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HORNSBY SHIRE COUNCIL

HORNSBY TOWN CENTRE

NET ZERO CARBON PRECINCT STRATEGY

JULY 2021

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Hornsby Town Centre
Net Zero Carbon Precinct Strategy

Hornsby Shire Council

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GLOSSARY

BAU	Business As Usual
BASIX	The Building Sustainability Index. A tool for rating the Energy & Water efficiency and Thermal Comfort performance of a development against baseline benchmarks. Provided by NSW DPIE to support the requirements under BASIX SEPP 2004
DCP	Development Control Plan
ESD	Ecologically Sustainable Design
FSR	Floor Space Ratio
HTC	Hornsby Town Centre
LEP	Local Environmental Plan
LGC	Large-scale Generation Certificate
LSPS	Local Strategic Planning Statement
NCC	National Construction Code
OSD	Over-Station Development
PV	Photovoltaic
PPA	Power Purchase Agreement
SEPP	State Environmental Planning Policy
TfNSW	Transport for NSW

1 INTRODUCTION

Hornsby Shire Council is seeking to consolidate the bulk of planned future growth within Hornsby Town Centre (HTC), to take advantage of its improved access to public transport and services and to derive value from concentrated infrastructure delivery rather than dispersed facilities. The growth would be included in a revitalisation of Hornsby Town Centre to create a liveable, green, and accessible centre that enhances public life for the community.

Intensification of activity within the town centre and significant new buildings being delivered, along with substantial opportunities for refurbishment and repurposing of existing buildings, provides an excellent opportunity to deliver high-performing, low emission developments. Supporting councils target of net zero emission precinct aligns with local policy, NSW State policy and international commitments.

HTC is the major commercial centre within Hornsby Shire and encompasses a commercial core surrounded by light industrial, community, civic and residential development of varying density all anchored by Hornsby Station. The new masterplan is considering a new multi-purpose community facility and plaza, approximately 3,000 new dwellings, and new commercial and retail spaces.

The strategy looks first at onsite solutions to reduce energy consumption through excellent building design and high performing, low energy building services. The next step is to consider options for onsite renewable energy options to deliver clean energy to the precinct. Finally, the remaining energy demands not able to be met onsite can be offset through a contribution to offsite renewable energy initiatives or renewable energy procurement agreements. The analysis has also investigated the feasibility of the timing of achieving net zero emission and the trajectory to this target.

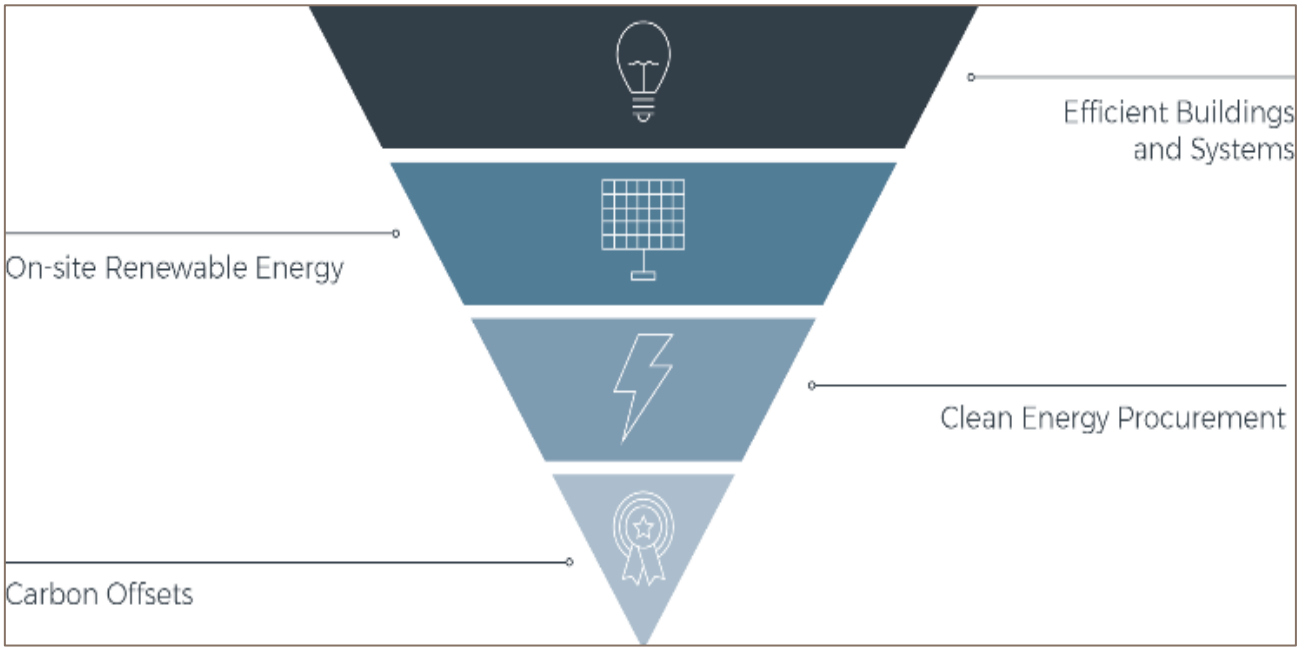

Figure 1.1 Energy use hierarchy for HTC

1.1 POLICY CONTEXT

As a large and contained redevelopment precinct, with potential large uplifts in density facilitated by rezoning and large amounts of government-owned land, HTC provides an opportunity for a consolidated precinct-level sustainability strategy to be implemented. This strategy has been committed to by Council and is in support of state sustainability priorities and objectives:

- Regional Policy:
  - A Metropolis of Three Cities – *A low-carbon city contributes to net-zero emissions by 2050 and mitigates climate change*
  - North District Plan - *Reducing carbon emissions and managing energy, water and waste efficiency*

The sustainability strategy reflects Hornsby's Local Strategic Planning Statement (LSPS) and Sustainable Hornsby 2040 Strategy:

Hornsby Town Centre Vision

"A place for people that reflects the uniqueness of the bushland setting, integrated around key public spaces, where the city meets the bush. An active, thriving centre that exhibits economic diversity, design excellence, liveability and sustainability."

Hornsby Town Centre Principles

"A centre that exhibits best practice environmental sustainability."

Hornsby Park Objectives 5:

Demonstrating Sustainability - Developing robust and 'smart' systems that demonstrate 'sustainability in action' for management of the parkland. Examples may include autonomous electric vehicle transport and renewable energy systems.

Sustainable Hornsby 2040

Goal 5 Climate Wise – *"We will mitigate our actions and achieve zero net emissions by 2050. We will adapt to the changing climate"*

Figure 1.2: Hornsby Shire Council Planning Instruments

1.2 POLICY CASE STUDIES

The following case studies are provided to demonstrate where councils have included specific policies in their LEPs to require higher energy standards in buildings. These policies use incentives such as increased floor space ratio (FSR) or building heights. While these particular incentives may lead to undesirable outcomes in the context of the master planning

process and rezoning for HTC, they provide examples of specific policy measures that have been taken elsewhere to support the desired outcome.

BASIX is implemented under a SEPP and therefore planning controls cannot exceed the targets set in state legislation such as those for BASIX, hence incentives such as additional floor area are offered in these examples to incentivise such development.

1.2.1 BANKSTOWN CASE STUDY:

Clause 4.4A of Bankstown LEP 2015 provides for Floor Space Ratio (FSR) bonus of 0.5 on the FSRs allowed under the Local Area Plan for the Bankstown CBD on the condition that they achieve the following environmental design standards:

4.4A Additional gross floor area for more sustainable development in Bankstown CBD commercial core:

- *"Non-Residential component of a building:*
  - *Energy target is a maximum 135 kg of carbon/m²/year (equivalent to a 5 Star NABERS Energy rating for commercial buildings)*
- *Residential component of a building:*
  - *Energy target is a minimum 10-point increase in the BASIX score compared to current requirements."*

1.2.2 GUIDELINE FOR SITE-SPECIFIC PLANNING PROPOSAL REQUESTS IN CENTRAL SYDNEY (DRAFT)

This draft policy guideline details the planning pathways for developments seeking additional height and density through a site-specific planning proposal. Guidelines are provided which outline the methodology for determining the maximum possible building envelope along with minimum requirements for the Community Infrastructure Contribution, efficient land use, footpath pedestrian capacity testing and site testing.

The guidelines provide very high standards for ecologically sustainable design (ESD) and the control requires that proposals drive zero-net energy, zero waste and water efficient outcomes. The test for this is as follows:

- *"Development resulting from a Request must exceed Sydney LEP's minimum ESD controls.*
- *Proposed new buildings (or altered buildings) that rely on increased FSR and/or height must achieve an Office and Environment and Heritage (OEH) National Australian Built Environment Rating System (NABERS) Energy Commitment Agreement of at least 5.5 stars for office and 4.5 star for hotel.*
- *Sites subject to a Request must achieve net-zero carbon, zero waste and water efficient outcomes across the site.*
- *Net-zero carbon involves maximising inherent efficiency through design, materials and equipment selection with onsite renewable energy generation to the fullest extent possible.*
- *Net-zero carbon, zero waste and water efficient outcomes may be delivered by way of a block agreement where proposed new buildings (or altered buildings) facilitate the upgrade and/or off-set of greenhouse gas emissions, water consumption and operational waste production of other developments within the site."*

2 NET ZERO EMISSIONS APPROACH

The approach to determining the net zero emissions strategy for HTC was structured to firstly establish the base case or business-as-usual (BAU) building across five distinct asset classes, with three building typologies within each class. The asset classes are office, hotel, shopping centres, residential and mixed-use buildings. Also investigated were smaller clusters of asset classes including public buildings to account for the library/community centre, along with light industrial units. New build and major refurbishment projects have also been included in the analysis. As detailed in Limitations, the net zero emission strategy for the precinct relates to building operations and does not consider embodied carbon or emissions associated with transport or waste.

With the base case established, the next step was to model a notional 'maximum energy efficient' building using current, available technologies and methods, to understand how far a building's energy could be reduced through building fabric and its services alone. Contribution from solar PV was then considered for providing renewable energy to meet the low carbon target.

Cost-benefit analysis was then undertaken, which showed that the 'maximum energy efficient' building, although technically feasible, was not economically viable. Regression from the maximum energy efficiency case established interim targets on the net zero trajectory. The range of interim targets allow selection of cost-neutral targets or targets that carry an implied low, medium or high uplift in development cost. Interim targets also provide some flexibility in terms of the number of milestones on the pathway to net-zero carbon.

An important factor in reaching net-zero carbon is the offsite or offset opportunities. It is accepted that for a majority of buildings it isn't feasible to achieve 100% zero emissions onsite, however the energy demand that can't be completely reduced or met through onsite renewables could be supplied from an offsite renewable energy installation, or through renewable energy procurement contracts.

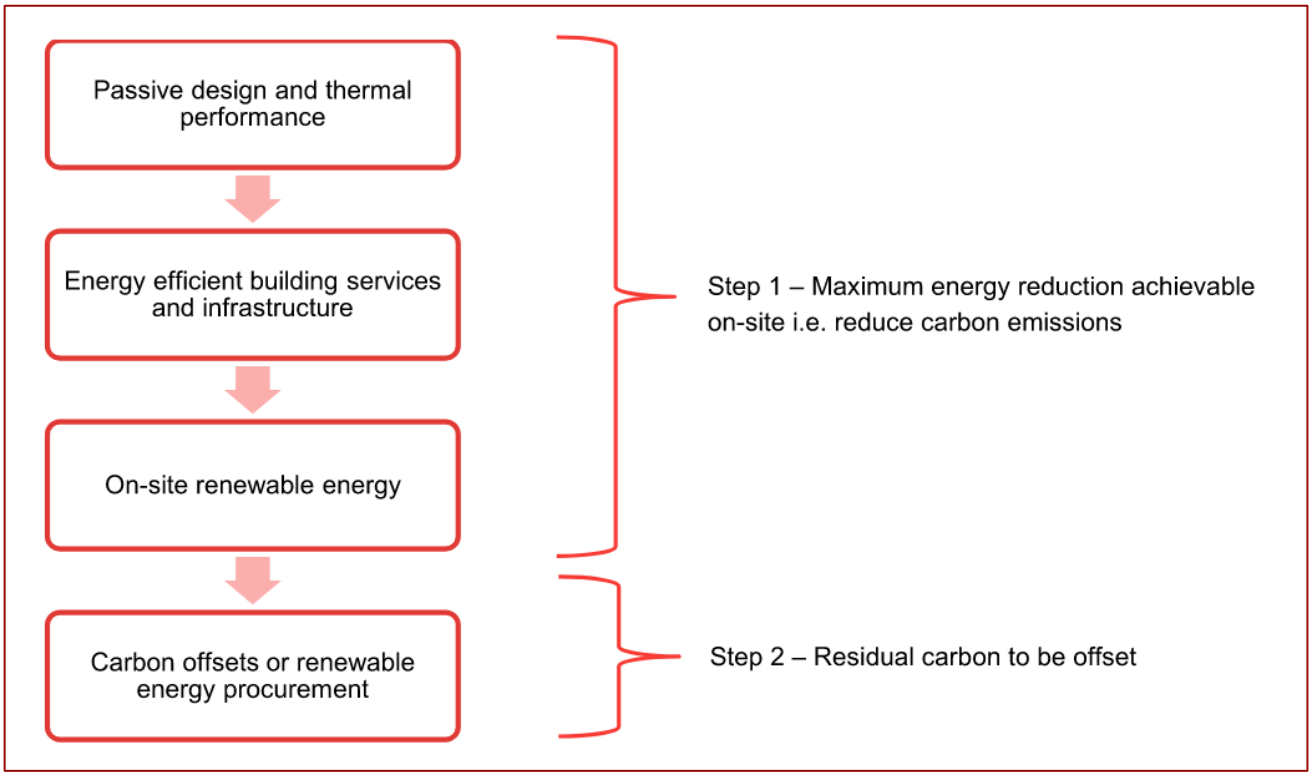

Figure 2.1 Achieving Net Zero Carbon – First Principles

2.1 DATA ANALYSIS/MODELLING

The following three approaches provides a range of benchmarks for Energy Efficiency in the context of this analysis:

- **Business as Usual** (BAU) is in accordance with NCC 2019 minimum requirements or common practice.
- **Best Practice** is superior procedure or strategy to a business as usual approach.
  For example:
  - Improving mechanical systems efficiency
  - Including daylight sensors.
- **Maximum Energy Efficiency** (MEE) case incorporates the following strategies (as applicable to and in accordance with building typology):
  - **Renewable energy contributions:** inclusion of PV systems on available roof tops has been investigated, however auxiliary contributions from BIPV or solar roads were excluded due to their minor magnitude.
  - **Applying emission offsets:** this is typically in the form of renewable energy procurement.

The three approaches have been applied to the following building typologies used in the calculations:

- Office Building: Grade A building, GFA of 35,634m² with 18 office floors and 457m² of Retail space.
- Hotel Building: 4 Star Hotel, GFA of 4,420m² with 10 floors at 16 rooms per floor and Floor spare for Restaurant, Conference Room and Gym.
- Residential Building: 15 Story Residential Building, GFA of 9,858m² with 15 floors at 7 apartments per floor and carparking spaces.
- Shopping Centre: Medium size, GFA of 26,560m² with 2 floors and a total tenancy of 84.
- Public Buildings: as for office buildings in this analysis
- Light Industrial: considered for PV roof area opportunity

2.2 COST BENEFIT ANALYSIS

Energy consumption modelling used an example development typology, based on existing and proposed development designs, across five asset classes.

This seven-phase approach is described in Figure 2.2.

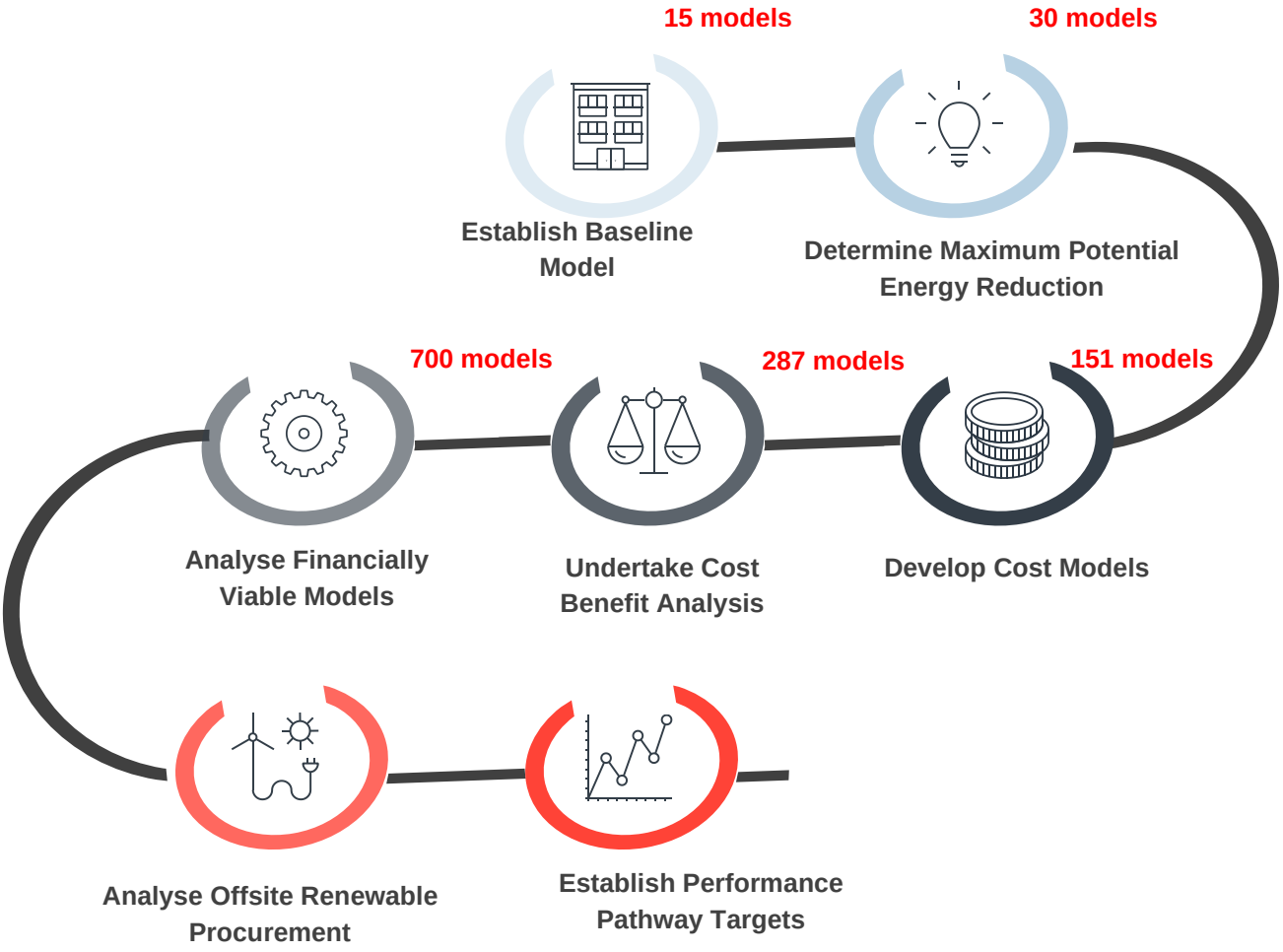

Figure 2.2 Phases of Energy Consumption modelling applied to the data for net zero emissions analysis

1 **Establish baseline model**
This step determined the suitable typologies for each asset class from a range of existing or proposed development designs that represented development in HTC, with a focus on high rise development. Three typologies were selected for each asset class, with each uplifted to meet NCC 2019 Section J.

2 **Determine maximum potential energy reduction**
This step determined maximum level of energy efficiency that could be achieved by optimising the building envelope and ensuring best practice building systems were provided in developments. The installation of onsite renewable energy generation was also considered in this analysis.

3 **Develop cost models**
Cost models, based on this maximum level of energy efficiency, were developed for the baseline model and each individual energy reduction measure of the maximum energy reduction potential model.

4 **Undertake cost-benefit analysis**
The cost benefit analysis identified which individual energy efficiency measure within the maximum energy efficiency potential model were financially viable or would become financially viable before 2050. An internal rate of return (IRR) was developed for each initiative and compared against the uplift in capital investment. While high performing, green credentialed building may attract high asset valuation this did not factor into the assessment.

5 **Analyse financially viable models**
Individually viable measures were aggregated to determine the financially viable energy efficiency measures for each typology from implementation to 2050.

6 **Analyse offsite renewable procurement**
Accounting for onsite energy reductions, offsite renewable procurement options were assessed for their viability in planning and their cost impact. This was informed by feedback from stakeholders.

7 **Establish performance pathway targets**
The final phase determined the targets from the financially viable energy reductions by considering the financially viable energy efficiency measures and the stakeholder engagement.

The analysis covered major refurbishments as well as new developments where major refurbishment means only the existing façade, floorplates and key structures are retained. It was assumed that the base case for a major refurbishment is a building with non-NCC compliant building fabric and glazing. Therefore, a major refurbishment would trigger Section J and all building fabric and glazing would need to be upgraded to meet Section J requirements.

It was assumed that all energy efficiency initiatives applied for a new development can be achieved in a major refurbishment without modifying the building structure.

ASSETS AND TYPOLOGIES

Table 2.1 shows the typologies in each asset class, how they are defined for the purposes of this assessment, and the scope considered in this analysis. The building typologies ranged in size and scale and were drawn from recent development applications in Greater Sydney.

Table 2.1 Asset classes and typologies making up the benchmarking data

ASSET CLASS	SCOPE	TYPOLOGIES SELECTED FOR ASSESSMENT PURPOSES	GROSS FLOOR AREA (GFA m²)
Office	Base building	Premium Grade (PCA) - 37 storey	67,684
		Grade A (PCA) - 20 storey	35,635
		Grade B (PCA) - 4 storey	8,878
Shopping Centre	Base building	Regional - 5 storey	114,443
		Subregional - 2 storey	26,560
		Neighbourhood - 1 storey	7,359
Hotel	Whole building	5 Star (ATAP) - 50 storey	38,975
		4 Star (ATAP) - 24 storey	11,262
		4 Star (ATAP) - 10 storey	4,420
Multi-unit residential	Whole building	High Rise - 25 storey	16,995
		Mid Rise - 15 storey	9,858
		Low Rise - 9 storey	7,847

3 EMISSION REDUCTION STRATEGY

3.1 EMISSIONS PROFILE

The trajectory to a Net Zero emissions precinct has been developed to set a clear target with increments over time, allowing industry time to adapt to new standards in high performance buildings.

A series of mechanisms can be applied sequentially and holistically to pursue the desired trajectory:

3.1.1 ENERGY EFFICIENCY

Initiatives to improve and maximise energy efficiency start with effective passive design and performance fabric selections so that HVAC plant can operate optimally. To complement well-performing building fabric, selection of higher efficiency HVAC plant, fans, pumps and lighting all contribute collectively to reduction in energy consumption.

Greater efficiency in operational energy consumption also contributes to reduced peak energy demand. This will reduce the burden on energy supply infrastructure and create the conditions for successful implementation of de-carbonised energy strategies that will rely on renewables-based electrification and effective peak management.

3.1.2 ON-SITE RENEWABLES

Energy efficiency will naturally only reduce but not eliminate energy consumption. The current primary source of electrical energy supply carries a high emissions ranking, resulting from heavy contributions by coal, gas and diesel-fuelled generators.

While and until the electrical grid transitions to renewables, the higher emissions associated with electrical energy consumed can be mitigated through on-site generation of renewable energy from photovoltaic (PV) installations and other non-fossil fuel sources of energy.

3.1.3 INFRASTRUCTURE AND SHARED SYSTEMS

Local infrastructure solutions at the precinct level can be applied that provide economies of scale for shared generation and storage of renewable energy as well as responding to peak demand events to manage energy pricing fluctuations associated with excessive grid demands. Where these economies of scale allow for optimal utilisation of renewable energy without surplus generating capacity, practical means of uptake should be explored.

Shared thermal energy infrastructure systems can also play a role in delivering efficient cooling and heating solutions across multiple assets, however this does rely on an integrated design approach and effective implementation of energy sharing agreements. Owner operated and infrastructure assets may benefit the most from such initiatives.

3.1.4 OFFSITE / OFFSET OPTIONS

After energy efficient design, on-site renewable generation and infrastructure-scale options have been incorporated, there is a likely shortfall from zero emissions that will remain. The expectation is that the shortfall along the trajectory to net zero emissions will reduce, in accordance with the choice of initial improvements to be implemented and the growth of the trajectory towards zero emissions over time.

The remnant shortfall in emissions reductions can be mitigated through the purchase of offsets or off-site renewable sourced energy. By balancing the remnant 'negative' emissions with an equivalent amount of 'carbon-positive' emissions reductions off site, the net-zero emissions target is attained.

The primary mechanisms through which this balancing can be achieved are:

- Power Purchase Agreements (PPAs) for 'green' electrical power that guarantee renewable energy sourcing over a minimum time commitment
- Purchasing and voiding of certificates for an amount of emissions or carbon abatement equivalent to the surplus emissions generated.

3.2 TRAJECTORY TO NET ZERO EMISSIONS

The proposed pathway towards achieving net zero carbon emissions by 2035 is presented as a trajectory plot of percentage reduction in emissions over time, aligned to key milestone dates (years) at which to audit and review the amount of offset adjustment required to meet the net zero target.

The regulatory drivers and incentives for residential development differ from those affecting non-residential development, and therefore an overall steep initial trajectory relies on a greater proportion of the reduction commitment carried by the residential elements of the scheme. This is due to the opportunity that exist to incentivise residential developers to perform beyond minimum compliance.

The residential components are anticipated to follow a trajectory aligned to the measures implemented through regulatory mechanisms of BASIX and the National Construction Code alone.

Figure 3.1 and Figure 3.2 demonstrate these differences in weighting between the non-residential and residential elements of the scheme respectively.

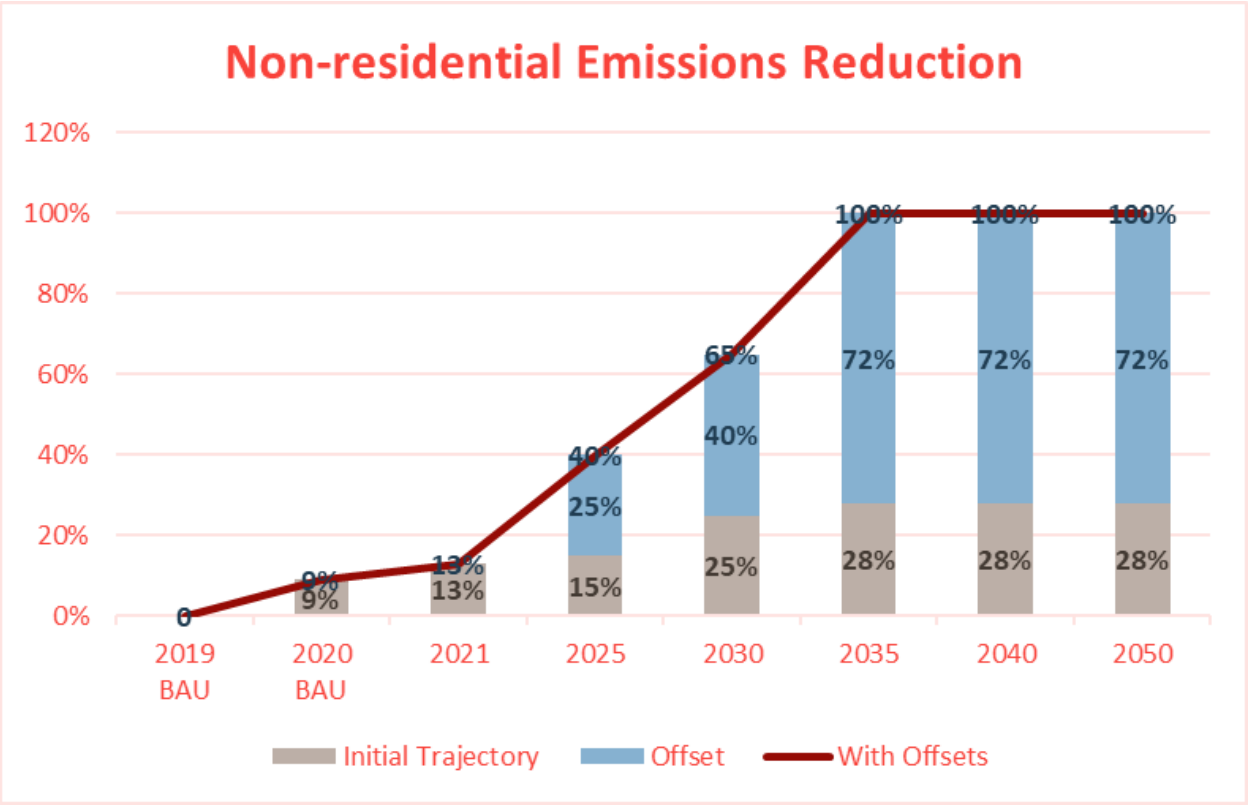

Figure 3.1 Proposed trajectory to net zero emissions for non-residential asset classes

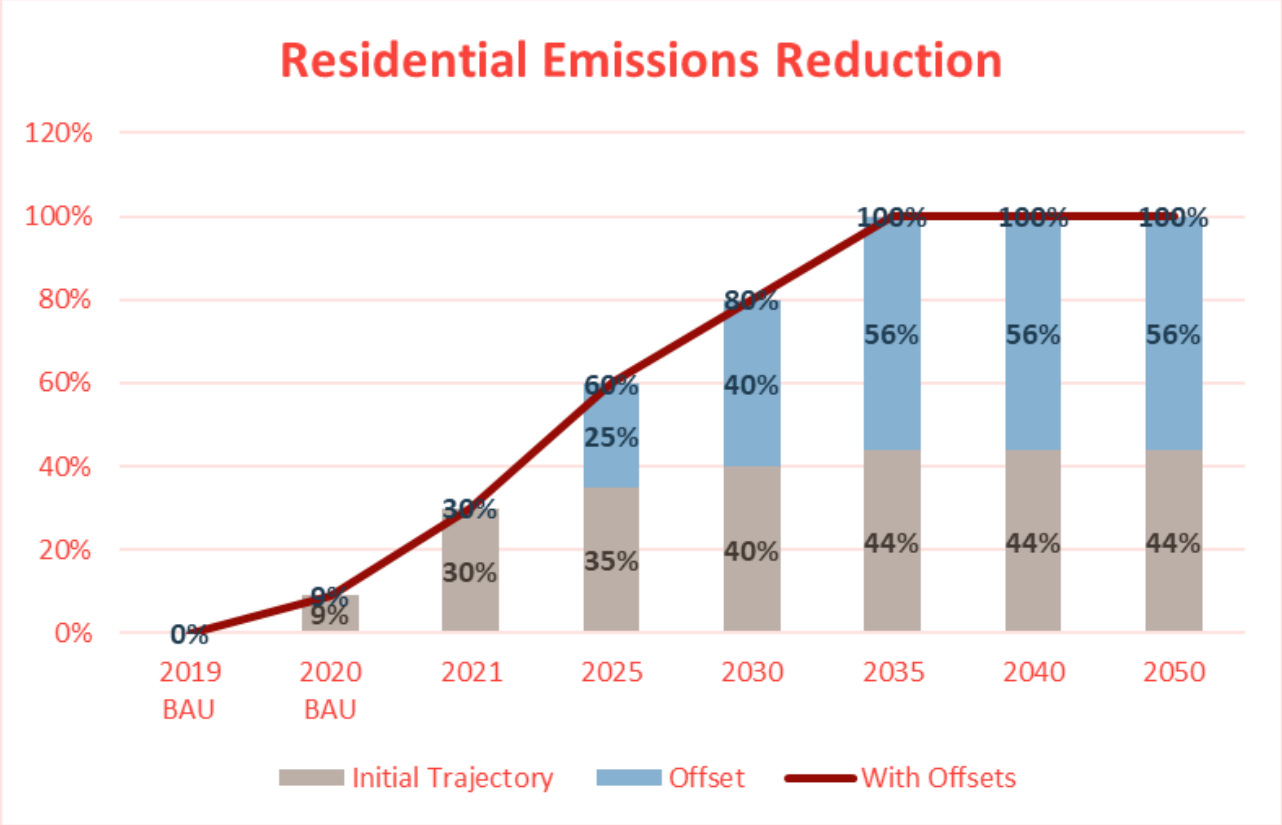

Figure 3.2 Proposed trajectory to net zero emissions for the residential asset class

3.2.1 ASSET MIX

The 'Intervention Case' capacity information from Cox Architects provides the spread of asset class GFA listed in Table 3.1, to which the available energy and emissions analysis data has been applied.

Public buildings for the purpose of current analysis can be broadly interpreted as being similar to the office asset class.

Table 3.1 Summary of HTC capacity breakdown by GFA across modelled asset classes

	Office†	Hotel†	Shopping Centre / Retail	Residential	Public Buildings (Civic & Education)
Gross Floor Area (m²)	112,017	28,004	29,846	566,721	22,477
Percentage split of GFA	14.8%	3.7%	3.9%	74.6%	3.0%

†*The present yield data for the HTC master plan does not identify hotel GFA explicitly. A factor of 20% of total commercial area has been applied so that the range of asset classes matched to analysis data could be assessed.*

The asset mix above has excluded all GFA associated with car parks and infrastructure identified in the capacity breakdown from Cox.

3.2.2 PERFORMANCE IMPROVEMENTS ACHIEVING COST NEUTRALITY

A first step on the trajectory towards net zero was selected based on a combination of measures deemed to achieve a cost neutral outcome, on the basis that the costs of uplift are justified against the internal returns on the asset and/or the measures selected being already, or expected to become, standard practice within the time frame of the strategy implementation.

From the modelled performance settings for Business As Usual (BAU), Best Practice and Maximum Energy Efficiency approaches, the matrix of measures shown in Table 3.2 is the configuration that was agreed as defining the cost neutral first step on the net zero emissions trajectory described in Figure 3.1 and Figure 3.2 above.

Table 3.2 Cost neutral matrix of improvement measures across asset classes representing first step on net zero emissions trajectory

Proposed Building Improvements	Office	Hotel	Shopping Centre	Residential
Fans	**Best Practice**	**BAU**	**Best Practice**	**Best Practice**
Pumps	**BAU**	**BAU**	**BAU**	**BAU**
Heating	**BAU**	**Max Efficiency**	**Best Practice**	**Best Practice**
Cooling Towers	**BAU**	**BAU**	**BAU**	**BAU**
Cooling	**Best Practice**	**BAU**	**Best Practice**	**Best Practice**
Mechanical Ventilation Fans	**Best Practice**	**BAU**	**Best Practice**	**BAU**
Lighting	**Best Practice**	**BAU**	**Best Practice**	**BAU**
Tenant Condenser Water Loop	**BAU**	**N/A**	**N/A**	**N/A**
Hotel/Dwelling Kitchen Equipment	**N/A**	**Best Practice**	**BAU**	**Best Practice**
Hotel Room/Dwelling Equipment	**BAU**	**Best Practice**	**BAU**	**Best Practice**
Hotel/Dwelling Laundry Equipment	**N/A**	**Best Practice**	**N/A**	**Best Practice**
Pool Heating	**N/A**	**BAU**	**N/A**	**N/A**
Lifts and Escalators	**BAU**	**BAU**	**BAU**	**BAU**
Domestic Hot Water	**BAU**	**Max Efficiency**	**BAU**	**Max Efficiency**
Hydraulic Pumps	**BAU**	**BAU**	**BAU**	**BAU**
House Power	**BAU**	**BAU**	**BAU**	**BAU**
Generator Jacket Heater	**BAU**	**BAU**	**BAU**	**BAU**

Table 3.3: Summary of predicted emissions reductions by use and asset class under the cost neutral first trajectory step

		OFFICE	HOTEL	SHOPPING CENTRE	RESIDENTIAL
AC	Fans	18%	9%	32%	44%
	Pumps	9%	9%	- *	0%
	Heating	9%	47%	20%	9%
	Cooling Towers	9%	9%	- *	0%
	Cooling	27%	9%	20%	0%
Mechanical Ventilation Fans		3%	9%	19%	9%
Lighting		37%	9%	28%	9%
Kitchen Equipment & Appliances		-	23%	9%	23%
Dwelling Equipment & Appliances		-	27%	9%	38%
Laundry Equipment		-	-	-	29%
Lifts and Escalators		9%	9%	9%	9%
Domestic Hot Water		9%	-49%	9%	59%
Hydraulic Pumps		9%	9%	9%	9%
Overall Emissions Reduction by Asset Class:		15%	11%	14%	30%
Average Emissions Reduction Total:		**27%**			

* HVAC modelling for shopping centres assumes air cooled, VRF based systems with no water use for heat transfer or rejection and therefore does not include components of emissions reduction for pumping or cooling towers.

*The -49% for DHW in hotels is a consequence of switching to electric heat pumps which are far more energy efficient but have substantial higher emissions compared to gas in the baseline. As the grid de-carbonises this can be expected to improve.

The Cost Neutral pathway demonstrates a feasible and achievable first step target for designers and developers to work towards.

BUILDING ENERGY PERFORMANCE IMPROVEMENTS SUMMARY BY ASSET CLASS

The cost neutral target for the net zero trajectory first step is a significant improvement compared to the current Business As Usual approach. Compared to the maximum energy efficiency case, there remains ample opportunity for further improvement after the first step, confirming that the selected trajectory initiation is not an aggressive launch towards the maximum targets straight away.

Table 3.4 Summary of predicted emissions reductions by asset class and strength of performance improvement

	BAU	COST NEUTRAL FIRST STEP	MAX ENERGY EFFICIENCY
Office	9%	15%	36%
Hotel	9%	11%	25%
Shopping Centre	9%	14%	24%
Residential	9%	30%	44%
Overall Emissions Reduction	**9%**	**23%**	**36%**

The predicted overall improvement is an average of the improvements across the various asset classes and dependent on the relative mix of those assets in the scheme.

Comparing the broader scheme yields with the anticipated breakdowns in the Scenario 1+ core scheme for example, there are material variations in the weighting of different asset classes that could substantially shift the resultant improvements if these were reflected across the precinct.

The divergent capability for percentage of improvement between residential and non-residential development suggests that different step targets can be set between the two broad asset classes.

Establishing separate targets for residential vs. non-residential typologies will enable more representative tracking to a net zero pathway for the asset classes and should apply to publicly owned assets as well as private.

Public entities including Transport for NSW and Council have opportunity to meet and exceed the trajectory targets.

- Aligned with commitment to state government targets
- Creates policy leadership signal
- Early public building projects can showcase initiatives, with inherent benefits for Council as the operator
- Sets clear agenda for trajectory
- Subsequent cuts are more incremental and assist in maintaining policy momentum.
- Captures early, substantial reductions

3.2.3 POTENTIAL FOR PHOTOVOLTAIC (PV) INSTALLATION AND CAPACITY

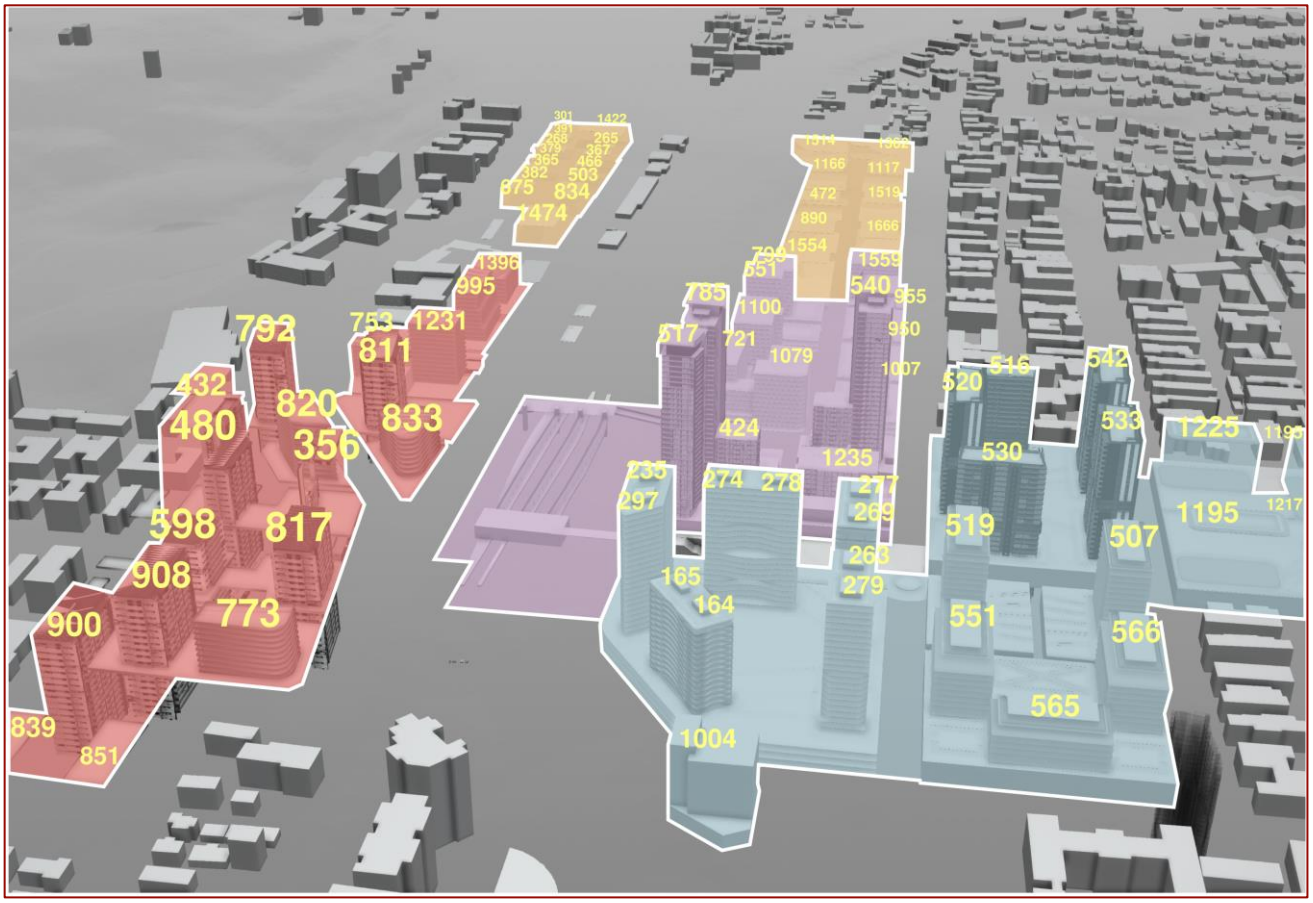

Figure 3.3 Areas of potential roof space in m² identified across the proposed HTC Scenario 1+, showing breakdown by Western Heritage (●), Northern Employment (●), Central Heart (●) and Retail Core (●) development sites.

A take-off of potentially usable roof areas across the town centre yields approximately 63,000m² of space. Accounting for other needs for the roof including plant and outdoor lettable space, and for potential overshadowing of the available area, it is prudent to work with 25% utilisation of this yield for estimation purposes i.e. ~15,750m². An opportunity may exist for partnership between HTC and Transport for NSW to utilise roof space in the rail yards in addition.

Generation capacity from the utilised area will be influenced by factors such as panel technology and model selection, spacing needs and inverter efficiency. Taking a representative model of PV panel on the current market rated at 450W and current inverter technology and allowing nominal spacing and access area around installed PV racks, 2,235 MWh of annual precinct renewable energy generation can be expected.

Against the cost neutral first step strategy, this represents a 1.4% offset to energy demand, and 2.3% reduction in associated emissions, for overall 54% reduction in energy and 29% reduction in emissions. To achieve 5% reduction or more under the cost neutral first step, a greater amount of PV capacity would be required, utilising 50% or more of available roof area across the town centre.

Precinct 2%-5% Emissions Reduction

- 25% to 50% of tower roof tops selected for PV allocation in the current analysis for optimal solar access
- Lower height buildings and podiums may conflict with other planned uses and overshadowing could impact PV performance

- Opportunities to be explored include potential for PV on structures over the rail corridor and lower height, unshaded roof areas, to improve the percentage of roof area available to utilise for PV.

3.3 OFFSITE / OFFSET CASE STUDIES

The following case studies demonstrate instances where councils have included specific policies in their Local Environmental Plans (LEP) to require higher energy standards in buildings, as well as other initiatives such as voluntary agreements that sit outside the planning framework and have been used to facilitate net zero carbon precincts or bulk purchase renewable energy.

3.3.1 LOCAL ENVIRONMENTAL PLANS

PERFORMANCE AND / OR INCENTIVE CONTROLS IN POLICIES

BASIX is an achievable benchmark for new developments to target, however, individual Council's and communities who are looking to apply sustainability targets beyond that prescribed by BASIX are inhibited by the hierarchal nature of the SEPP over LEPs and other local policy related to residential development.

Targets beyond BASIX can be included in local plans for non-residential development at the discretion of the Council. For residential, minimum requirements can only be set aside in favour of higher standards, if provisions offer incentives under the competing provision rule. Below are case studies of alterative examples on how to achieve higher sustainable outcomes through incentive base approaches.

Clause 4.4A of Bankstown LEP 2015 provides for Floor Space Ratio (FSR) Bonus of 0.5 on the FSRs allowed under the Local Area Plan for the Bankstown CBD on the condition that they achieve the following environmental design standards:

Residential component of a building:

- *Energy target is a minimum 10-point increase in the BASIX score compared to current requirements.*
- *Water target is a minimum BASIX 60.*

Non-Residential component of a building:

- *Energy target is a maximum 135 kg of CO_2/m^2 per year (equivalent to a 5-star NABERS rating for commercial buildings)*
- *Water target is a maximum 0.47 kL/m^2 per year for office (equivalent to a 4.5-star NABERS rating for commercial buildings)*

Parramatta City Council have taken a similar approach to include higher energy performance standards in the draft Parramatta CBD Planning Proposal, which is currently being considered by Council (https://www.cityofparramatta.nsw.gov.au/parramatta-cbd-planning-proposal).

3.3.2 OFFSITE / OFFSET OPTIONS VOLUNTARY AGREEMENTS

Initiatives such as voluntary agreements that sit outside the planning framework that have been used to facilitate net zero carbon precincts, or ability to purchase bulk renewable energy.

ESTATE LEVY – BARANGAROO

The Barangaroo Authority has committed to Barangaroo operating as a carbon neutral precinct that is delivered through a carbon reconciliation and offsetting process, using a proportion of the funds generated by the Estate Levy to purchase Renewable Energy Certificates (RECs) and offsets where appropriate. The Authority allocates an amount no greater than

$4.90 per annum of the Estate Levy per m² of GFA for each building which has achieved Practical Completion to Climate Positive Fund provision account. The Authority intends to utilise the nationally recognised National Carbon Offset Standard (NCOS) certification process to validate carbon neutrality once the standard is introduced.

POWER PURCHASING AGREEMENT

Corporate Purchase Power Agreements (PPAs) involve companies entering independent contracts with power producers or utility companies to source their renewable energy supply directly. This involves the company committing to purchase a specific amount of renewable electricity from the provider at an agreed amount for an agreed period of generally 10+ years. The two most common types of PPA contracts are wholesale and retail PPAs:

Wholesale PPA Contract - Also known as Unsleeved / Unbundled / Virtual contracts.
A corporation requests to purchase a certain amount of electricity from a producer for a certain time frame. To price this electricity, the utility company and buyer agree on a PPA strike-price for the electricity, which is an average price free from market fluctuations.

Retail PPA Contracts - Also known as Sleeved/Bundled - *approx. 20% of large-scale corporate renewable energy deals*
To access sleeved PPA's, corporate buyers enter contracts with the electricity retailers rather than the generators. In this contract, the retailers absorb most of the risk and responsibility, and avoids the need for the corporate buyer to have familiarly with the wholesale market.

CITY OF MELBOURNE PPA

The City of Melbourne instigated a market-wide request for offers from renewable energy generators and "shovel ready" projects for the supply of renewable energy to a consortium including Melbourne City Council and businesses within the City of Melbourne.

Collective tender out to 16 energy retailers seeking a renewable energy Power Purchase Agreement

- Facilitated by City of Melbourne
- The Melbourne Renewable Energy Project (MREP) Group will supply electricity to Large Sites, Small Sites and Unmetered Sites with a combined annual consumption of 110,261 MWh.
- City of Melbourne ensured all parties were aligned on fundamental criteria such as risk appetite and organisational carbon targets

Marketing points:

- Melbourne Renewable Energy Project resulted in 140 construction jobs
- Aside from renewable energy itself, other benefits for the group include knowledge sharing, purchasing power and greater flexibility in energy use change

HORNSBY TOWN CENTRE PPA OPPORTUNITY

- Large entities such as Hornsby Shire Council, Westfield and Transport for NSW are ideal candidates to establish a PPA. The PPA would provide opportunities for smaller scale agreements to support the balance of buildings.
- Hornsby Shire Council could facilitate the agreement; arrange the collective tender and go to market.
- There is an opportunity to either construct a renewable energy source or access existing renewable energy.

ENOVA COMMUNITY-BASED MICROGRID

Enova20 is Australia's first community-owned power company and has developed a microgrid project in Byron Bay. The model shows the consumer also being a producer, rather than the traditional model of large scale generation and long distance distribution. Enova encourages microgrids and solar gardens, where communities generate, distribute and share their renewable energy at a lower cost. The self-described social enterprise is owned by more than 1,600 Australian community shareholders and invests 50% of profits (after tax and reinvestment) back into the community, by way of renewable energy projects, energy education and energy efficiency services.

3.4 POTENTIAL UTILITY / PRECINCT LEVEL INITIATIVES

EMBEDDED NETWORK

An embedded network (EN) is a privately owned, operated or controlled energy network, connected at a parent (main) connection point to a distribution or transmission system tethered to the main centralised (public utility) grid. A 'smart embedded network' (SEN) has additional ability to integrate, monitor, and optimise (and potentially peer to-peer trade) distributed energy, storage, load and demand, while maintaining interaction with the main grid.

PRECINCT EMBEDDED BATTERY STORAGE

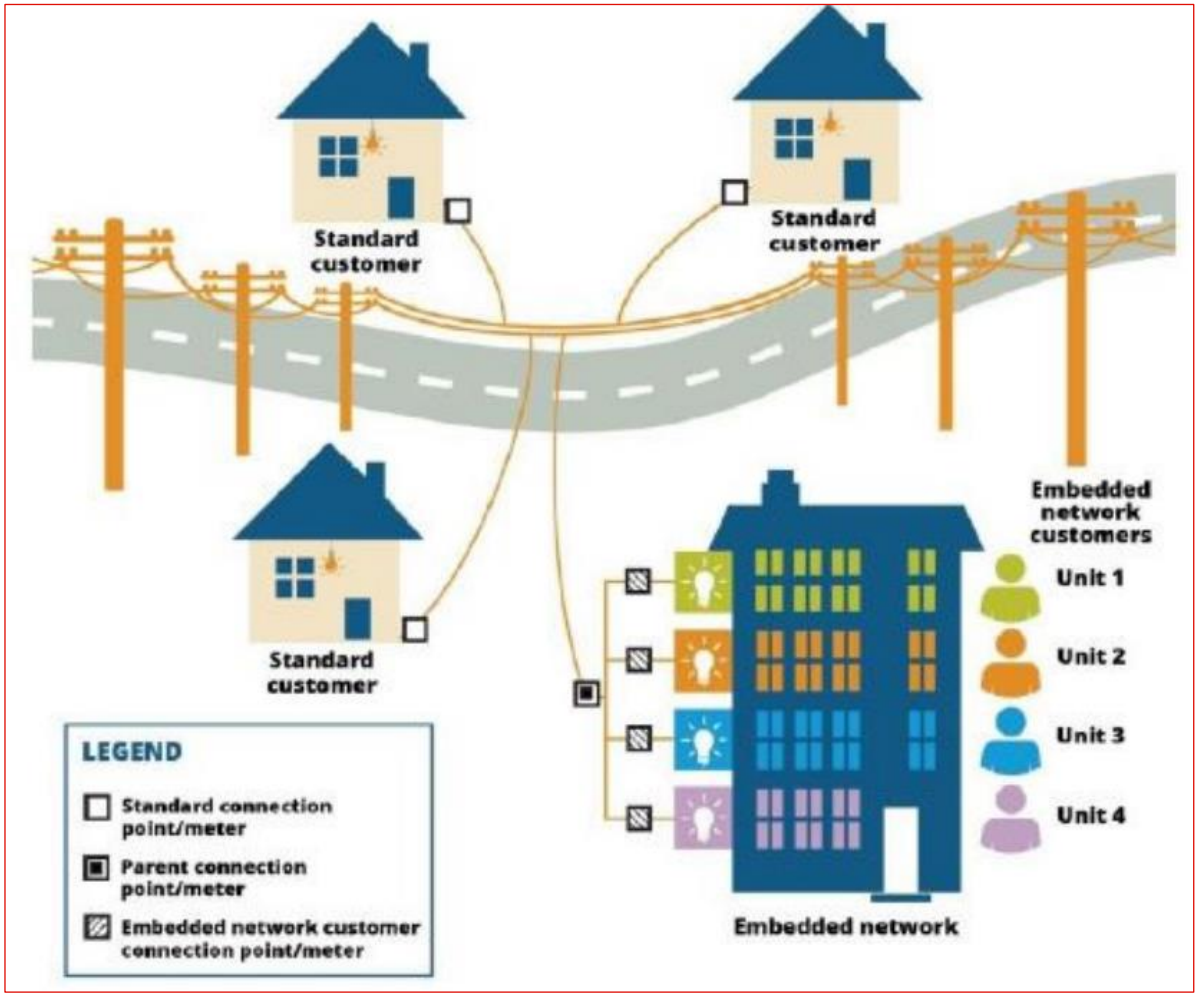

Figure 3.4 Embedded network connection points (AEMC)

The adoption of on-site energy storage systems provides the opportunities for a range of new energy management initiatives. Embedded battery energy storage systems can be used to provide demand response support and are a key component in managing peak electricity demand, providing storage for excess renewable energy generation, and the use of smart tariffs and power purchase agreements through the connection with the site-wide electricity grid.

Electrical energy storage can be delivered through a variety of mechanisms including large scale battery deployment and the aggregation of multiple smaller batteries being managed through a Virtual Power Plant (VPP) network.

VIRTUAL POWER PLANT & DISTRIBUTED ENERGY RESOURCES MANAGEMENT SYSTEMS

A Virtual Power Plant (VPP) is a network of distributed energy resources and generations (i.e. DES), including energy storage, as well as flexible power consumers (i.e. households), to give reliable overall power supply. The interconnected systems are dispatched through the central control room of the VPP but nonetheless remain independent in their operation and ownership.

4 EMISSIONS TARGET & TRAJECTORY

The following recommendations have been put together based on the workshop with Hornsby Shire Council, input from industry stakeholder groups and robust analysis to identify cost effective pathways to net zero.

The recommendations consider what can be practically achieved within the target timeline.

4.1 WORKABLE TARGETS AND IMPLEMENTATION

First and second target milestones are recommended for each asset class, to establish a trajectory towards the target emissions reduction and lock in reduction targets in a timely fashion. The first target is proposed for 2023 and the second in 2026. This includes an absolute energy intensity target in kWh/m² or a recognised benchmark that achieves an equivalent outcome for each asset class. These targets are shown in Table 4.1.

Most buildings will require purchase of offsite renewables or offsets to achieve a net zero outcome, after implementing cost-effective energy efficiency measures and onsite renewables. The additional cost of offsite options was included in cost benefit analysis and the results. Further consultation will be required with stakeholders that include developers, industry groups, local and state government, to refine the options and establish a robust assessment process (including clarity around required documentation to support a development application).

Embedding of the 2023 and 2026 targets into the statutory planning assessment framework, with support from reference to achievement of net zero in the strategic planning framework, entails setting of practical and achievable targets within the available timeframe under the following recommended approaches.

4.1.1 ACHIEVING THE FIRST TARGET (2023)

For all asset classes, amending the DCP and LEP.

HTC has primary management and control over the process – amendments to the DCP and LEP allows HTC some flexibility in how they will achieve the target, which would not be the case if the target is only in the LEP.

However, for residential flat buildings, the statutory weight of the BASIX SEPP may hinder implementation. If HTC wants to implement an energy target for residential developments that is higher than that in the BASIX SEPP, either the SEPP needs to be altered or the council will need to amend its LEP to incorporate incentives for developers to reach the recommended target.

4.1.2 ACHIEVING THE SECOND TARGET (2026)

For many developments, the purchase of offsite renewable energy will be a key element to reach the second target of net zero. The NSW planning system will need to allow for the procurement of offsite renewables to be recognised in the assessment of development applications.

This approach is primarily voluntary at present, through agreements outside the planning system. Any requirements for offsite renewables applied through a condition of consent could be challenged in the Land and Environment Court if certificates associated with the purchased renewables expire before the end of the required period.

Benefits of achieving targets for net zero buildings include:

- Creating jobs and demand for new skills in the energy efficiency (design and operation) component of the building construction and management sectors, as well as in the renewable energy sector;
- Reducing the need to build additional energy infrastructure, potentially reducing costs; and
- Potential lower operational costs.

Table 4.1 Metrics for first and second milestone targets by asset class

ASSET CLASS	FIRST TARGET (2023)	SECOND TARGET (2026)
Office	Maximum 45kWh/m², **or** Equivalent NABERS Energy, **or** Green Star Buildings credits	Maximum 45kWh/m², **or** Equivalent NABERS Energy, **or** Green Star Buildings credits, **and** Renewable energy procurement to net zero
Shopping centre	Maximum 45kWh/m², **or** Equivalent NABERS Energy, **or** Green Star Buildings credits	Maximum 45kWh/m², **or** Equivalent NABERS Energy, **or** Green Star Buildings credits, **and** Renewable energy procurement to net zero
Hotel	Maximum 245kWh/m², **or** Equivalent NABERS Energy, **or** Green Star Buildings credits	Maximum 240kWh/ m², **or** Equivalent NABERS Energy, **or** Green Star Buildings credits, **and** Renewable energy procurement to net zero
Multi-unit residential		
6-10 storeys	BASIX Energy 40	BASIX Energy 45 **and** renewable energy procurement to net zero
11-20 storeys	BASIX Energy 35	BASIX Energy 40 **and** renewable energy procurement to net zero
21-30 storeys	Energy 30	BASIX Energy 43 **and** renewable energy procurement to net zero
Mixed use	Combination of individual asset component targets apportioned by GFA	Combination of individual asset component targets apportioned by GFA

5 ACTIONS AND RECOMMENDATIONS

5.1 SUMMARY OF STAKEHOLDER WORKSHOP

To inform analysis to this point, a workshop with stakeholders was undertaken in the early phase of this project to understand and seek consensus on principle issues. These included the nature of the net zero emissions implementation trajectory and the leadership role of council with regard to initiatives such as precinct Power Purchase Agreements (PPAs).

"Whether to adopt a steep or shallow trajectory for HTC development. with an option for different targets to be applied to different asset classes."

Consensus from the workshop was steep curve for implementing net zero carbon initiatives. This is due to the unique opportunity HTC has for redevelopment in the Town Centre. The concurrent changes in policy and zoning permits a win / win approach for developers and landowners in the area.

It was made clear that HTC should discourage mediocre development and aim to attract building excellence. Developers should be incentivised to build in the town centre. Early adoption of carbon neutrality is a big opportunity for innovation, the benchmark can be set high early and sets the culture for the rest of the town centre.

Appointing council internal champions of the policy will provide a level of assurance to successfully implementing the net zero emissions policy. The internal role of such champions working across council departments will be outworked publicly through engagement with community and development proponents.

Residential development has higher profit margins and should therefore adopt a higher target. This is also applicable to government land, both Transport for NSW (TfNSW) & Hornsby Council should deliver higher standards to lead by example. Moreover, it is financially responsible to implement net zero carbon design to government assets, as the asset will remain in governments control.

"Opportunity for PPA in the precinct and would Hornsby Shire Council see themselves as a facilitator / leader of this type of agreement"

Hornby council have conducted preliminary investigation into PPA. Hornby community members have approached Council to establish a PPA, this is positive for future opportunities. The Westfield has an existing embedded network to be taken into consideration. Future opportunity for TfNSW, Hornsby Council and Hornsby community to establish the PPA. The PPA is only beneficial at scale and is likely to be reliant on council to act as the facilitator.

5.2 OPPORTUNITIES AND RECOMMENDATIONS

Based on the findings of this study, the net zero buildings modelling, reviews of case studies and stakeholder perspectives summarised in the workshop, the opportunities were identified and are recommended for further consideration:

- Opportunity to negotiate with TfNSW on the provisions for Over-Station Development (OSD), specifically large-scale PV systems would be an ideal onsite renewable source.
- Community members have initiated conversations on PPA with council. Opportunity for future agreement.

- Possible agreement / joint venture with Westfield to install roofing over the carpark to hold PV systems. This was completed by neighbouring council (Willoughby Council).
- An option during the DA lodgement to commit to a carbon net zero development. In doing so would fast track the planning process providing developers a shorter timeframe prior to construction.
- Council has set interim targets for achieving their 2050 net zero commitment. For 2025, a 32% reduction and for 2030 a 53% reduction in emissions is sought. These targets are aligned with State government commitments. They also broadly align to the proposed steeper trajectory presented in the workshop.

EDUCATING LOCAL GOVERNMENT STAFF TO FACILITATE NET ZERO DEVELOPMENTS

- Provide planning training on:
  - the application of the National Construction Code
  - how to prepare performance based LEPs and DCPs
  - net zero building innovations such as passive principles (air tightness) and alternative energy sources
  - negotiation to deliver improved performance
  - developer perspective
- Improved regulation and monitoring of high-performance measures

IDENTIFYING INCENTIVES FOR DEVELOPMENTS ACHIEVING ABOVE MANDATORY STANDARDS

- Increased FSR or height allowances (e.g. if 6-star NABERS Energy Commitment Agreement)
- Fast tracked approvals
- Reduced application fees
- Tax and contribution incentive

SUPPORTING DEVELOPERS TO UNDERSTAND NET ZERO EARLY IN THE DESIGN AND PROJECT PLANNING PHASES

- Providing resources:
  - Cost-benefit evidence base for higher targets
  - Case studies
  - Best practice guidelines for net zero developments
- Explanation of rating tools and standards
- Information on new technologies
- Engaging with energy and utility providers to better understand any opportunities and constraints with their services, legislation and regulation.
  - Also needs to be a consideration for local and NSW government
- Providing industry upskilling to lower tier developers

INVESTIGATING FINANCIAL MEASURES TO INCENTIVISE NET ZERO DEVELOPMENTS

- Grant funding for new and model developments
- Investor green bonds
- Voucher subsidies for purchasers
- Funding of demonstration and model projects.
- Green home loans for purchasing high efficiency homes

DEMONSTRATING LEADERSHIP AND DIRECTION FROM HTC

- Undertake demonstration projects.
- Funding or facilitation by State Government of a 'hero' project or design to understand the opportunities and possibilities for future projects.
- Advocate to the Environment Minister, local members and the Department of Planning, Industry and Environment (DPIE) to implement targets in legislation and state policies
- Work with Greater Sydney Commission to update the North District Plan to support the implementation of targets across Greater Sydney
- Advocate for the extension of the Renewable Energy Target to 2050 to support the use of off-site renewables
- Behavioural workshops/instructions for owners/renters on how to maximise effectiveness of energy saving features of buildings

6 FUTURE OPPORTUNITIES

Incentives were considered the primary driver for delivery of net zero buildings or precincts as there is perceived to be limited market advantage to delivering higher energy performance buildings. The possibility was raised for Hornsby Council to scale contribution requirements to reflect building standards achieved. It was also suggested that an increase in FSR could be linked to performance commitments. There were concerns however that incentives need to be carefully considered to ensure that they facilitate a significant advancement in delivering on net zero development.

Appointing council internal champions of the policy will provide a level of assurance to successfully implementing the net zero emissions policy. The internal role of such champions working across council departments will be outworked publicly through engagement with community and development proponents.

It was felt that owners and occupiers of residential developments were least educated about the benefits of energy efficient developments. With little market incentive or pressure, developers require upfront financial benefits to move beyond minimum standards.

Other incentives suggested by participants included:

- Reduced council rates for energy efficient buildings
- Expanding low interest loans such as the Environmental Upgrade Agreement scheme to new builds
- Providing planning contribution incentives for net zero developments.

A number of changes to the existing planning pathway for major developments were suggested to improve the uptake of net zero buildings. This included identifying benchmarks in the Secretary's Environmental Assessment Requirements (SEARs), fast tracking net zero development assessments, incorporating building performance and sustainable material requirements in DCPs and using conditions of consent to increase and ensure energy efficiency. It was noted that conditions of consent for energy efficiency could be strengthened along with improvements to the National Construction Code. It was noted that high energy performance standards should be set during the concept plan and rezoning process at a level which is acceptable to the market.

Under a City of Sydney draft DCP amendment, new office developments and retrofits with net lettable areas of 1,000 m² or more will be required to enter into a 5.5 Star Office Base Building NABERS Energy Commitment Agreement. This initiative was well regarded by participants who suggested it should be made standard across all councils in Greater Sydney.

7 LIMITATIONS

The net zero emission strategy for the precinct relates to building operations and does not consider embodied carbon or emissions associated with transport or waste. The strategy has therefore focussed on options and opportunities to deliver buildings that, over the long term, have reduced their operational energy requirements as far as possible and that energy supplied is from low or zero emission sources. Any residual emissions associated with the building operations is offset through an appropriate mechanism to enable the Hornsby Town Centre area to demonstrate global leadership in achieving net zero emission status. The assessment targets net zero emissions strategy for buildings; it is not a precinct emissions assessment. Advice provided is focused on buildings within Hornsby Town Centre and does not included factors outside of the building requirements. Water and waste are not factored into the carbon net zero assessment. We can provide further advice in the future on how to deliver water and waste reductions.

The energy modelling to develop the carbon profile of the precinct will be based on the HTC masterplan, and will consist of high level building models rather than on the basis of architectural detail. The models will be selected from WSP's extensive database of projects and adapted to the masterplan area schedules.