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RENEWABLE RANDWICK

RANDWICK CITY COUNCIL RENEWABLE ENERGY MASTER PLAN

PREPARED BY KINESIS FOR RANDWICK CITY COUNCIL

08 JULY, 2015

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Document Version:

FINAL

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This Plan has been prepared by Kinesis on behalf of Randwick City Council. It is the result of an engaged consultative process which has included:

1. Consultation and collaboration with City Sustainability staff
2. Discussions with active groups in the community renewables space, including:
   - REPower, a Shoalhaven-based group responsible for Australia's first community investor-owned solar power system
   - Lismore City Council, where Australia's first council-community solarfarm is underway
   - Embark, an organisation acting to eliminate barriers to community renewables
3. A presentation to Council Management and Directors

This Plan is accompanied by the Randwick Renewable Energy Master Plan Technical Report. In instances where this Master Plan has cited sources that are NOT included in the technical report a footnote of the referenced source has been included. The Technical Report and Master Plan are provided subject to some important assumptions and qualifications:

The results presented in this report are modelled estimates using mathematical calculations. The data, information and scenarios presented in this report have not been separately confirmed or verified. Accordingly the results should be considered to be preliminary in nature and subject to such confirmation and verification. Electricity, gas and greenhouse consumption and generation estimates are based on local climate, utility and government data available to the consultant at the time of the report. These consumption demands are, where necessary, quantified in terms of primary energy consumptions using manufacturer's data and scientific principles. Generic cost estimates provided in this report are indicative only and based on Kinesis's project experience and available data from published economic assessments. These have not been informed by specific building design or construction plans and should not be used for design and construct cost estimates. The Kinesis software tool and results generated by it are not intended to be used as the sole or primary basis for making investment or financial decisions (including carbon credit trading decisions). Accordingly, the results set out in this report should not be relied on as the sole or primary source of information applicable to such decisions.

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RENEWABLE RANDWICK – A SNAPSHOT

THE PURPOSE OF THIS PLAN IS TO:

1. HIGHLIGHT THE CHALLENGES TO THE UPTAKE OF RENEWABLE ENERGY IN RANDWICK & COUNCIL'S ROLE IN ADDRESSING THEM
2. EXPLORE THE TECHNICAL POTENTIAL OF RENEWABLE ENERGY IN RANDWICK
3. IDENTIFY NEW STRATEGIES TO UNLOCK BROADER RENEWABLE ENERGY UPTAKE ACROSS THE COMMUNITY IN THE SHORT TERM
4. DEFINE CLEAR AND ACHIEVABLE TARGETS FOR RENEWABLE ENERGY UPTAKE IN RANDWICK.

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OUR CURRENT CHALLENGE

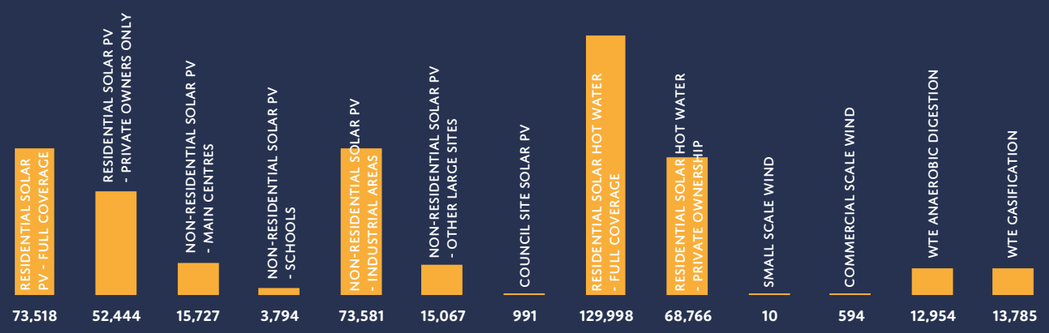
Only **3%** of all households in Randwick have installed solar PV (compared to the metropolitan average of **4.3%**). That's because Randick has

2X the proportion of apartments and **40%** HIGHER RENTER RATE (compared to the Sydney average).

This unique urban form and dwelling ownership rate means that currently only **1 IN 3** dwellings in Randwick could be reasonably expected to install solar without intervention.

WHAT IS POSSIBLE

By exploring the land use and urban form specific to Randwick it is possible to estimate **280,000MWH** of potential renewable energy generation which equals **37%** of total Randwick Local Government Area energy demand. This can be broken down into:



MWH RENEWABLE ENERGY

WHAT WE CAN DO IN THE SHORT TERM

There are 3 key strategies that Council can execute to unlock potential renewable energy generation in the community:

1. Establish Community Solar Projects to allow residents to benefit from solar energy that is not on their own roof
2. Embed Renewable energy in new developments through development controls & incentives
3. Establish Energy from Waste through collaboration with waste providers and regional councils

SUPPORTED BY MORE RENEWABLES ON COUNCIL ASSETS

Randwick Council can lead from the front by installing up to **916KW** of potential solar PV on council assets which would equal **27%** of current council electricity demand.

WHAT WE SHOULD AIM FOR

ASPIRATIONAL COMMUNITY TARGET:
30% of total energy demand supplied by renewable energy by 2050

supported by a

COUNCIL IMPLEMENTATION TARGET:
15% of total council energy demand supplied by renewable energy by 2025

KINESIS

PREPARED BY KINESIS FOR RANDWICK CITY COUNCIL

INTRODUCTION

SHAPING THE FUTURE ROLE OF RENEWABLE ENERGY IN RANDWICK

In 2012 Randwick City Council completed its review of its 20 Year City Plan which, through consultation with the community, is used to establish a clear direction to shape the city's future. Included in this plan are two key outcomes aimed at guiding the city's policy on environmental sustainability including climate change; Leadership in Sustainability (outcome 1) and A Healthy Environment (outcome 10). These outcomes are delivered by a 4 year management plan, which outlines a commitment to 'increasing energy conservation and efficiency, improving local air quality and reducing greenhouse gas emissions from Council, our community, businesses and transport".

In response to this long term strategic vision, Randwick City Council developed a number of strategic plans which were consolidated into the Energy and Greenhouse Management Plan with the aim of prioritising the implementation of various energy efficiency measures as well as increasing Council's renewable energy capacity. This plan continues a proposed target of 20% reduction in greenhouse gas emissions and related energy use across the Local Government Area.

THE WIDER ADOPTION OF RENEWABLE ENERGY TECHNOLOGY ACROSS THE COMMUNITY HAS BEEN IDENTIFIED AS PLAYING A VITAL ROLE IN HELPING TO ACHIEVE THIS COLLECTIVE VISION FOR A LOW CARBON, RESILIENT RANDWICK.

Randwick City Council has already demonstrated considerable leadership in this space, having installed a small wind system and 136kW of solar PV on its own assets throughout the Local Government Area. Through this Council has generated 618 MWh of electricity over the last 7 years.

These actions are in line with those of many metropolitan councils around Australia, who have identified renewable energy as the most accessible and cost effective method to addressing their own corporate emissions. This has resulted in many local governments leading the charge in pioneering new renewable energy technologies and subsequently demonstrating the business case for renewables to their local constituents.

While the uptake of renewables by local councils is vital in driving local awareness, it represents only a small percentage of the potential opportunity for renewable energy across their community. As a result, many councils are now looking beyond their own assets to explore ways they can further facilitate and incentivise the uptake of renewable energy across the entire community as part of a more comprehensive approach to energy conservation and abatement of greenhouse gas emissions.

This Renewable Energy Master Plan has been commissioned by Randwick City Council to identify the most cost effective and suitable renewable energy technologies for Randwick Local Government Area and establish a roadmap for implementing renewable energy projects over the next 5 years. More specifically, this Master Plan will be used to define the Council's role as a facilitator between residents and existing renewable energy providers, and in doing so help to unlock greater uptake of renewable energy across the Local Government Area.

CURRENT RENEWABLE ENERGY UPTAKE IN RANDWICK

In order to determine the future role of renewables in Randwick, we must first understand the current level and type of renewable energy generation across the Local Government Area. Current generation can be split into commercial installations and small-scale residential installations, both of which are dominated by solar PV technology.

In terms of commercial installations, the University of New South Wales was the first university in Australia to install solar PV in 2005 and have since installed 216kW of solar PV across its' assets. Sydney Water has installed a 3 MW cogeneration system at Malabar Sewage Treatment Plant, which is powered by biogas. In addition, Randwick City Council has installed 132kW of solar PV across council's assets and a 2.4kW wind turbine installed at the Sustainability Education hub located at the Randwick Community Centre.

In terms of small-scale residential installations, there are currently approximately 1,500 solar PV installations in Randwick. This represents **under 3% of all households in the Randwick LGA.** As highlighted in Figure 1, while this is roughly in line with other inner city suburbs, it is significantly less than the Sydney Average of 4.3%.

Figure 2 outlines installations by suburb, highlighting higher installations (total kW and percentage of total dwellings) for south areas of the Local Government Area.

In addition to solar PV, the Federal Government RET (Renewable Energy Target) data also reports over 1,100 solar and air sourced heat pump hot water systems installed in Randwick households.

These lower than average adoption rates across the LGA suggest the existence of other local factors inhibiting resident's ability to install and benefit from renewable energy. These are explored below.

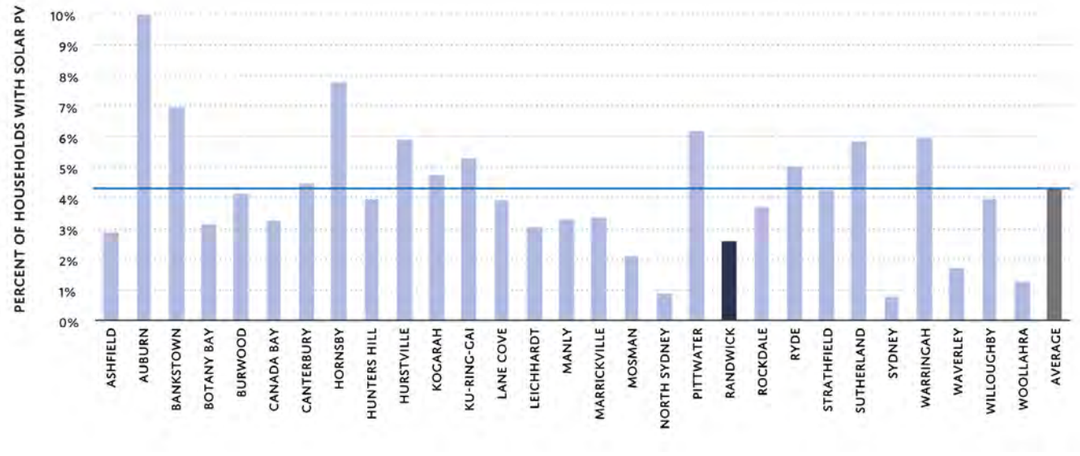


Figure 1: Solar PV installations by suburb (2014)

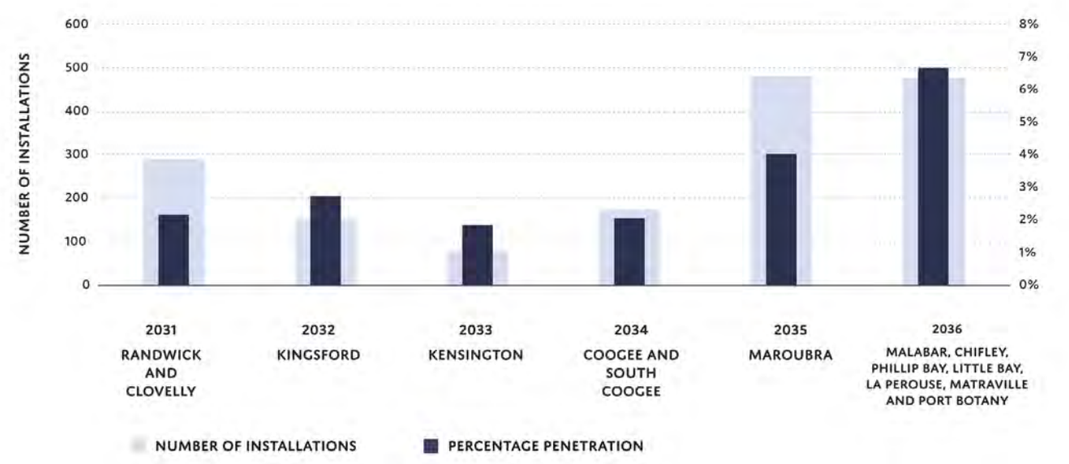


Figure 2: Solar PV installations by area (2014)

IDENTIFYING BARRIERS TO RENEWABLE ENERGY UPTAKE IN RANDWICK

RESIDENTIAL DWELLING TYPE AND OWNER-OCCUPANCY RATE

Lower than average adoption of renewable energy across the LGA as a whole, in combination with the significant variation in the percentage penetration across various suburbs would suggest the existence of barriers for renewable uptake specific to particular areas of Randwick.

In order to better understand these barriers, it is important to consider the specific urban form and demographics of the Randwick area in comparison to the metropolitan average. These key characteristics of Randwick are shown in Figures 3 & 4. These illustrate a high-density urban form with 54% make-up of multi-unit dwellings compared to the metropolitan average of 26%. It also illustrates a significantly greater renter rate of 46% in comparison to a metropolitan average of 33%. The high density of students attending the university and close proximity to the Sydney CBD are two contributing factors behind this higher renter rate.

Studies and independent analysis by Kinesis has demonstrated a strong link between dwelling type, owner-occupier rates and the level of up-take of solar PV. Residents living in multi-unit dwellings or dwellings that they do not own are much less likely to install solar for a range of reasons including:

- Lack of ownership or sole sovereignty over suitable roof space.
- Uncertainty over the length of occupancy.
- Lack of metering infrastructure to allow for appropriate billing.

Assuming that residents in apartments and renters are unlikely to install renewables, approximately **only 1 in 3 dwellings** in the Randwick Local Government Area would expect to install solar without encountering the above barriers. Not only does this preclude the majority of residents the opportunity to reduce their personal greenhouse gas emissions, it also excludes them from the potentially profitable financial investment opportunity that renewables represents.

This suggests that in order to overcome these barriers, Randwick City Council would need to explore opportunities in which residents can invest in renewable technology that is not tied to the dwelling in which they reside.

SHIFTING RENEWABLE ENERGY POLICY

A more common barrier to the uptake of renewable energy relates to the uncertainty resulting from shifting renewable energy policy. In recent years, Australia's State and Federal Governments have been removing support for renewable energy technologies, particularly solar PV and hot water. These changes have included removal of the NSW Solar Bonus Scheme and the NSW Hot Water System Rebate, the phase out of the solar credit multiplier, and the removal of the Federal Government's Renewable Energy Bonus Scheme (Solar Hot Water Rebate). Recent reductions in the RET will also reduce financial incentives for households, small businesses and community groups to install large and small-scale renewable energy systems.

This shifting landscape and the subsequent lack of clarity over current and future financial incentives has significantly impacted the uptake of solar in Australia. It has also placed more focus on local government to step in to provide a more stable renewable energy policy at the household and city scale.

RANDWICK DWELLING AND OWNERSHIP RATES:

2x **THE PROPORTION OF APARTMENTS***

&

40% **HIGHER RENTER RATE***

=

1 IN 3 **DWELLINGS IN RANDWICK COULD BE REASONABLY EXPECTED TO INSTALL SOLAR.**

* Compared to greater Sydney average (2011).

GREATER SYDNEY

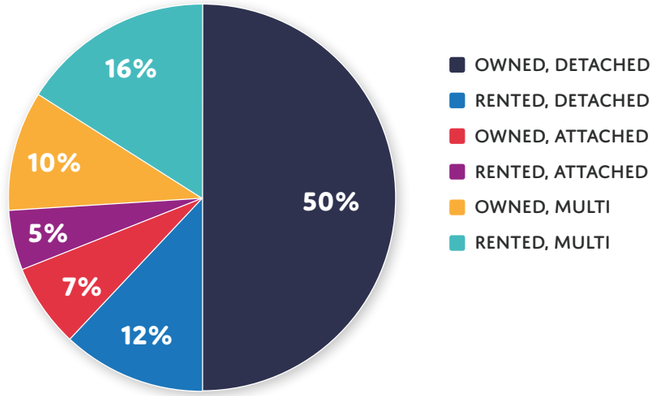


Figure 3: Dwelling and ownership breakdown in Greater Sydney (2011) (includes entire Sydney basin as opposed to metropolitan Sydney)

RANDWICK

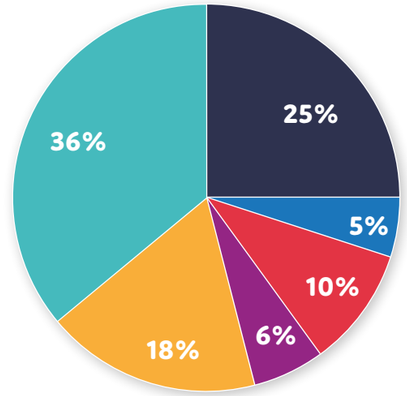


Figure 4: Dwelling and ownership breakdown Randwick Local Government Area (2011)

THE ROLE OF THIS MASTER PLAN

Randwick City Council has previously executed several projects as key outcomes of their Energy and Greenhouse Management Plan. These projects have focussed on various areas including energy efficiency, residential solar and behaviour change. Rather than replicating these strategies (or similar projects in adjoining councils) this Master Plan is used to identify innovative strategies specifically facilitating the increased adoption of renewable energy throughout the Randwick Local Government Area. Therefore, this plan assumes that associated energy efficiency opportunities will be explored prior to or in conjunction with the strategies outlined in this report.

Ultimately, local governments have little control over the energy consumption behaviour and the associated financial decisions that occur within the homes or businesses of their residents. Councils cannot therefore be held solely responsible for the uptake of renewable energy within their community.

However, more than any other level of government, local governments can take responsibility to act as strategic advisors and facilitators to address local challenges that may be impeding the natural execution of market forces. This Master Plan represents a strategic approach to respond to these key barriers to renewable energy in the Randwick Local Government Area. This requires a thorough investigation of all the available strategies to mitigate these barriers and guidance on the most effective and efficient role that Council can have in establishing projects or policies to address these barriers

Therefore the role of this Master Plan is to:

1. **Highlight where the market has failed in delivering renewable energy solutions.**
2. **Understand the role of Council in addressing this market failure.**
3. **Explore various technology solutions, how they could be delivered and programs that currently exist.**
4. **Identify new approaches and programs that unlock broader renewable energy uptake across the community.**
5. **Define a clear roadmap to how these technologies could be implemented in the short term.**
6. **Set a clear and achievable renewable energy target for Randwick.**

EXPLORING WHAT IS POSSIBLE

In order to establish an informed and achievable renewable energy target it is important to understand the full technical potential of renewable energy and the various mechanisms that could be used to help achieve this potential.

WHAT IS THE TECHNICAL POTENTIAL FOR RENEWABLES?

Renewable Energy can be defined as energy generated from solar, wind, waste, wave and tidal sources. Whilst there are numerous opportunities for the roll out of renewable energy across the Randwick Local Government Area, each technology has its own opportunities, challenges, restrictions of space availability and competition with other land uses and variations in built form. This study has analysed each of the major renewable technologies in relation to their specific opportunities and in the context of the Randwick Local Government Area. The key findings of each are outlined below:

SOLAR PV

The high density of multi-unit dwellings and high renter rate mean that many Randwick residents do not have access to appropriate roof space in order to invest in solar.

Solar PV is significantly more financially viable when the energy generated is used directly by the asset on which it sits rather than being exported into the grid. It is therefore important to ensure that solar PV installations are sized to maximise the electricity they displace within the building and minimise the export of electricity.

Battery storage may alleviate the issue of exported electricity, allowing electricity to be stored and dispatched as household energy demand requires it.

New business models are emerging that remove the requirement for solar panels to be on the roof of those who own them.

Key commercial sites across the local government area, including UNSW, Randwick Racecourse and the hospital, offer significant roof area for commercial scale solar, generating electricity during commercial peak periods (12pm to 2pm).

SOLAR HOT WATER

High capital cost compared to standard electric or gas hot water systems.

The percent take-up of solar hot water in new dwellings under BASIX has declined in recent years. Policies that seek to increase solar hot water take-up will need to address this issue.

CONCENTRATED SOLAR THERMAL

Appropriate for large scale commercial buildings with high and consistent heating and cooling loads, such as hospitals, schools and universities.

High capital cost when compared with high efficient electric heating and cooling systems.

ENERGY FROM WASTE

The life-cycle of procuring an energy from waste facility takes approximately 10 years. Up to 90% of non-recyclable waste can be converted to gas[1]. Food waste collection and waste minimisation strategies may reduce the waste available for Energy from Waste. An integrated and regional approach is needed to ensure adequate feedstock is available for a viable facility.

WAVE AND TIDAL SYSTEMS

Both wave and tidal energy technology is still in research and development phase and is not currently commercially viable.

WIND

Commercial scale (>100 kW and between 60 to 120 metres in height) is not considered appropriate for the Randwick Local Government Area.

Due to siting requirements, small scale wind is limited to unobstructed open space (a minimum of 10 meters above any obstacle within a 100 metre radius). Malabar Headland offers the most potential for wind turbines within the Randwick LGA.

[1] City of Sydney Advanced Waste Treatment Master Plan.

By exploring the land use and urban form of the Randwick Local Government Area it is possible to estimate the maximum generation potential of these technologies. Figures 6 and 7 and outline the technical potential used in the analysis of renewable energy across the Randwick Local Government Area.

A detailed analysis of these renewable energy technologies has identified a total potential of **280,000 MWh** of annual renewable energy generation[2]. Should this be reached it would be equivalent to **37%** of total Randwick Local Government Area energy demand.

RENEWABLE ENERGY TECHNICAL POTENTIAL:

280,000MWH OF POTENTIAL RENEWABLE ENERGY GENERATION = **37%** **OF TOTAL RANDWICK LOCAL GOVERNMENT AREA ENERGY DEMAND**

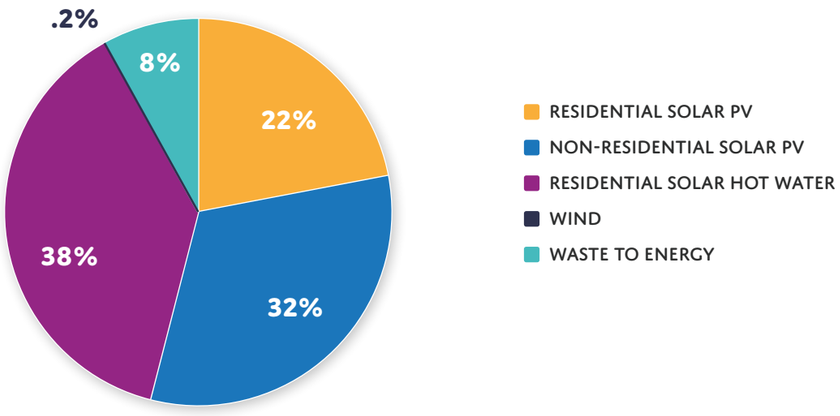


Figure 5: Renewable Energy Technical Potential

COUNCIL'S POTENTIAL CONTRIBUTION

An analysis of the existing Council assets suggests that the technical potential of renewable energy produced from Council assets is 991MWh. This assumes that 60% of the 'large site' roof space is utilised. This represents 0.35% of the overall potential. It also represents 21% of Council's total energy demand (based on 2013-14).

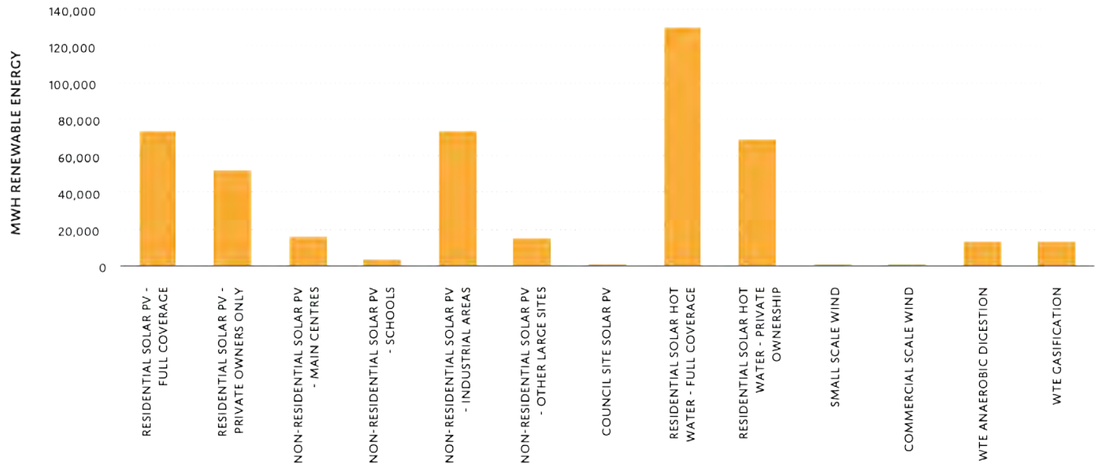


Figure 6: Renewable Energy Technical Potential (MWh)

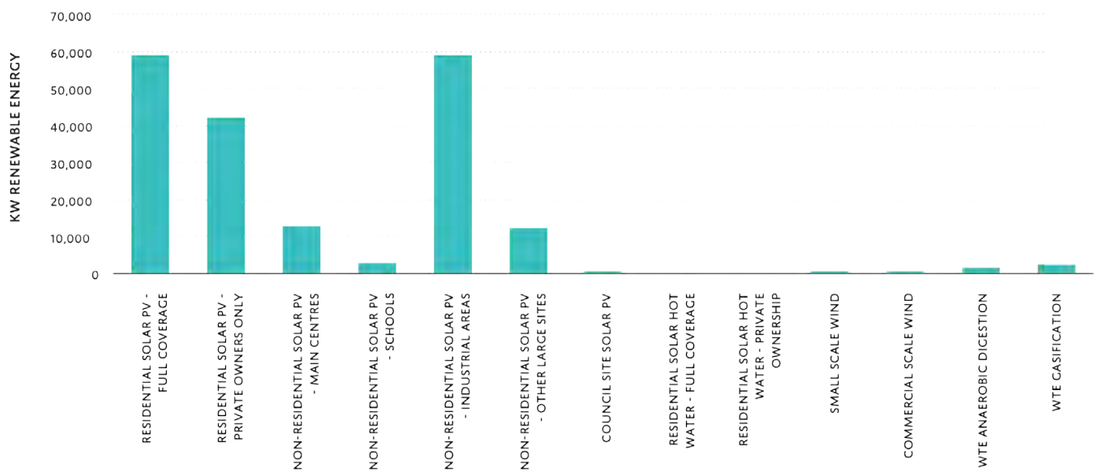


Figure 7: Renewable Energy Technical Potential (kW)

[2] Solar hot water is not included as energy production as kW production is not relevant for solar hot water (MJ heat) contribution. Energy from Waste MW is based on full estimated electricity output during operation

HOW COULD THESE TECHNOLOGIES BE DELIVERED

While the renewable energy technical potential exists, the ability or practicality of Randwick City Council in delivering this potential relates to the delivery model(s) used.

A series of delivery models have been reviewed and identified for the application of renewable energy generation across the Randwick Local Government Area. This process provides a filter or lens against which to relate the renewable energy generation potential to implementation. In addition, these delivery models were grouped by Council's ability to influence the delivery of renewable energy, from direct ownership and control to facilitator or participant.

All of these delivery models represent realistic and achievable mechanisms that Council could use to deliver renewable energy across the community. However, not all of these delivery models address the existing key barriers to uptake of renewables specific to Randwick. Furthermore, Council's ability to influence and execute them varies. Therefore it is important that key opportunities are identified and prioritised. Table 1 summarises the delivery models reviewed for this project and outlines the technical potential of each renewable energy source under each delivery option.

BULK PURCHASE

Randwick Council purchases renewable energy systems in bulk through a provider to attract a lower purchase price. These systems are then purchased and owned by private residents or businesses. This delivery model is appropriate for solar PV and solar hot water.

COUNCIL OWNERSHIP

Council owns and operates the renewable energy system. This is expected to be available and viable on Council owned assets or sites only. This delivery model is appropriate for all renewable energy sources.

REBATES

Randwick Council sets aside funds to subsidise the installation of renewable energy systems through rebates. The system is then purchased at a reduced market rate and owned by private residents or businesses. This delivery model is appropriate for solar PV and solar hot water.

COMMUNITY OWNERSHIP

A renewable energy project is one that is owned by community members. In this case, community members invest directly in a cooperative or company (which could be established, operated or supported by Council) that builds, owns and operates the renewable system. This delivery model is most appropriate for solar PV and wind.

DEVELOPMENT CONTROLS

Randwick Council establishes development controls (through either the DCP or LEP) to require new non-residential development to install a component of renewable energy generation. It should be noted that, due to BASIX, Council cannot establish renewable energy development controls for residential development.

DEVELOPER INCENTIVES

Randwick Council provides incentives, such as floor space bonuses, for new developments to incorporate renewable energy systems. In this case, the renewable energy system is built into new developments or major renovations/ retrofits that trigger development consent and owned and operated by the building owner. This delivery model is most appropriate for building level renewable energy technologies such as solar hot water and solar PV.

BUILD OWN AND OPERATE

In this case, an external provider installs, owns and operates the renewable energy system and sells energy to the building owner or others. In this scenario, there is little to no upfront capital cost and the energy user enters into an arrangement with the provider to buy energy at an established rate. This delivery model is most appropriate for building level technologies, such as solar hot water and solar PV.

ENERGY UPGRADE AGREEMENTS (EUAS)

Randwick Council enters into an agreement with a private commercial building owner or strata and a financial institution. Council lends the commercial building owner funds for environmental upgrades (including renewable energy installations), then levies the building owner through Council rates to repay the loan to the financial institution.
The renewable energy system is owned by the private business. This delivery model is appropriate for solar PV and solar hot water.

LEASE ARRANGEMENTS

A host (which in this case could be Randwick Council, a private business or resident) leases their land or asset's roof space for use for a renewable energy system. The system is installed by an external provider. The leaser pays rent for the roof space or land, the host pays a charge to use the generated electricity which could be a regular predetermined amount (regular lease payment) or tied to how much electricity is generated and used. This delivery model is most appropriate for solar PV.

DELIVERY MODEL	POTENTIAL MWH GENERATION[3]	SOLAR PV	SOLAR HOT WATER	WIND	ENERGY FROM WASTE[4]
COUNCIL OWNERSHIP	LOW	Continued installations on Council assets. Focus on assets with high tariffs and high daytime load.	Solar hot water on Council aquatic centres.	Small wind installations on Council land. Less cost-effective than solar PV (see cost-benefit analysis below).	Council potential to own and operate Energy from Waste facility. However, may require regional approach to be financially feasible.
BULK PURCHASE	MODERATE	Applicable to residents and small businesses.	Applicable to residential detached and attached dwellings.	Not applicable	Not applicable
REBATES	MODERATE	Applicable to residents and small businesses.	Applicable to residential detached and attached dwellings.	Not applicable	Not applicable
EUAS	MODERATE	Applicable to commercial, retail and industrial buildings only.	Not applicable	Not applicable	Not applicable
LEASE ARRANGEMENTS	MODERATE	Applicable to all dwellings and non-residential roof space.	Not applicable	Unlikely to be applicable	Not applicable
COMMUNITY OWNERSHIP	HIGH	Applicable to large roof areas (industrial sites, Council sites, schools etc.). Focus on buildings and precincts with high tariffs and high daytime load.	Not applicable	Medium (50 to 100 kW) scale wind systems are appropriate. Malabar headland is the only location viable for this option.	Unlikely to be applicable
DEVELOPMENT CONTROLS	MODERATE	Appropriate for new non-residential development only (cannot require higher residential targets due to BASIX).	Appropriate for new non-residential development only (cannot require higher residential targets due to BASIX).	Not applicable	Not applicable
DEVELOPER INCENTIVES	LOW	Appropriate for new development only. Applicable to residential and non-residential development. Must be voluntary for residential dwellings due to BASIX requirements.	Appropriate for new development only. Applicable to residential and non-residential development. Must be voluntary for residential dwellings due to BASIX requirements.	Not applicable	Not applicable
BUILD OWN AND OPERATE	HIGH	Applicable to large scale systems, including industrial sites, schools or major commercial centres.	Not applicable	Applicable to medium scale systems and could overlap with the community ownership model.	Council potential to send municipal waste to a facility owned and operated by an external provider, either within or outside the local government area. This model is most applicable to a regional approach.

Table 1: summarises the delivery models reviewed for this project and outlines the technical potential of each renewable energy source for each.

[3] Potential generation is based on the ability of the delivery model to access the technical potential outlined in Table 1. For this purpose of this memorandum, this potential has been provided as a qualitative, relative ranking for discussion at the stakeholder workshop to be held on 10 December, 2014.

[4] The City of Sydney recently released their Advance Waste Treatment Master Plan which seeks to generate renewable gas for the City's planned trigeneration network. This plan identifies the potential to capture waste from surrounding local government areas and regions (up to approximately 250 km from the City of Sydney LGA). Randwick Council could consider partnering with the City of Sydney to facilitate a regional approach to Energy from Waste generation.

ENABLING RENEWABLE ENERGY IN THE SHORT TERM

Given the finite financial and human resources available, it is unrealistic for Council to be able to execute all of these mechanisms in the short term. Instead, it is important that key opportunities are identified and prioritised according to where Council can have the greatest impact.

This involves considering the role of Council in the provision of services or 'key areas of influence' that would otherwise not be delivered by the market. The 'key areas of influence' of local government that are relevant in enabling renewable energy include:

- **Fostering innovation through facilitation and leadership:** A key function of government is to fill the holes where market forces have failed to take hold. In terms of renewable energy, this involves utilising Council resources to demonstrate the business case for renewables and facilitate market transactions where they may not have previously existed. This may be through connecting various parties or providing the framework for a secure financial transaction.
- **Regulating through development and planning policy:** Local governments have the ability to regulate a greater standard of compliance in the built form of the Local Government Area, requiring the private sector to raise the bar in terms of adoption of renewable energy.
- **Advancement through delivery of essential services:** Local governments often have sole control over the delivery of services fundamental to the functioning of households such as waste collection and disposal. These can be areas where Council can work autonomously to effectively drive considerable change.

Through consideration of these key areas of influence in combination with analysis of generation potential and cost, three key strategies have been identified as areas of focus for council in the short term. These are:

1. **Kick starting community renewables**
2. **Embedding renewables in future development and planning policy**
3. **Implementing energy from waste generation**

KICK STARTING COMMUNITY RENEWABLES

Our analysis suggests that a key barrier to the up-take of renewable energy in the Randwick Local Government Area is the high density of multi-unit dwellings and the high renter rate, which ultimately precludes up to 2 out of 3 residents from obtaining viable roof space to invest in solar. In response to this, Kinesis has identified Community Renewables as a key strategy that both opens up appropriate roof space to residents and provides the financial mechanisms to allow them to invest in solar. Facilitating appropriate Community Renewable projects will not only significantly kick-start additional investment in renewables in the short term, it will also generate substantial education, leadership and community cohesion opportunities for Council.

WHAT IS IT?

Community Renewables is a model of collective or crowd sourced investment in renewable energy on a site that is not necessarily directly owned by the investors. To date, these models have mainly focussed on community investment in moderately sized solar PV installations (50-99kW systems) on suitable community or council owned buildings.

Community investment structures separate the physical and financial delivery of renewables. This breaks traditional ownership models which restrict the viability of solar PV to owner-occupiers (both residential and non-residential), while also extending investment in renewables to anyone wishing to participate.

HOW DOES IT WORK?

In any solar PV delivery model there are the following key roles:

HOST

The building owner on which the solar panels are installed. The host typically consumes or exports the generated power.

INVESTOR

Provides funding for the upfront capital cost of the panels, and receives repayments or utility savings over time.

FACILITATOR

This is either a private solar installation and consulting company or a company (or collective) established by members of the community used to initiate community solar. The facilitator covers a number of possible roles including; coordinating payments, designing and/or maintaining solar PV system, marketing and communications to identify hosts and investors.

In order to understand how Community Solar works, it is important to distinguish this model from the traditional delivery model for solar PV.

HOW THE TRADITIONAL SOLAR DELIVERY MODEL WORKS:

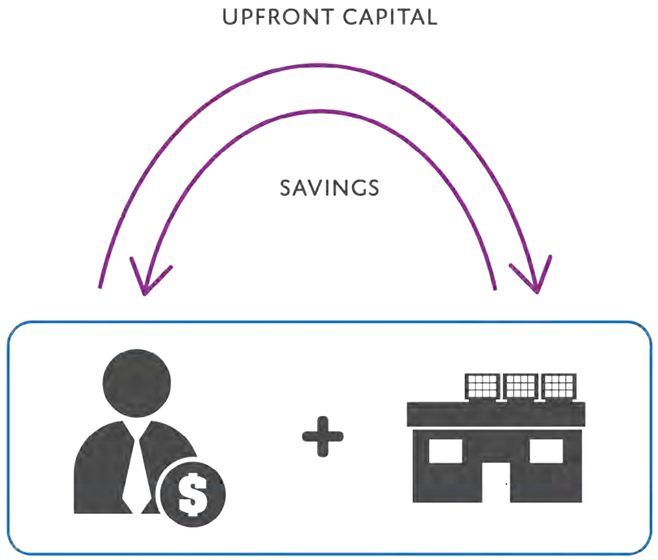


Figure 8: Traditional Solar Delivery Model

In the Traditional Delivery Model a building owner purchases a solar system outright and installs it on their roof. Figure 8 outlines how a traditional delivery model works. This model can be applied to any building type, both residential (usually excluding apartments) and non-residential, which has the appropriate aspect to the sun and appropriate metering infrastructure.

In this scenario the building owner-occupier plays both the role of host and investor, and hence little facilitation is required. Energy retailers and other organisations are starting to offer loans on solar PV systems. The loans work alongside the traditional model to alleviate the burden of a high upfront capital outlay.

This model is only attractive to long-term owner-occupiers as they will benefit from savings resulting from offset and exported electricity, which will allow them to recoup the capital cost of the system over time. For most residential solar installations this can take between 6-8 years.

HOW COMMUNITY SOLAR WORKS:

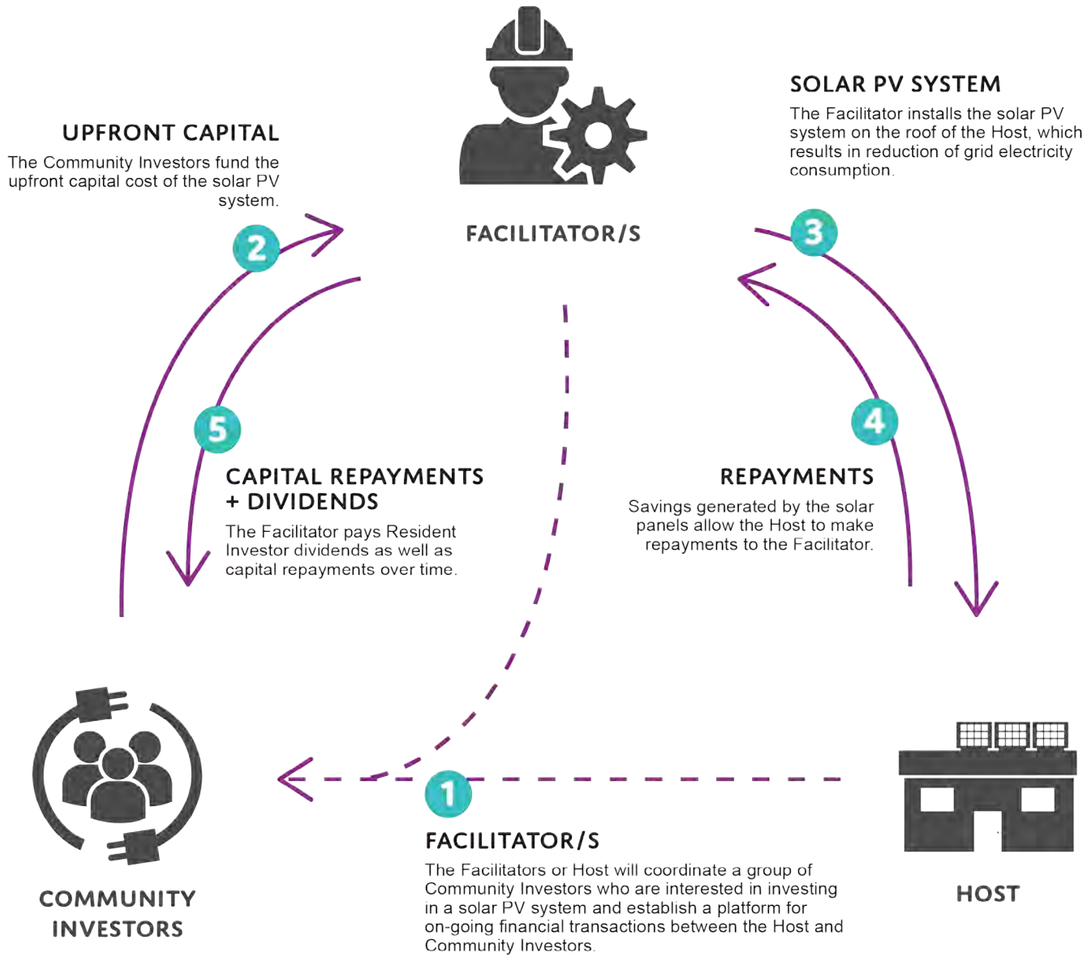


Figure 9: Community Solar Delivery Model

The Community Delivery Model aims to separate the role of the host and the investor, enabling broader participation and hence enhances the viability of renewable energy projects. Figure 9 outlines how these Community-based delivery models work.

FACILITATING FINANCIAL TRANSACTIONS FOR COMMUNITY SOLAR:

Because the investor does not own the building or consume the generated electricity, some facilitation is required in order to fairly distribute the financial benefit. The Facilitator is required to identify and coordinate the separate parties, in particular facilitating the specific financial transactions between the host and investor. Facilitation of the financial transactions can take several forms, with varying levels of Council involvement.

ENVIRONMENTAL UPGRADE AGREEMENT (EUA)

EUAs allow loans to be established for environmental improvements to buildings. The council charges an additional environmental upgrade charge on the building owner alongside their regular quarterly council rates. Using the council's existing payments framework greatly reduces the administrative burden and financial risk of coordinating loan repayments. Because of this, EUAs are the preferred method of handling the financial transactions between the building owner and investor group. The cost of upgrades can also be partly recouped from tenants.

Applicability: EUAs can be used for existing non-residential or multi-residential (more than 20 lots) strata buildings.

DIRECT LOAN

A building owner and investor group could enter into a direct loan without an EUA, however there is some complexity to manage the financial transactions between the two parties.

Applicability: Suitable for smaller-scale projects, potentially with existing payment frameworks in place such as schools and clubs.

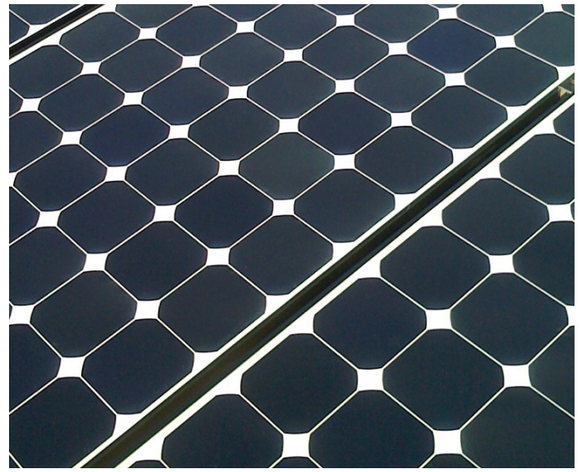
POWER PURCHASE AGREEMENT (PPA)

When applied to renewable models, a PPA typically involves the host agreeing to buy all generated power from the system owner at an agreed tariff (typically set to be less than the cost of retail electricity), thus securing a revenue stream for investors. Note that the host buys all generated power, not just what they consume. From the host's perspective it is vital that the system is sized appropriately, as they bear the risk of paying for electricity they are not consuming.

Applicability: PPAs are best suited for larger sites, for example the 520kW installation on the new International Convention Centre in Sydney (Sydney Renewable Power Company).

AGGREGATED MODELS

While hosts and loans (EUAs, direct or PPAs) need to be established on a site by site basis, a single community investor group can be established for a portfolio of sites. This reduces the administrative overhead of establishing the group, however does require timing of solar installations across the sites to be aligned.



VIRTUAL NET METERING

Virtual net metering (VNM) refers to when an electricity customer with on-site generation (such as solar PV) is allowed to assign their 'exported' electricity generation to other site/s[5]. The other site/s may be owned by the generator or other electricity customers. The term 'virtual' is used to describe this sort of metering arrangement as the exported electricity generation is not physically transferred to the consumer, but rather transferred for billing reconciliation purposes.

While the implementation and expansion of renewable energy across the Randwick Local Government Area is not reliant on virtual net metering, the inclusion of VNM would help expand the scope and feasibility of Community Solar due to:

- Solar PV does not have to be installed on the asset that uses the power.
- Any exported solar PV generated electricity can be aggregated across a number of sites within a local area and resold to local customers, ensuring all solar PV is used to offset the highest cost electricity.

In addition, VNM opens up other business model alternative for community renewable energy, including:

- Generation from solar PV on Council owned assets could be distributed and used directly by local residents or businesses.
- Community-owned renewable energy could be used directly by local shareholders.

Currently there are only a handful of case studies of VNM in Australia, each of which have been negotiated individually with energy networks and retailers. The majority of VNM arrangements that have been approved are those in which local generation is proven to assist the network in the transmission and local distribution of energy.

The main challenge to establishing VNM in Australia revolves around the complexity of defining appropriate billing mechanisms that take into consideration network costs and transaction costs to network owners and retailers. The City of Sydney, in collaboration with other interested organisations has recently submitted a rule change request the Australian Energy Market Commission (AEMC) on reduced network charges for local energy generation in a step towards establishing an approach for VNM.

[5] Virtual Net Metering in Australia: Opportunities and Barriers http://www.tec.org.au/images/reports/ISF_TEC_VNM_paper_20130627.pdf-1.pdf

DEFINING THE ROLE OF COUNCIL IN COMMUNITY SOLAR:

While council is not expected to be solely responsible for the delivery of Community Solar projects in the long term, it will play a crucial role in the short term to help to demonstrate the business case and facilitate the role of the private sector. This includes:

- **Establishing EUA capabilities:** Council is in the unique position to facilitate EUAs which provide the simplest mechanism for managing financial flows between asset owners and investors. Only a handful of councils currently accommodate EUAs. Enabling loan transactions via EUAs within Randwick City Council could facilitate not only renewable energy projects but any project providing environmental improvements.
- **Identifying appropriate assets:** In the short term, Council should offer their own applicable assets for Community investment. In the absence of suitable council owned assets it can facilitate discussions with community owned assets such as schools.
- **Marketing and communications:** Council will play a vital role in connecting investors to hosts. This may involve the development of a website or portal that facilitates investment and payment. It would also involve driving awareness amongst the community.
- **Leverage support from existing frameworks and community groups such as:**
  - Support from Office of Environment and Heritage to councils to cover administrative burden in establishing EUAs.
  - Not-for-profit Community Solar groups who can provide pro-bono assistance with community renewables projects.
  - Existing Local Community Groups that are already seeking to explore community renewable projects. A group has already been identified in Clovelly who are exploring project opportunities.

BENEFITS OF COMMUNITY RENEWABLES:

There are several key benefits to Community Solar projects relating to both the generation of renewable energy as well as the residual community and council benefits:

- **Unlocks the viability of solar that is not being delivered through traditional models.**
- **High technical potential of Community Solar:** Solar PV and hot water deliver the highest technical potential of all technologies that have been explored in this Master Plan. Community investment could provide the capital for the installation of large scale solar, which could have significant generation potential in the long term.
- **Unique leadership role for Council:** Randwick has the ability to kick-start community renewables through opening up of their own assets and offering EUAs. Randwick City Council will be one of the first to establish such programs, which would further support the council's reputation as leaders in exploring innovative solutions.
- **Community outreach:** A community-based delivery model also provides opportunity to integrate community outreach programs for community groups. Parents will have the ability to invest in their children's schools with the added benefits of education, members of local bowling and surf clubs can invest in their sports club while receiving a financial return.
- **Optimises financial and environmental benefits:** The implementation of Community solar means that investment is no longer restricted to specific roofs, which are owned by the investor. This means that solar can be installed on those roofs that are most suitable in terms of aspect and building use (ie, can be sure that the generated power will be used). This maximises the financial and environmental return of the panels.

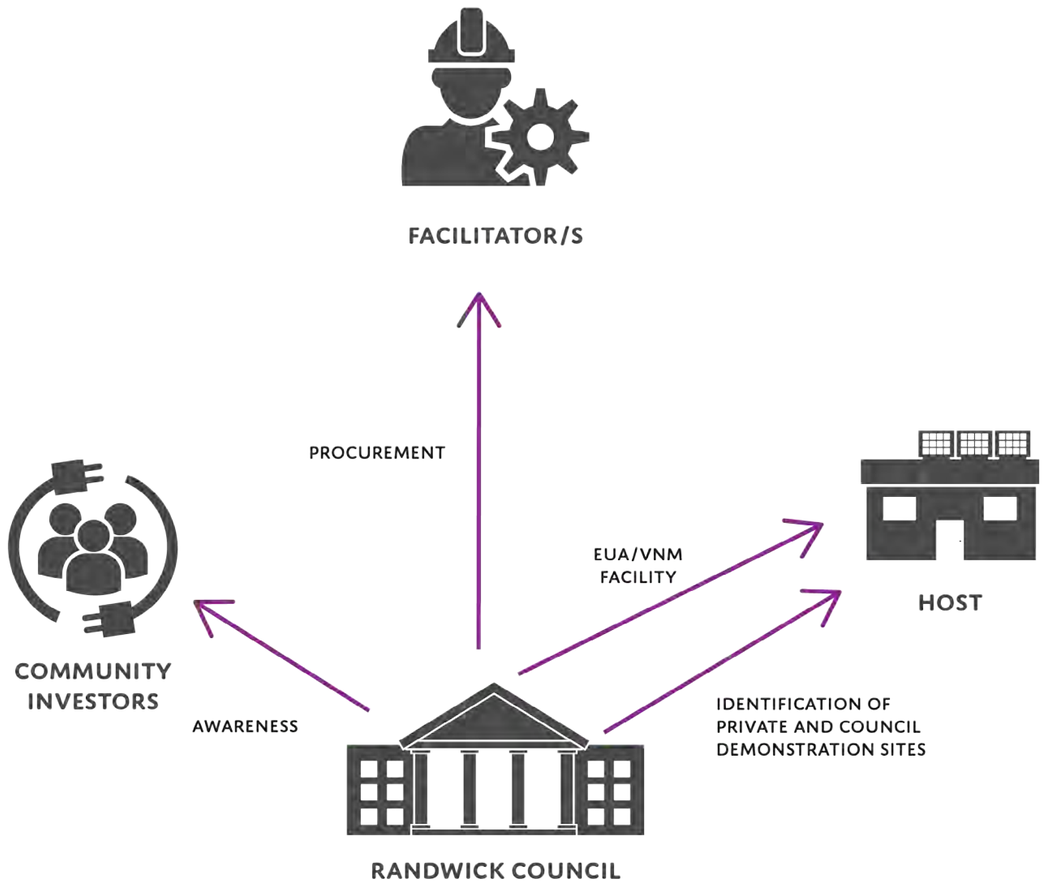


Figure 10: The role of Council in Community Renewables

WHAT COMMUNITY RENEWABLES MIGHT LOOK LIKE

While the exact financial return for each community renewables model may vary according to the building and the repayment arrangement, when executed appropriately the community owned delivery model will provide a win win for all parties. Below are some examples of how community renewables might be delivered in the community[6]:

COMMUNITY RENEWABLES IN SCHOOLS

Facilitated through Randwick City Council, the local public school establishes a community solar program as a mechanism for the school community to invest in renewable energy while at the same time educating their students on the value of renewable energy. Parents are given the opportunity to pay an extra $2,000 when enrolling their child in a new school which funds the purchase of a 1kW panel on the roof of the school.

Throughout the 7-year schooling period, a small dividend of $28.9/month ($1.80/day) is passed back directly to the child, either in the form of deposit into a bank account or as credit at the schools facilities such as the tuck shop. In doing so, educating the child on both renewable energy and money management.

While most of the savings resulting from the panel are initially passed back to the child, at the end of the 7 years the school keeps the panels and benefits moving forward.

WHAT THEY GET:

SCHOOL: REDUCED ENERGY COSTS, PANELS AT END OF TERM.

PARENTS: SMALL RETURN ON INVESTMENT (2.7%)

CHILD: EDUCATED ABOUT RENEWABLE ENERGY AND $ MANAGEMENT.

COMMUNITY RENEWABLES ON APARTMENTS

Following a feasibility assessment, Randwick City Council (or private Facilitator) approach the Strata of the residential apartments that would be appropriate for community renewables. Once the Strata agree to install solar, either the Strata or Facilitator will contact residents to gather interest to invest $2,000 each to purchase 1kW of solar PV on their roof for a total of 80kW. Investors are not restricted to residents only, which provides long term flexibility should a resident move out.

The energy generated from the solar PV is then used to power all communal areas, the savings from which are paid back to the council through an additional 'Environmental Levy' in the usual council rates (EUA). The council then passes this levy onto the facilitators who return a payment of approximately $370 per year for 10 years to the investor. The strata keep the panels at the end of the 10 years.

WHAT THEY GET:

STRATA: REDUCED ENERGY COSTS, PANELS AT END OF TERM, MORE MARKETABLE BUILDING

TENANTS/INVESTORS: 6.4% P.A. RETURN OVER 10 YEARS

LARGE SCALE OR AGGREGATED COMMUNITY RENEWABLES

Randwick City Council and/or Facilitators identify a large industrial site such as a factory that is suitable site for a large-scale community solar. The Host agrees to a Power Purchase Agreement, which locks them in to fixed electricity price that is less than they currently pay. The energy generated from the Solar PV creates additional savings (below this fixed price).

Simultaneously, Council identify 10 large council owned sites that amount to a total of 100kW of potential solar installation. A Power Purchase agreement is put in place for these sites and a Facilitator is procured to install and manage the financial transaction with investors.

When investments are available, residents of the Randwick Local Government Area receive a letter from the Council and/or facilitator notifying them of an opportunity to invest in renewable energy in their local community. The investor pays $2000 through a secure site approved by Randwick City Council, which is managed by the Facilitators. The facilitators will then pass on a payment of $207/year for 15 years to the investor.

WHAT THEY GET:

HOST OR COUNCIL: LOWER ELECTRICITY PRICES

INVESTOR: 5.7% P.A. RETURN OVER 10 YEARS

[6] The associated numbers are rough estimates only used to demonstrate example rates of return. Specific financial paybacks will require individual feasibility assessments

KEY CHALLENGES TO BE CONSIDERED IN DEFINING A PROJECT

There are also a few key challenges that need to be addressed in any Community Solar Installation:

- **Eligibility of the host building:** In order for community solar to be a viable financial option the host asset must not be on an already discounted tariff (which is the case for some council assets and schools), needs to be consuming the generated energy directly during the day and also have an appropriate unshaded roof aspect. Given these factors not all assets will be appropriate for community solar.
- **Eligibility for rebates:** In order to take advantage of upfront rebates via the creation and sale of Small-scale Technology Certificates (STCs) under the Small-scale Renewable Energy Scheme (SRES) any single system must be restricted to 99kW or less to. Systems above 99kW are covered under the Large-scale Renewable Energy Target (LRET) where Large-scale Generation Certificates (LGCs) are generated annually and rebates are received over the lifetime of the system. LGCs expose the financial model to longer term risk, particularly considering the uncertainty in the legislation around the Renewable Energy Target.

COMMUNITY SOLAR CASE STUDIES

Community renewables is still a relatively new model. In fact, should Randwick City Council proceed with the strategies outlined in this Master Plan they will be one of the first Local Governments in Australia to support a Community Solar program. There are a few key notable case studies for consideration:

REPOWER[7]

REPOWER installed a 99kW system on the rooftop of the Shoalhaven Heads Bowling and Recreation Club, with operation commencing in August 2014. The system is owned by both the club and community shareholders. Investors will receive 6.5% p.a. over 10 years, and the panels will be gifted to the bowling club at the end of the 10-year term.

LISMORE COMMUNITY SOLAR[8]

Australia's first council-community solarfarm is underway in Lismore. Local community investors will fund two 99kW solarfarms at Goonellabah Sports & Aquatic Centre and East Lismore Sewage Treatment Plant. Lismore City Council will facilitate payments between the assets and the investors via an EUA, whereby the assets make loan repayments alongside their usual council rates. The council has also played a much larger role in demonstrating leadership in renewables via their support of community ownership and their commitment to a 100% Renewable Energy Master Plan.

[7] http://www.repower.net.au/repower-one.html
[8] http://farmingthesun.net/lismore-community-solarfarm/

NEXT STEPS:

It is important to ensure that the appropriate level of investigation and community engagement is done prior to undertaking any community solar project. Suggested next steps for council are:

- Make contact with existing community groups wanting to undertake community solar to get an indication of their requirements and assets they are hoping to utilise.
- Undertake a Site Feasibility Assessment for appropriate assets across the Local Government Area that would be suitable for Community Solar. This may include both council assets and community assets.
- Undertake a community engagement process that assesses the desire within the community for investment in community renewables and their key concerns that would need to be addressed in any communications.
- Undertake a procurement process for 3rd party facilitator to establish and roll out the community renewable projects.
- Establish an Environmental Upgrade Agreement facility enabling financial transactions between hosts and investors.
- Monitor progress of the rule change submitted by City of Sydney to the Australian Energy Market Commission on reduced network charges for local energy generation.

EMBEDDING RENEWABLES IN NEW DEVELOPMENTS

90% of future dwelling growth in the Randwick Local Government Area will be apartments. Compared to the difficulty in influencing and implementing the retrofit of renewables in existing buildings, new multi-unit developments represent a significant portion of the building stock where Randwick City Council has a relatively large degree of control in incentivising renewable energy via development controls.

WHAT IS IT?

By encouraging new developments to be delivered with embedded renewable energy, Randwick City Council will overcome several existing challenges and take advantage of future growth patterns:

- Apartment dwellers: including both owners and renters, have traditionally had limited access to solar PV and hot water due to both roof access and split incentives.
- Strata buildings: are more difficult to retrofit with renewables as agreement from all owners is required. By embedding renewables upfront, the capital value of the dwellings will increase, and owners will receive savings over time from reduced energy costs.
- Multi-unit dwellings: are the fastest growing dwelling class within Randwick LGA.

HOW DOES IT WORK?

New developments with embedded renewables can include either solar PV systems servicing common area loads, or a centralised solar hot water system delivering hot water to individual apartments. Electricity generated from solar PV could potentially also be used by apartments internally however dwelling-level solar metering may be complex.

Currently, developers have little incentive to deliver renewables in new developments. Within the Randwick LGA the impact of this barrier is magnified due to its urban form and demographics which has resulted in an above average proportion of apartment dwellings as well as renters.

DEFINING THE ROLE OF COUNCIL IN EMBEDDING RENEWABLES IN NEW DEVELOPMENTS:

Existing BASIX legislation demonstrates the effectiveness of using development controls to drive sustainability. BASIX Energy targets encourage low greenhouse gas emission hot water systems for new dwellings and alterations. This has seen the phase out of electric storage systems and the increase in solar hot water systems. While the take-up of solar hot water was close to 50% in the first few years after the introduction of BASIX, over the last 5 years solar hot water has reduced and is favoured by the lower cost gas hot water system in new residential dwellings in Randwick LGA.

The BASIX regulations allows for provisions which “encourages, or offers incentives for, the adoption of measures beyond those required...”. Randwick City Council can look to motivate developers to incentivise BASIX requirements via voluntary planning agreements (VPAs) or incentives that include solar PV or hot water in buildings.

Existing developments which set a precedent for this approach include Harold Park and Green Square in the City of Sydney and Bankstown, where developers have exceeded BASIX requirements in exchange for an increased floor space allowance.

NEXT STEPS:

The next steps for Council to ensure renewable energy is embedded in future developments include:

- Engage internal planning teams to discuss appropriate mechanisms to deliver renewable energy in new developments.
- Establish development incentives to maximise renewable energy in new residential and non-residential development (e.g. BASIX Energy targets or a minimum kW of renewable energy installed).
- Open discussions with Department of Planning regarding mandating higher BASIX targets.

Figure 11: Percent of hot water system types in new single dwellings in Randwick under BASIX (Source: NSW Department of Planning, 2014)

CASE STUDY: LINKING ENVIRONMENTAL PERFORMANCE TO DEVELOPMENT INCENTIVES

Clause 30A of Bankstown Local Environmental Plan (LEP) 2001 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 CO2/m2 per year.
- Water target is a maximum 0.47 kL/m2 per year for office.

As the FSR Bonus will increase the size of new buildings this will lead to increased environmental impact, in terms of increased greenhouse gas emissions from energy consumption and increased water consumption. The environmental performance standards established by Council seek to offset the impact of the increased floor space so that buildings which receive the FSR Bonus have the same environmental performance as buildings which do not.

ENERGY FROM WASTE

Energy from Waste has been identified as a key mechanism for council to deliver consistent long-term renewable energy generation. The analysis of technical potential suggested that 27,000 MWh of energy is possible to be generated from the existing waste stream produced in the Local Government Area. This represents up to 5% of total energy demand.

WHAT IS IT?

Energy from Waste is the process of generating energy (electricity, heat or biogas) from waste. There are two main methods of extracting energy from waste:

- Biological treatment through anaerobic digestion
- Thermal treatment through gasification

Anaerobic digestion involves the decomposing of organic material to create biogas that can be converted into electricity or gas for the grid. Anerobic digestion is for garden, household and commercial organic waste and even sewage sludge. Figure 12 outlines the standard process involved in anaerobic digestion. This process results in a diversion from landfill of 40-70% of waste[9]. Anaerobic digestion is the most simple and cost effective form of energy from waste and could begin implementation in the near future.

Most major waste contractors in Australia are already undertaking some form of anaerobic digestion. SITA Australia currently has an anaerobic digestion established at the Kemps Creek facility and Veolia have a similar site at Woodlawn. The Malabar Wastewater Treatment Plant includes an anaerobic digestion facility operating on sewage sludge. The energy produced is used on-site by a 2,975 kW-effective cogeneration system, producing both heat and electricity.

Gasification is a more advanced energy from waste technology which involves gasifying waste at extremely high temperatures (upwards of 300 to 3,000 degrees Celsius). In recent years it has matured as a technology and has proven to be suitable for a wide variety of waste streams including municipal solid waste and some commercial waste streams. Combining waste separation and resource recovery with gasification it is possible to divert 90-100% of waste from landfill, recover valuable materials and produce energy.

BENEFITS OF ENERGY FROM WASTE

While waste to energy only represents a small portion of the total technological potential for renewable energy generation, it remains one of the key technologies that Council can maintain the greatest level of autonomy over. In addition to the renewable energy generated from waste to energy, there are other residual benefits of waste to energy that align with Randwick City Council's strategic environmental targets.

Reduction in waste to land fill: Randwick City Council has previously established a resource recovery target of 66%. Analysis undertaken as part of the City of Sydney's Advanced Waste Treatment Master Plan suggests that through a combination of both existing energy to waste technologies it is possible to convert up to 90% of non-recyclable waste to gas. Existing studies undertaken by Randwick City Council suggest that, taking into consideration existing recovery of recyclable materials, combining both available technologies could result in 90-100% of existing waste being diverted from landfill.

Reduction in greenhouse gas emissions: Avoided landfill greenhouse gas emissions and conversion of non-recyclable waste into renewable gas could prevent up to 40,000 tonnes of CO2-equivalent from entering the atmosphere every year.

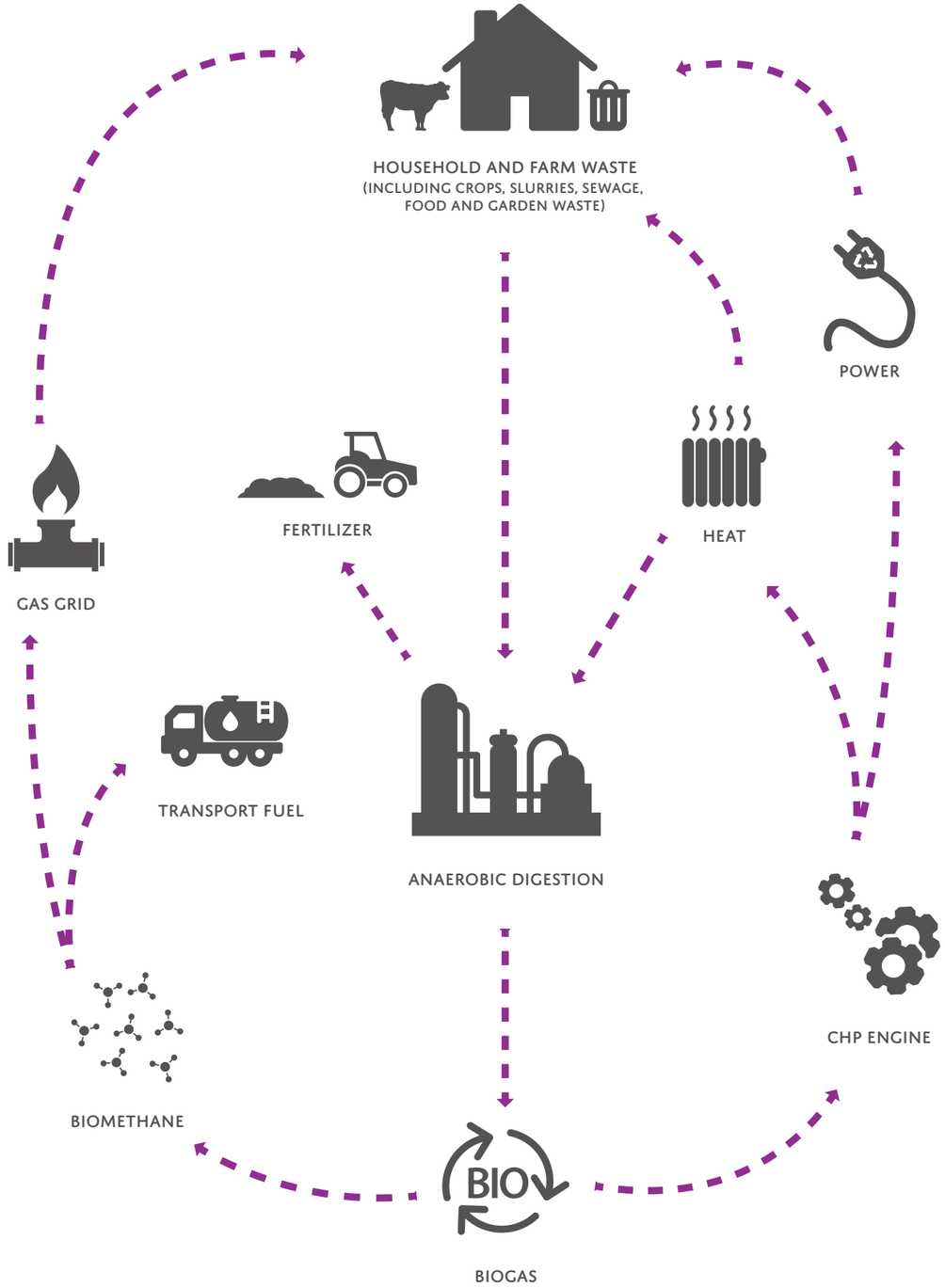


Figure 12: Standard Process of Anaerobic Digestion

[9] City of Sydney Advanced Waste Treatment Master Plan

KEY CHALLENGES TO IMPLEMENTATION:

Although waste to energy technology poses significant long-term benefits, there are also several key short-term challenges to implementation that need to be addressed. These have been documented in detail in Council's previous Resource Recovery strategies (GHD Report). However the main challenges in relation to the generation of renewable energy revolve around the requirement for a consistent organic waste stream and overcoming the capital investment required for a local energy from waste facility.

Most waste providers will require an organic waste stream in order for anaerobic digestion to remain financially feasible. Ensuring a clean and consistent feedstock of organic waste can be a costly and time-consuming process for council due to issues relating to contamination, household participation and contractual arrangements with existing waste providers.

In 2009 Penrith City Council introduced domestic waste organics collection service, where fruit and vegetable scraps, meat and bones, garden clippings and prunings were collected each week from approximately 50,000 households in the city.

The council encountered a number of issues during the first year of the service, including negative media coverage, organics bin lids which did not fit the older bin bodies, and a large number of complaints from residents about odor, pests and insufficient residual waste collection capacity and frequency. However in subsequent years the council has addressed many of these issues and is currently receiving a usable organic waste stream, which is processed at SITA Australia's AWT plant in Kemps Creek.

Establishing local waste to energy facilities can also require significant capital expenditure. Gasification plants can cost upwards of $100 million and therefore it is unreasonable to expect a single council to fund the procurement of these facilities. Instead, a regional approach is required in order to ensure both the capital and the delivery of a constant organic feedstock.

ROLE OF COUNCIL

Randwick City Council has already demonstrated considerable leadership in exploring Energy to Waste opportunities. In 2012, Randwick City Council commissioned a Resource Recovery Strategy and Alternative Waste Technology Implementation Roadmap which analysed Council's current waste collection system and resource recovery performance and identified potential alternative waste treatment technologies, sites and purchasing options for Council.

The initial requirement by council is to establish a consistent organic waste stream with low levels of contamination. Randwick currently operates on a 2 bin system (recycling and landfill) for apartments and a 3 bin system (recycling, garden and landfill) for houses. Food waste is not currently separated. However, as of November 2013 Randwick City Council began a trial food waste collection for approximately 5,000 multi-unit dwellings. This is due to be expanded to all multi unit dwellings in July 2016.

Furthermore, existing feasibility studies have identified the expansion of the Sydney Water Sewage Treatment plant in Malabar as an appropriate site for an anaerobic digestion plant.

NEXT STEPS:

Next steps for Council in considering energy from waste in the short term would include:

- Expanding the food waste collection program to all dwellings by 2017
- Further facilitate meaningful discussions with neighbouring councils around securing a regional energy from waste contract or procuring another dedicated facility
- Initiate conversation with Sydney Water in regards to expansion of the existing Energy from Waste facility while procurement of another facility is occurring .

OTHER PROGRAMS AND POLICIES

In addition to the short-term opportunities outlined in the previous section, there are also a range of existing projects and policies that should be considered by Randwick City Council to facilitate renewable energy uptake in the short term.

INCREASING SOLAR PV ON COUNCIL ASSETS

Randwick City Council has already demonstrated clear leadership in the adoption of renewable energy, having installed a small wind system and 136kW of solar PV on its own assets throughout the Local Government Area. This represents roughly 4% of current Council energy demand. This Master Plan recommends that Randwick City Council continue with both the expansion of existing installations as well as the facilitation of new installations on other sites in the short term.

While not the key focus of this report, a high level analysis of Council assets was undertaken to provide an estimate of the available potential generation from solar PV. Table 2 breaks down the capacity of the top 23 sites. It also assumes that at least 2kW of solar could be installed on the remaining 60 small sites that are on a high tariff. This high level analysis estimates that a further 780kW of solar potential that could be installed on Council assets. This represents 27.4% of the total council electricity consumption as of 2013/14 levels.

Given the current tariff arrangements and demand profiles, not all of these sites will be economically viable for solar PV in the short term. However, due to the forecast of energy tariff increases, decreasing costs of solar installation and future impacts of battery storage, it is expected that more of these sites will reach the appropriate threshold in the medium to long term. Figure 15 highlights the key Council owned assets with the greatest potential.

How Council chooses to utilise this roof space will depend on available funding and the agreement on long-term strategic objectives in terms of facilitating wider adoption of renewables across the community. In light of this, it is important that at least a portion of this available roof space is used to demonstrate the business case for Community Solar and act as a catalyst for private organisations to undertake similar projects independently. Hence, Council may decide to progress with both the direct ownership as well as establishment of Community Solar programs in tandem in the short term.

COUNCIL SITE	TARIFF	CURRENT GENERATION (KW)	POTENTIAL GENERATION (KW) (ADDITIONAL)[10]	TIMEFRAME
2 MOVERLY RD COOGEE NSW	High		10	Short
HEFFRON PARK	High		20	Short
BUS TERMINUS - AMENITIES - MARINE PD, MAROUBRA	High		10	Short
COOGEE BEACH AMENITIES BUILDING	High		15	Short
CROMWELL PARK - LIFEGUARDS CARAVAN	Medium		4	Short
WORKS DEPOT	Low	48	50	Long
DES RENFORD LEISURE CENTRE	Low	30	200	Long
MATRAVILLE PUBLIC HALL	High		15	Short
MATRAVILLE RECYCLING DEPOT	High		4	Short
MATRAVILLE YOUTH CENTRE	Medium		5	Short
MOVERLY CHILD CARE CENTRE	High	2	3	Short
NURSERY	High	8	0	Short
2 COAST HOSPITAL RD LITTLE BAY NSW	High	2	30	Short
RANDWICK COMMUNITY CENTRE	High	4	0	Short
ADMIN CENTRE (1-10 YEARS)	Low	10	60	Short
ADMIN CENTRE (10 YEARS +)	Low		140	Long
RANDWICK BRANCH LIBRARY	High		40	Short
BOWEN LIBRARY	Low	30	30	Long
SHELF SPACE AT BOWEN LIBRARY	High		10	Short
SNAPE PARK - DRESSING SHEDS	High		10	Short
CLOVELLY RD COOGEE	High		4	Short
BARRETT HOUSE	High	2		Short
APPROX. 60 REMAINING SITES	High		120	Short
TOTAL (KW)		136	780	

Table 2: Solar PV capacity on Council owned assets.

TIMEFRAME	KW	% OF 13/14 TOTAL COUNCIL ELECTRICITY CONSUMPTION
CURRENT	136	4.1%
SHORT (1-10 YEARS)	496	14.8%
LONG (10 YEARS +)	916	27.4%

Table 3: Generation from Solar PV on Council assets as a percentage of total council electricity demand.

[10] The analysis here should be used only as a guide and should be accompanied with a more detailed feasibility assessment. Methodology: Randwick Council's billing data was reviewed in order to estimate kW capacity of sites based on average daily consumption, and focusing on sites with high tariffs. Bowen Library: 2 meters exist for Bowen Library under different asset names and tariffs of "Bowen Library" and "Shelf Space at Bowen library". Cromwell Park – Lifeguards caravan: the asset address is listed as "Fishermans Rd Malabar"

SSROC OUR SOLAR FUTURE

In 2014, the Southern Sydney Regional Organisation of Councils established the Our Solar Future website[11]. This website is used to assist residents through the initial investigation process of installing solar PV, solar hot water or heat pumps. This is done by guiding users through a step-by-step process to determine their eligibility for solar and provides a range of quotes from verified installers.

This site addresses some key challenges that residents have previously identified:

- **Determining eligibility:** Residents can easily determine if their home is appropriate for solar without paying for an inspection.
- **Finding an appropriate installer:** By limiting the number of verified providers residents can be confident that they are receiving a quality product and a competitive price.
- **Addressing capital cost:** The website provides option for leasing arrangements, overcoming key concerns regarding the availability of upfront capital costs.

Facilitating the uptake of solar PV on appropriate residential dwellings is still seen as being one of the most achievable mechanisms available to Council. However, rather than recreating a similar program, a more resource efficient method would be to join this program which meets all the basic requirements and would allow resources to be utilised on other strategies suggested in this master plan.

EASTERN SUBURBS REGIONAL GREENHOUSE GAS REDUCTION STRATEGY:

In 2014 the Eastern Suburbs regional group of councils consisting of Randwick City Council, Waverley Council and Woollahra Council commissioned a Regional Greenhouse Gas Reduction Strategy. This strategy, which is due for Council consultation in late 2015, outlines key regional strategies to reduce community greenhouse gas emissions. The implementation of renewable energy technology, in particular the development of a wider regional scale community solar project, is likely to be a key pillar of this strategy. Therefore, the outcomes of this regional strategy should be considered in the context of actions taken by Randwick City Council.

RENEWABLE ENERGY TARGET REBATES

Despite recent reduction in the overall generation targets, the federal government's Renewable Energy Target is still in place. This program funds the generation of small-scale renewable energy through small-scale Technology Certificates (STCs) to system owners of approximately $800 per kW installed. This can have a significant impact on the feasibility in establishing community renewable projects.

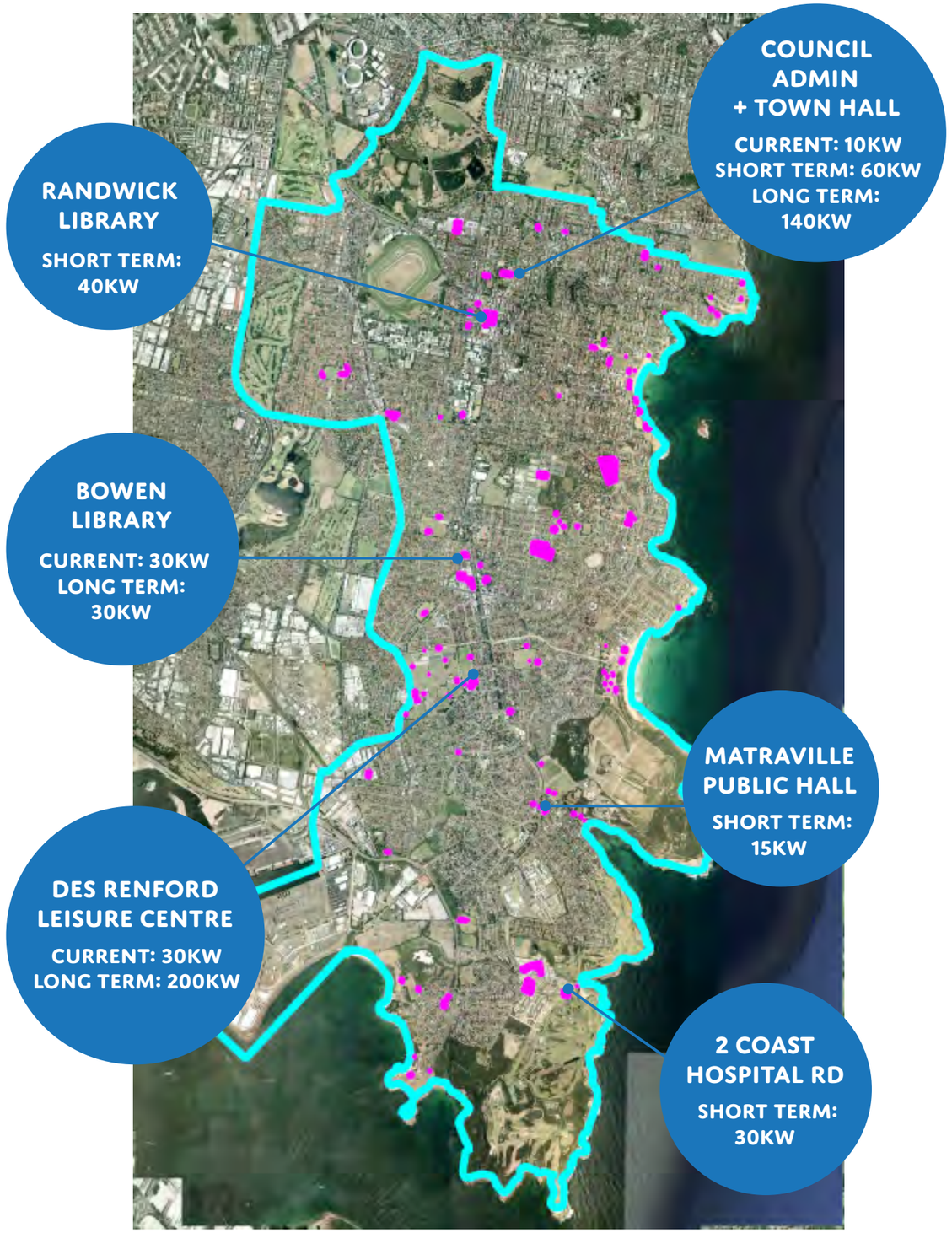


Figure 15: Key Solar PV installation opportunities on Council owned assests

[11] http://www.oursolarfuture.nsw.gov.au/

FUTURE OPPORTUNITIES

ENERGY FROM WASTE

Energy from waste has previously been discussed in this report and it's impact is expected to grow as the technology matures. Anaerobic digestion is a relatively mature technology and a number of waste treatment facilities around Australia already employ it to generate energy from waste, including the Malabar Wastewater Treatment Plant in the Randwick LGA. Gasification however is a newer technology approaching maturation with a number of proposed facilities awaiting approval or under construction around Australia.

WIND

Randwick City Council have previously explored wind technology and installed a small-scale system on the Community Centre. However the Randwick LGA is an urban environment and not particularly suited to commercial scale wind generation in its current form. Despite this, wind turbines designed for the urban environment is an active form of research worldwide and a number of promising products already exist in prototype phase in Australia and abroad.

WAVE

Wave energy involves harnessing the sea swell to operate pumps or drive turbines and is in a very juvenile state with only a handful of small scale research generators active worldwide. Australian companies Carnegie Wave Energy and Ocean Power Technologies both have plans to construct wave energy generators in Australia with capacities of about 20 MW in the coming years.

BATTERY STORAGE

Battery Storage technology is just reaching the stage where it is becoming economically viable and prices are expected to continue to drop. How batteries eventually get incorporated in the electricity network is a topic under investigation by many stakeholders.

Battery storage doesn't generate electricity on its own, but can facilitate the uptake of renewable generation technologies. Renewable power production is often intermittent so would benefit from the ability to store energy while generation is high but demand is low and redistribute it later when generation falls or demand rises.

- **Utility scale load levelling batteries** -- batteries attached to the electricity grid and operated/maintained by the network utility which soak up excess electricity from renewable sources within a local catchment and re-sell it when demand rises above generation.
- **Generator attached load levelling batteries** -- for renewable technologies such as urban wind farms which produce electricity intermittently and allow the generator to produce a constant power output and avoid surging on the electricity network.
- **Small scale domestic systems such as the Tesla Power Wall**

Illustration of Carnegie Wave Technology

ESTABLISHING AN ASPIRATIONAL RENEWABLE ENERGY TARGET

DEFINING A TARGET

Defining clear and achievable targets play an important role in driving momentum toward a collective future vision of the region. Rather than being used as a mandate, the establishment of a community renewable energy target should be used as an aspirational goal to help define a clear picture of what a 'Renewable Randwick' could look like and provide a strategic grounding for future project and planning decisions.

There are a several key considerations that must be taken into account when framing effective and actionable targets:

- **Timeframes should ideally align with other strategic planning:** Most of the internal strategic planning timeframes for Randwick Coucil align with 2020, 2030 & 2050 year timeframes. This will provide sufficient scope for advancement in technology and allow key projects to be incorporated into the next round of 5-10 years plans.
- **Should be informed by evidence:** This Master Plan outlines the key analysis used to inform the basis for a target. This includes assessment of technical potential and appropriate delivery models to achieve this in short and long term.
- **Should provide clear interval milestones to achieving this target:** It is important to provide the key milestones to help benchmark performance against these targets. This can be done through identifying an adoption curve or outlining key performance indicators as demonstrated later in this section.

The technical potential of renewable energy generation across the Randwick Local Government Area is **280,000MWh.** This represents approximately **37%** of total energy demand across the Randwick Local Government Area at 2011 levels.

Our analysis suggests that in the long term the majority of this technical potential is achievable. As a result this Master Plan recommends the adoption of an aspirational target of **30% of total energy demand supplied by renewable energy by 2050.**

LONG TERM TRENDS SUPPORTING THIS TARGET

While a target of 30% may appear ambitious, it is important to remember that the strategies adopted by Council will not be the only contributing factors in helping to achieve it. While Council will play a vital role in addressing existing barriers and demonstrating the business case for renewables in the short term, there are a also a range of external trends that are likely to further multiply the impact of these strategies in the long term. These trends include:

- Solar technology is getting cheaper and more efficient: The production cost of solar PV panels has dropped significantly in the last 5 years and is expected to drop by a further 40% by the end of 2017[12].
- Increasing cost of electricity generated from fossil fuel: Forecasts show that the cost of energy obtained from the fossil fuels are likely to gradually increase in the long term. There are various reasons for this including the implementation of a price on carbon, increased unit cost of sourcing remaining available fossil fuels and the requirement to replace aging coal fire power plants.
- Storage will increase the number of assets that can be used: The increase in available and affordable battery technology will overcome many of the existing barriers to solar PV in relation to the requirement for immediate use of the power generated in order to be financially feasible. This will open up the possibility of solar for buildings that may not be used on weekends or mostly used in the evening.

These factors will further increase the business case for renewable energy which, in combination with a clear and defined roadmap for Council intervention, demonstrate that the recommended target of **30% by 2050** is both realistic and achievable.

LEADING FROM THE FRONT – RENEWABLE ENERGY TARGET FOR COUNCIL ASSETS

In order to effectively support the aspirational community target, it is vital that Council set clear and achievable targets for the adoption of renewable energy on it's own assets. Not only will this facilitate the community target and demonstrate leadership in the short term, it will also provide significant financial and environmental benefits for Council in the long term.

Analysis of all Council assets suggests a total potential of 780kW of solar PV capasity in the long term. However, not all of these will be economically viable in the short term. Through analysis of existing economically viable sites, this Master Plan reccomends the target of 496kW of solar PV generation on council assets by 2025. This would represent **15% of total Council energy demand by 2025** (based on 2013/14 levels).

Our analysis also suggests that a long term target of **30% of total council energy demand supplied by renewable energy by 2050** is both feasible and would support the wider community target.

ASPIRATIONAL COMMUNITY TARGET:

30% OF TOTAL ENERGY DEMAND SUPPLIED BY RENEWABLE ENERGY BY 2050

COUNCIL IMPLEMENTATION TARGET:

15% OF TOTAL COUNCIL ENERGY DEMAND SUPPLIED BY RENEWABLE ENERGY BY 2025

[12] https://www.db.com/cr/en/concrete-deutsche-bank-report-solar-grid-parity-in-a-low-oil-price-era.htm

DEFINING THE ROAD TO "RENEWABLE RANDWICK"

Figure 13 outlines the projected uptake of renewables toward the 2050 target. This projection has been informed by the predicted adoption and generation rates of the various technologies in a scenario in which Council executes the key strategies outlined in this plan.

This curve demonstrates a small increase in generation in the short term as community solar is established, new development coming on line and waste to energy generation begins. Once the business case for community solar is demonstrated and opened up to private sector management, generation from non-residential solar is likely to significantly increase. This will be supported by the increase in emerging technologies such as wave technology. In the long term, residential solar will begin to reach saturation and total generation will be overtaken by non-residential solar.

Figure 13 also highlights the residential solar 'business as usual' growth. This projects the current uptake of rooftop solar out to 2050. Given that residential rooftop solar currently makes up the vast majority of existing renewable energy, it can be assumed that this projection would represent total renewable energy generation in a BAU scenario without Council's intervention.

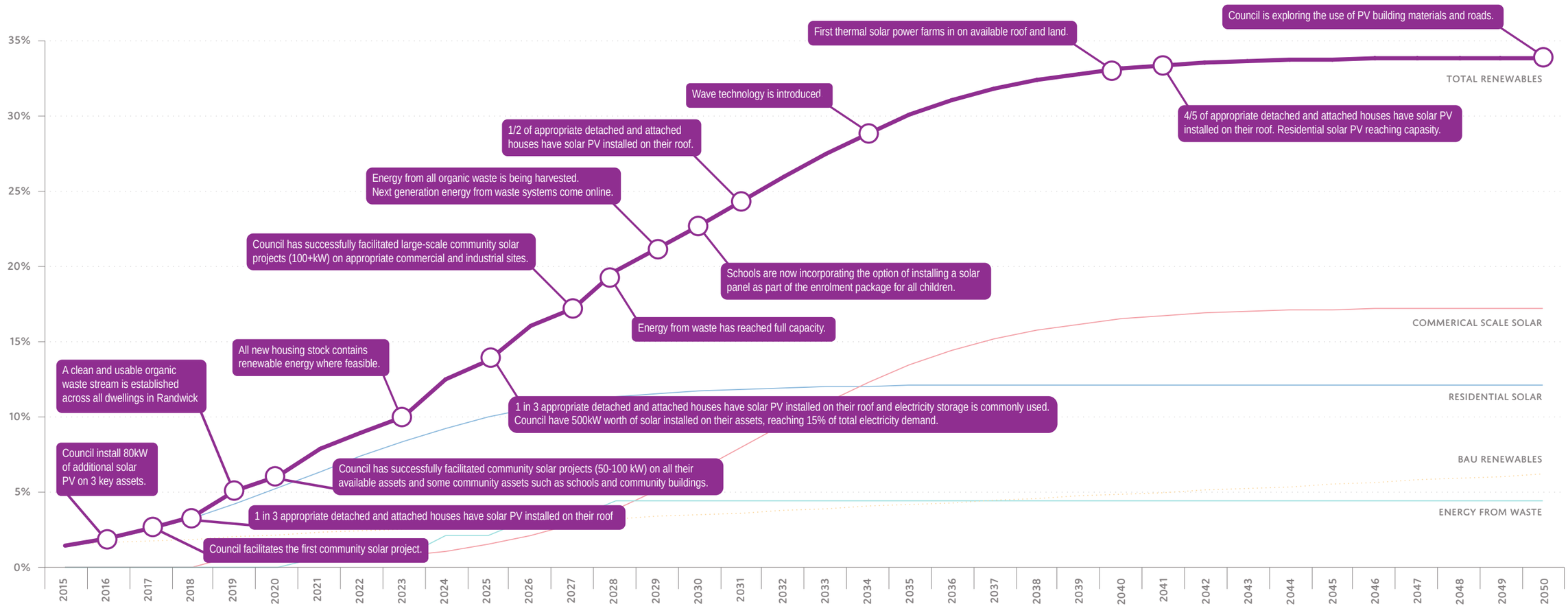


Figure 13: Progress towards 30% renewable energy target vs residential solar BAU

MAKING IT HAPPEN – NEXT STEPS FOR COUNCIL

This Master Plan outlines the analysis and associated strategies aimed at driving the uptake of renewable energy across the Randwick LGA. In doing so, it aims to reinforce Randwick City Council's current reputation as a leader in environmental sustainability.

THIS MASTER PLAN REPRESENTS ONLY THE FIRST STEP IN A LONG JOURNEY TOWARDS REALISING THE BENEFITS OF 'RENEWABLE RANDWICK'

The strategies outlined in this report are only as powerful as the tangible actions that result from it. In order to turn these insights into action, Kinesis recommends the following next steps from council in the short term:

IDENTIFY APPROPRIATE ASSETS AND PLANNING CONTROLS:

- Analyse the feasibility of new and additional solar PV on Councils assets identified in this plan.
- As part of this process, identify Council and community assets that could be packaged up for a community renewable project.
- Identify appropriate planning controls or incentives to maximise renewable energy in new residential and non-residential development (e.g. appropriate BASIX Energy targets).

ENGAGE INTERNAL AND EXTERNAL STAKEHOLDERS:

- Run an internal education and engagement process to expand on the strategies outlined in this plan and gain internal agreement on strategic direction.
- Engage existing community solar groups to understand their current programs and how Council could support them.
- Re-engage regional councils and service providers on Energy from Waste opportunities.
- Engage internal planning teams to to discuss appropriate mechanisms to deliver renewable energy in new developments.

EXECUTE PROJECTS:

- Fund and install solar PV on identified Council's assets.
- Establish an Environmental Upgrade Agreement for the Randwick Local Government Area.
- Package up Council and community assets for a community renewable project and go to tender to find a community renewable energy provider.
- Expand food waste trial to all dwellings across the local government area.

MONITOR PERFORMANCE:

- Establish a mechanism to regularly monitor the uptake of renewables across the community to determine if these strategies are effective and adjust accordingly. This may be in the form of manual data gathering process or the commissioning of appropriate software that will provide automatic capture of this data.
- Integrate community renewable energy adoption into annual reporting and progress toward the aspirational target.