diverse range of commercial space for emerging, growing and established technology businesses, a hotel tailored to tech workers, as well as a range of retail, hospitality and service amenities to support the community working, staying and visiting the site.

Increased social interaction among community members can contribute to the improvements of people's health and wellbeing and ultimately increase community resilience. The Project has been designed and envisaged to deliver on the following social outcomes and benefits to both the buildings users and the wider community.

- Increase the availability of jobs to the surrounding community
- Ensure greater access to social infrastructure including child-care, health services and cultural infrastructure
- Encourage greater social cohesion among building users through offering a mix of spaces, services and equipment to encourage convergence, collaboration and cross-disciplinary research and development.
- Provide Sydney's first publicly accessible technology fabrication lab, creating an inclusive and energetic destination.

6 CONCLUSIONS

This ESD Concept Report has set out how the proposed development at 187 Thomas Street has considered sustainable design strategies from the outset of the project. The Project has a strong vision for creating a vertical innovation village through providing a complementary range of spaces and services within a world-class building.

An innovative, world-class building of this type must also deliver extremely high standards of ESD. This has been achieved through the holistic approach to sustainable design detailed in this report, with a strong focus on energy efficiency and low carbon design strategies, waste diversion and reduced water consumption. The project is subject to exceptionally high ESD standards as prescribed in the policies below.

POLICY	TARGET	USE CLASS
Draft Guideline for Site Specific Planning Proposals in Central Sydney	NABERS Energy 5.5	Commercial Offices
	NABERS Energy 4.5	Tech Hotel
	Net Zero Carbon	All
	Zero Waste	All
	Water Efficiency	All
DCP 2012	NABERS Energy 5.5	Commercial Offices
Central Sydney Planning Strategy (Draft)	NABERS Energy 5	Commercial Offices
	Net Zero Carbon - commitment	All

The ESD Concept strategy has shown that the NABERS targets are achievable.

In addition, building can achieve a 25% reduction in carbon emissions through a strategy to firstly reduce energy consumption and promote energy efficiency. Highly efficient building services are also essential to the strategy to reduce carbon emissions. And finally, PV will be installed as far as feasible and practical across the building, including investigation into aspects of the façade.

The waste strategy governing the operation of the building is expected to achieve at least a 70% diversion rate from landfill, which contributes significantly to the zero-waste target and moves beyond a business as usual approach.

Best practice water management will also be implemented including reducing consumption of potable water through efficient fixtures and fittings and through integration of rainwater harvesting.

The proposed innovation village at 187 Thomas Street has environmentally sustainable design strategies embedded through the overall design and vision for the project.

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