Sydney as a Renewable Energy Zone:

A metropolis of energy equity, affordability and abundance

Committee for Sydney

Acknowledgement of Country

We acknowledge Aboriginal and Torres Strait Islander peoples as the Traditional Custodians of the lands, waters and skies where this project takes place. We pay our respects to their Elders both past and present. We recognise that sovereignty was never ceded. This was, and always will be, Aboriginal land.

Acknowledgements

This report was prepared by Committee for Sydney in partnership with Arup and Arcadis. It has been informed by the deep knowledge experts and practitioners across and beyond Metropolitan Sydney, including the members of the Committee for Sydney's Resilience Policy Council.

ARUP ARCADIS

Thank you to the following organisations for their contributions.

Arcadis

Arup

AECOM

Ausgrid

Campbelltown City Council

CBRE

City of Ryde

City of Sydney

Climate Council

Climate-KIC Australia

Communicating the Arts

Dexus

Endeavour Energy

Goodman

JLL

Landcom

Lendlease

NSW Department of Climate Change, Energy, Environment and Water

Penrith City Council

Race for 2030

Resilient Sydney

SGS

Solar Citizens

The Energy Corporation of NSW (EnergyCo)

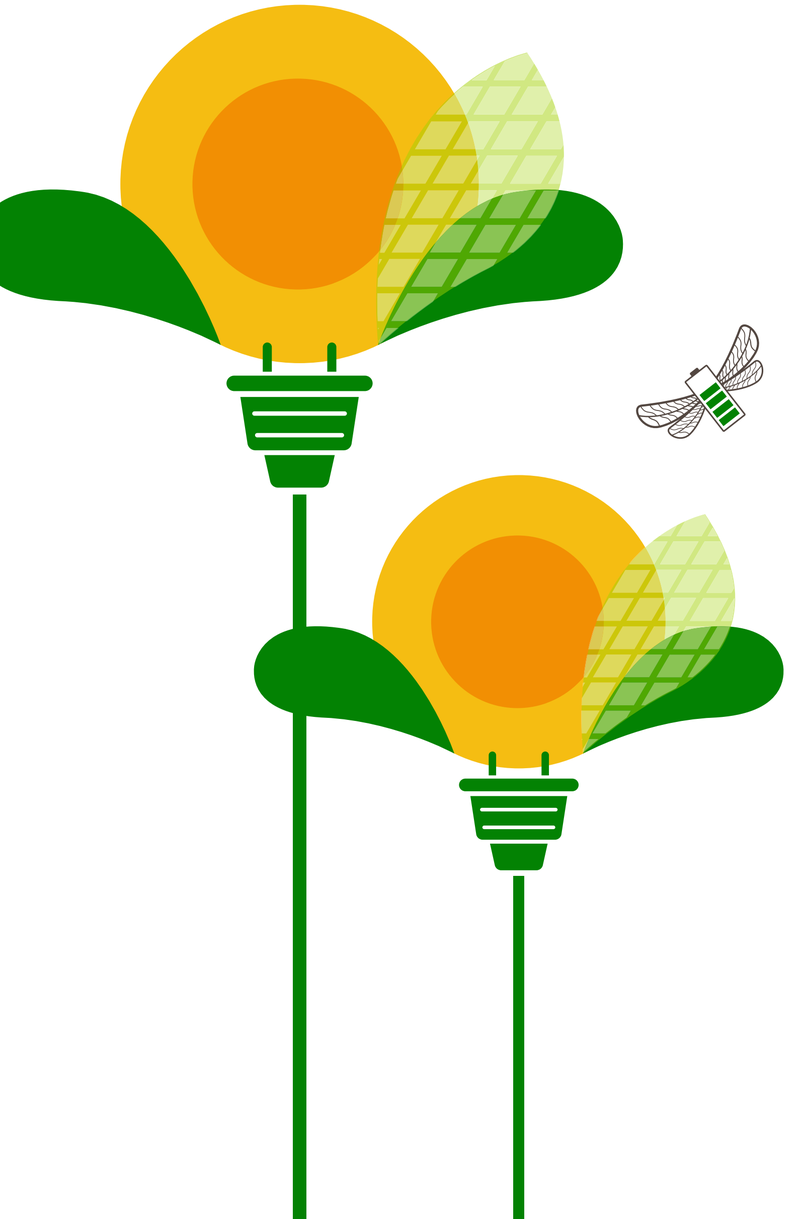
TransGrid

UNSW Energy Institute

UTS Institute for Sustainable Futures

Western Sydney Regional Organisation of Councils

Willoughby City Council



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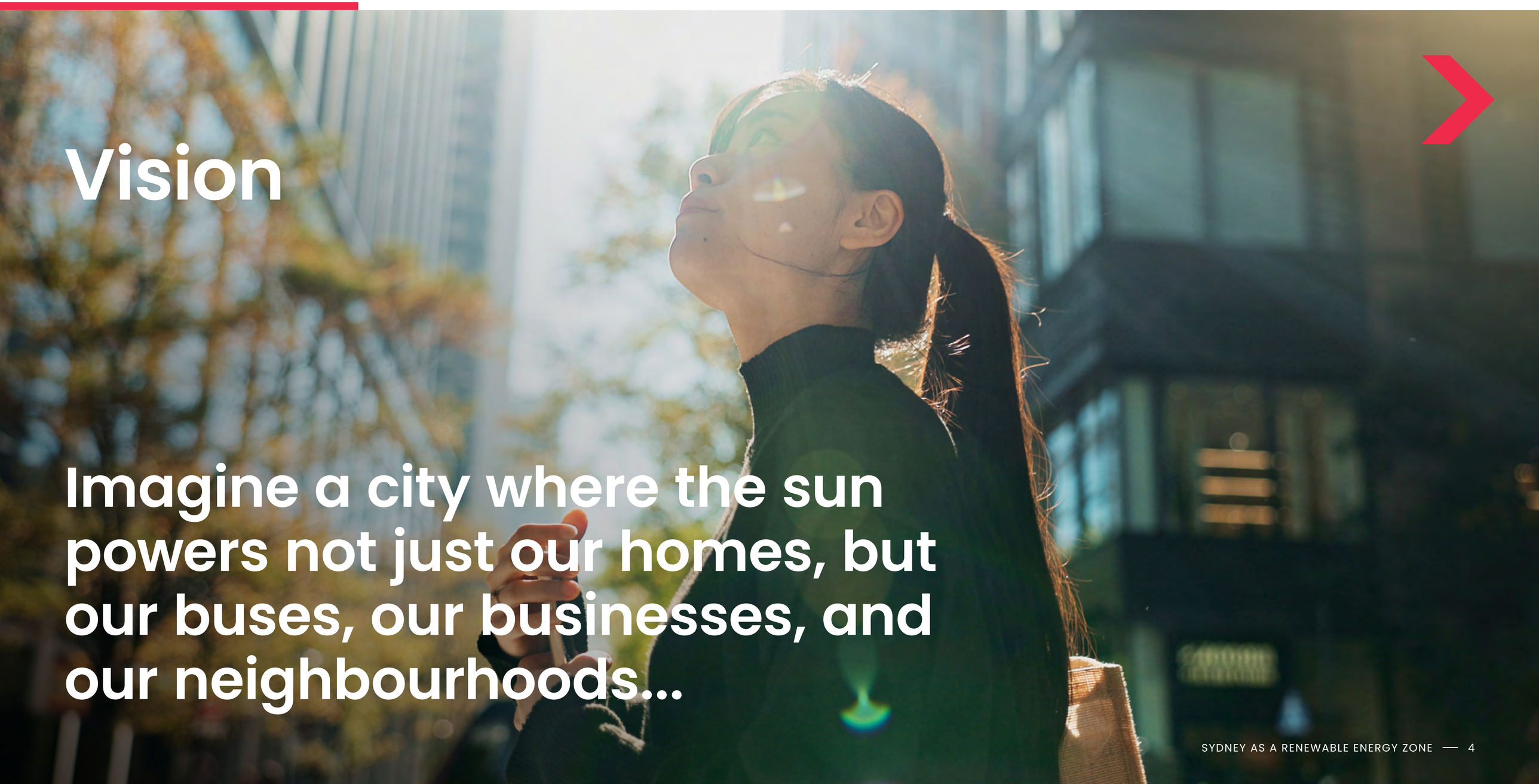
Vision



Imagine a city where the sun powers not just our homes, but our buses, our businesses, and our neighbourhoods...

Where energy flows dynamically – across rooftops, batteries, and electric vehicles – responding in real time to the needs of the grid and the rhythms of the city.

Imagine if every community could store, share, and shape its own energy future. If homes and businesses could shift their energy demand to match abundant solar supply.

This is not a distant dream. Sydney already holds the ingredients:

World-leading rooftop solar.

A growing fleet of electric vehicles (EVs).

Efficient and resilient electrical networks.

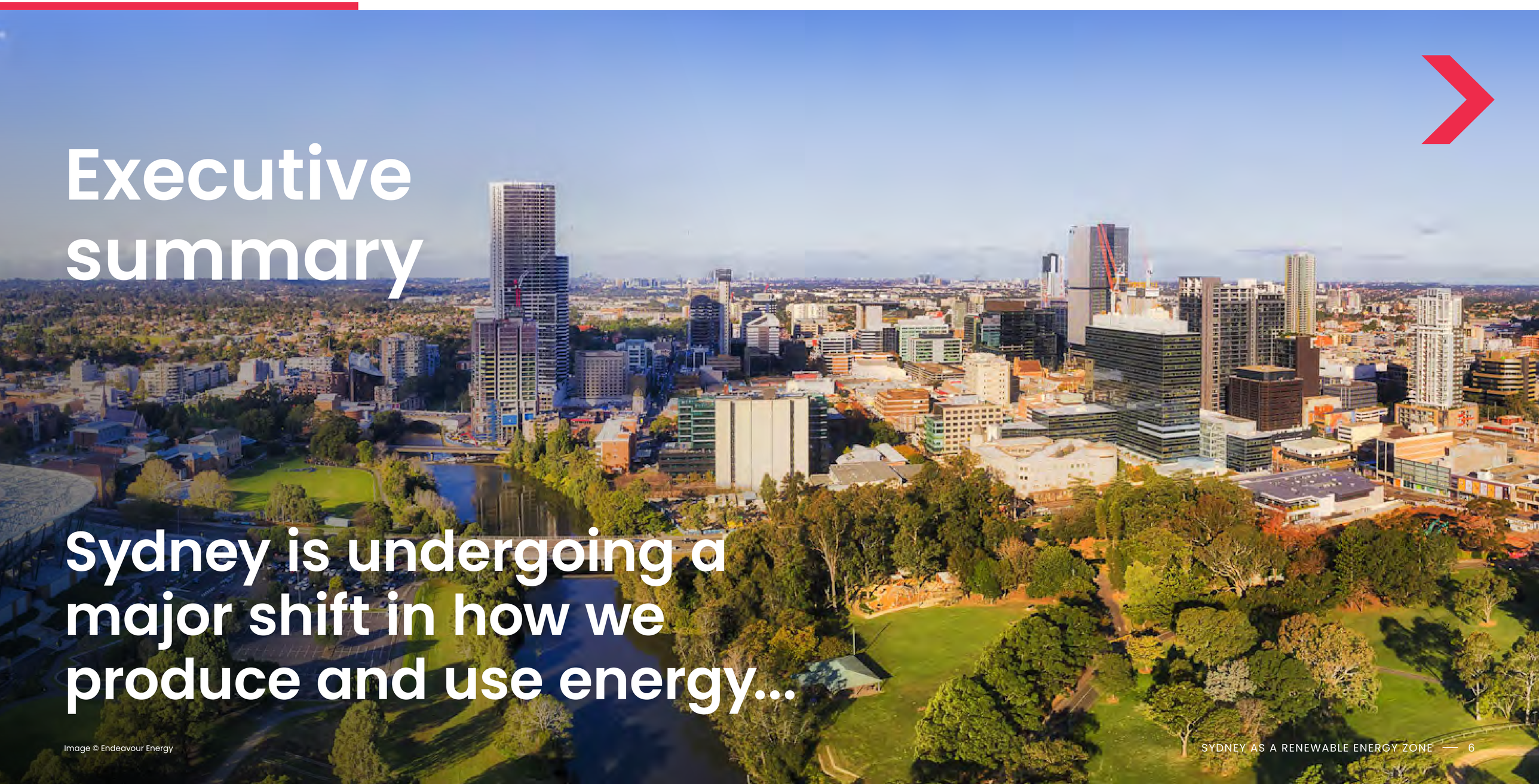
A vibrant network of innovators, councils, and communities ready to lead.

Building on the inspiration of renewable energy zones, we can create a more resilient, responsive, and inclusive energy system for Metropolitan Sydney.

This is about more than electrons. It's about economic development, energy equity, and empowering people to be part of the solution.

It's about designing a city that works with the grid - not against it - and building a future that's powered locally, governed collaboratively, and shared by all.

Executive summary



Sydney is undergoing a major shift in how we produce and use energy...

Image © Endeavour Energy

Solar panels on roofs, batteries in homes and neighbourhoods, electric cars, and smart appliances are changing the energy landscape from big power stations towards local and community-based solutions.

This transition isn't just technical - it's about rethinking our whole approach to energy to make it fairer, cheaper, and better for everyone.

This is a once-in-a-generation opportunity for Metropolitan Sydney to help keep the lights on, reach net zero, and make energy cheaper and more accessible to households and businesses to achieve energy equity. We can do this by accelerating renewable energy generation and storage at local, district and Sydney-wide scales.

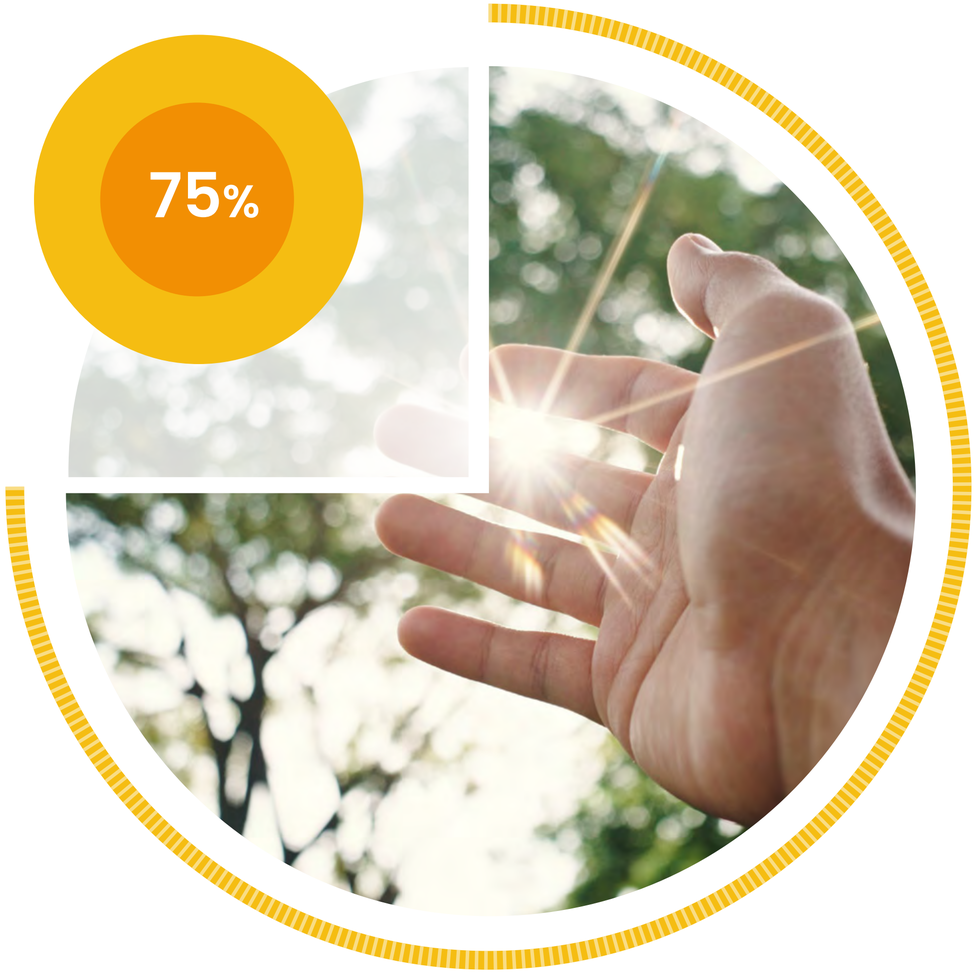
This shift presents a unique opportunity for Sydney. As coal power stations age and shut down, NSW urgently needs new, clean sources of electricity to support not only our growing population, but also increasing energy demands from homes, businesses, and transport. Rooftop solar has already helped reduce household energy costs significantly, but without enough batteries, this excess energy during the day creates challenges for the grid during peak evening hours.

Sydney could meet at least 75% of its annual energy needs through rooftop solar paired with battery storage. While central business district (CBD) buildings might cover only 5% of their energy needs through rooftop solar, industrial estates could produce between 500% to 1000% of their energy requirements, creating substantial excess power that could benefit nearby residential areas, including apartment buildings that currently lack access to solar.

The existing electricity distribution network across Sydney is already in place and underutilised, presenting an immediate opportunity to boost local energy independence and reliability.

However, the barriers to realising this opportunity are real.

Sydney could meet 75% of its own energy needs with abundant rooftop solar and batteries.



- Renewable energy in Sydney currently benefits some more than others, particularly homeowners who can afford solar panels, while renters, apartment residents, smaller businesses, and low-income households often miss out.
- Current approaches largely support individual property owners, with fewer initiatives targeting broader community or precinct-wide projects, which face challenges due to multiple stakeholders and unclear responsibilities.
- Regulatory frameworks aren't keeping pace with rapid energy innovations.
- Sydney lacks clear, city-wide leadership to prioritise renewable energy. While collaborations like Resilient Sydney coordinate local councils, stronger city-wide leadership is necessary to align stakeholders effectively and facilitate cooperation without bureaucratic delays.
- Significant financial hurdles exist, particularly around industrial rooftop solar and large-scale battery storage. It's unclear who should shoulder investment risks, especially between landlords and tenants.
- Building public trust is essential. Transparent communication about the benefits and impacts of renewable energy projects is critical for gaining community acceptance.
- Benefits such as economic competitiveness, fairness, community strength, and reliable, affordable power must be communicated clearly, not only focusing on environmental outcomes.
- Lastly, recycling and repurposing renewable energy materials, like solar panels, are crucial due to resource limitations, ensuring we can sustainably achieve Sydney's energy goals.

Renewable energy in Sydney can be implemented effectively across multiple, complementary scales. Individual buildings; residential neighbourhoods or industrial precincts; district-wide zones, and metropolitan electricity networks. Each scale offers distinct benefits and involves specific infrastructure, regulatory needs, and stakeholder groups.

Additionally, Virtual Power Plants (VPPs) provide flexible, modular energy management across these scales.

Selecting the appropriate scale depends on factors like excess rooftop solar needing community battery storage, or sufficient size and ownership complexity justifying a district-level energy zone connected to local substations. However, the most important factor in developing a plan for maximising Sydney's renewable energy potential is how we balance the outcomes we want to deliver on: equity of access, affordability, grid resilience, and meeting net zero targets each provide a slightly different way forward depending how these outcomes are prioritised.

To continue the momentum built through the convening, engagement and collaboration to deliver this report and effectively seize this opportunity, Sydney should:

1. Activate renewable energy trials at multiple scales to test solutions ensuring equitable energy access and affordability for homes, businesses, and communities.
2. Establish an urban renewable energy roundtable involving government, industry, community groups, and utilities to collaborate and define clear shared goals.
3. Develop a comprehensive spatial energy strategy to identify key locations for renewable energy investments and anticipate energy needs from housing, industry, transport, and data centres.
4. Introduce targeted policies and incentives to support residential renewable energy innovations and unlock latent renewable potential in commercial and industrial sectors.
5. Implement planning reforms that accelerate the approval processes and encourage renewable energy adoption, including reconsideration of heritage and zoning restrictions.
6. Incorporate plans for recycling solar panels and batteries into long-term energy strategies to manage environmental impacts sustainably.

Multi-layered scales approach

Summary of actions

1. **Activate, support and learn from trials at multiple scales**

   A. Activate, support and learn from trials at multiple scales to determine how best to increase equity of access to low-cost, resilient renewable energy for households, commercial and industrial businesses and other organisations with a property portfolio.

2. **Take a metropolitan approach to support NSW energy future**

   A. State Government leadership: Identify a dedicated body responsible for convening diverse stakeholders to create a shared view and pathway, and ensuring renewable energy, equity and net zero targets are set and met across the metropolitan area.

   B. Establish an urban renewable energy roundtable across government, industry, community and utilities to collaboratively define the shared equity, security, affordability and net zero outcomes for Sydney. Involving stakeholders from business and community, and local, state and Federal levels, provides is an opportunity to think beyond the hardware of the electricity network.

   C. Develop a spatial energy strategy for Metropolitan Sydney to increase visibility on the opportunities for renewable energy investment and orchestration, identify where the greatest needs for access and affordability, and respond to growing demand from housing, industry, transport and data centres.

   D. Increase metropolitan scale visibility of storage needs and opportunities. Create a transparent way of sharing place-based energy balance and opportunity, increasing awareness of solar and battery storage opportunities and that optimises placement based on local and system-wide considerations.

   E. Set renewable energy generation and storage targets for Metropolitan Sydney to track progress and support both green finance requirements and mandatory disclosure reporting.

3. **Focus policy and incentives on increasing equity of access to low-cost renewable energy for households**

   A. Solar for rentals programs: Financial incentives and rebates to encourage landlords to install solar on rental properties, with mechanisms ensuring tenants share in the benefits through reduced bills.

   B. Mandatory rental energy standards: Phased introduction of minimum renewable energy requirements for all properties, including minimum property energy performance and mandatory display of the energy rating and annual energy cost equivalence to prospective tenants.

   C. Community batteries with equitable access models: Ensure community-scale storage is accessible to apartments, renters, and others with limited access, including those in strata-titled properties.

   D. Community share or strata-owned batteries as a community ownership model to facilitate community acceptance and community revenue benefits.

   E. Virtual power plants with inclusive participation: VPP models that allow participation from households without their own generation or storage assets.

4. **Unlock renewable energy potential with commercial and industrial businesses**

   A. Sydney-wide industrial renewable mapping: Create a comprehensive mapping of all industrial and commercial roof space, energy demand, and network capacity to identify highest-value opportunities across the metropolitan area.

   B.Business park energy concierge: Create a 'concierge' type service that supports C&I owners to oversize their rooftop solar, connect to battery storage, and link to Government incentives and commercial models that can overcome barriers.

   C. Explore incentive mechanisms like the SRES and/or Capacity Investment Scheme to underwrite larger scale industrial rooftops solar, and/or more attractive value share or tariff model to encourage rapid deployment and oversizing of solar systems by commercial customers.

   D. Explore creating a local market for surplus battery storage underwritten by local storage. Batteries would buy all energy from Industrial assets and sell when market prices are high offering a revenue stream and facilitate a community acceptance.

   E. Timing demand to absorb growing solar: to reduce the impact of increased solar generation during the day by matching EV charging, energy use of commercial and industrial users (load) with times of renewable energy generation (buildings as batteries).

5. **Implement mandates, approval pathways and regulatory flexibility to accelerate deployment**

   A. Review heritage conservation zone constraints: The City of Sydney has recently updated planning controls in local heritage conservation areas to enable solar panels. There is opportunity to broaden this approach across metropolitan Sydney to expand opportunity for rooftop solar where appropriate.

   B. Implement mandates for rooftop solar on new residential or industrial buildings, and fast track approval pathways for battery energy storage systems (BESS).

   C. Ensure the renewable energy generation and storage potential of **new large scale urban renewal/ build projects** (Bays West, Western Sydney Airport, TOD precincts), and existing large demand centres (desalination plant, ports, manufacturing hubs).

   D. Seek regulatory flexibility for urban renewable energy innovation: Create safe regulatory environments to test options for local energy sharing to inform business cases that articulate the benefits to consumers and the network. This could also allow innovators and new market entrants to test different business and ownership models (such as local energy hubs) peer to peer trading.

6. **Integrate solar panel and battery recycling into energy planning**

   A. Product stewardship schemes or regulation for solar panels and batteries. There have been several efforts to establish solar panel product stewardship programs across Australia to enable the regulation of PF recycling and materials recovery. The Australian Government should finalise these plans as a matter of urgency.

   B.Facilitate formal partnerships between universities and recycling businesses as pathways to graduate programs for engineers. It is essential that photovoltaic, chemical and other engineers and manufacturers associated with solar and battery systems are educated in the materials recovery and resource stewardship of the products they design to ensure that they are manufacturing with end-of-life materials recovery in mind.

There is urgent need for Sydney to step up

Why now?

Australia's energy system is undergoing one of the most significant transitions in its history. Across the country, and especially in NSW, this shift is being driven by the dual imperatives of securing affordable, reliable, energy while rapidly reducing emissions.

Ageing coal-fired power stations are retiring, while rooftop solar, home batteries and electric vehicles (EVs) are transforming consumers into active participants in the grid.

Sydney already holds the ingredients it needs to lead this next chapter: world-leading uptake of rooftop solar, a fast-growing fleet of EVs, and a vibrant ecosystem of innovators, councils and communities ready to drive change.

This transition is about more than technology, it's about redesigning the system itself to create a cleaner, fairer and more resilient energy future that delivers economic development, energy equity and community empowerment.

Inspired by the establishment of **Renewable Energy Zones (REZs)** in regional NSW, as part of the NSW Government's Electricity Infrastructure Roadmap, and the proposed urban renewable energy zone in the Illawarra, this report explores whether a similar model could unlock Sydney's potential as a metropolitan renewable energy zone – one that is powered locally, governed collaboratively and shared by all.

Objective

The objective of this report is to investigate how Metropolitan Sydney maximises its energy generation potential, balancing energy security, affordability, and sustainability, while ensuring benefits are shared by all.

It explores whether the regional renewable energy zone approach offers a blueprint for metropolitan adaptation, leading Sydney to realise its renewable energy potential.

Approach

This report builds on the Committee for Sydney's 2022 report **'Decarbonising Sydney,'** which set a clear path for Metropolitan Sydney to deliver its fair share of NSW's 2030 and 2035 net zero targets. Decarbonising Sydney identified the key enablers and barriers to deeper renewable energy integration across transport, buildings and grid.

This report has been developed through collaborative research, workshops and interviews with over 25 organisations. We explored future models for collaboration and engaging communities in storing, sharing, and shaping their own energy future. By addressing both short and long-term energy security challenges, our approach supports equitable access to affordable power and advances ambitious climate targets.

Read the report

We are in a race to replace ageing coal fired power stations

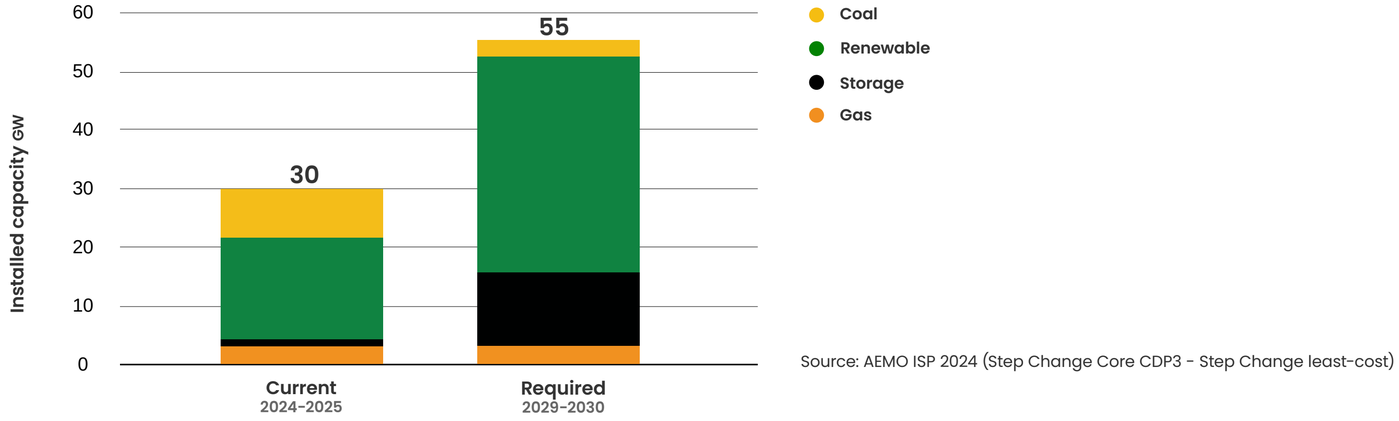
Transitioning away from ageing coal-fired power stations is not just a net zero requirement, but also a strategic imperative for energy security. The Australian Energy Market Operator's (AEMO) draft 2024 Integrated System Plan (ISP), the latest version of its 30-year planning blueprint for National Electricity Market (NEM), forecasts that coal fired generation will be fully retired from Queensland and Victoria by 2033-34 – and that the last coal unit will close in NSW by 2038 under its most likely planning scenario.[1]

As coal exits the system, the 2024 ISP confirms that renewable energy, connected by transmission and distribution, firmed with storage, and backed up by gas-powered generation, is the lowest-cost pathway to supply electricity to homes and businesses as Australia transitions to a net zero economy.

This transition demands substantial infrastructure investment. According to the NSW Government's Electricity Infrastructure Roadmap, over $32 billion in private sector investment is expected by 2030 to support new generation, storage, and transmission infrastructure, aligning with the state's energy transition goals.

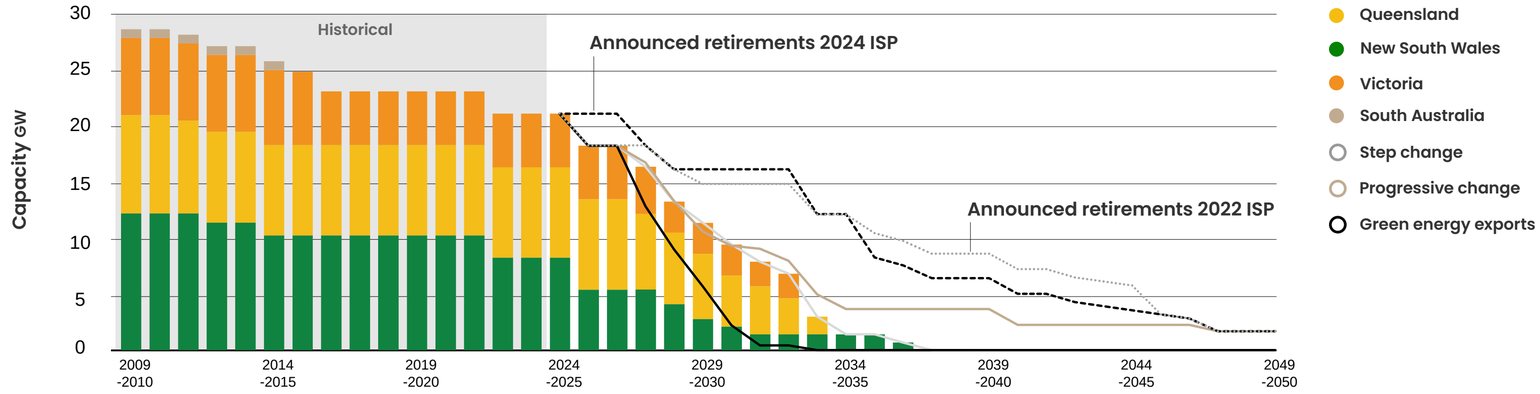
A significant portion of this renewable energy generation and storage, estimated at over $10 billion by 2030, must be fast-tracked to ensure reliability as coal exits the system, and align with the 'Step Change' scenario. This 'step change' scenario is considered the most likely future for Australia's National Electricity Market (NEM), as it reflects the rapid transformation already occurring in the energy sector and fulfils Australia's emission reduction commitments in a growing economy.[2]

The gap between actual and required installed capacity is widening



Source: AEMO ISP 2024 (Step Change Core CDP3 - Step Change least-cost)

Coal capacity, NEM (GW, 2009-10 to 2049-50)



Source: https://aemo.com.au/-/media/files/major-publications/isp/2024/2024-integrated-system-plan-isp.pdf?la=en

Regional Renewable Energy Zones are doing the heavy lifting

According to the Electricity Infrastructure Investment Act 2020, a renewable energy zone declaration comprises: (a) a specified geographical area of the State, and (b) specified generation, storage or network infrastructure, including planned or existing infrastructure.

Led by The Energy Corporation of NSW (EnergyCo), the renewable energy zone model offers a coordinated approach to bringing large-scale renewable energy generation, storage and transmission online. Community engagement is also integrated and elevated, including identifying economic and local development opportunities.

Private sector investment in renewable energy generation and dispatchable battery storage in renewable energy zones is supported by a long-term revenue safety net called the Capacity Investment Scheme (CIS). This Australian Government mechanism decreases financial risk for investors on projects more than 30 megawatts or 2 hours of storage. Tender rounds are held every 6 months, with project awards based on 4 criteria: Reliability; Emissions reduction; Lower electricity prices; and Community benefits (including First Nations engagement and local economic impact).

While regional Renewable Energy Zones bring opportunity - including substantial jobs and economic development opportunities - regional communities are managing significant infrastructure impacts. The scale of new infrastructure need is a major undertaking, from new transmission lines to reinforced roads, and temporary housing for thousands of temporary construction jobs.

For some, there are concerns about the city benefiting at the expense of the regions, the risk of poor network capacity, and the potential of negative impacts on agricultural and recreational land.

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Map of planned NSW Renewable Energy Zones

Source: www.energyco.nsw.gov.au/renewable-energy-zones/renewable-energy-zone-locations

Sydney's energy demand is almost half of NSW's total demand

Cities are energy hungry. Population density, a concentration of activity and industry and, increasingly, climate impacts like the urban heat island effect spurring increased air-conditioning all contribute. Energy consumption in Metropolitan Sydney is also rising with mass electrification of transport and buildings, surging data centre development, and continued housing and business growth. Metropolitan Sydney's demand is 40-45% of NSW's total grid electricity demand.

Over the next decade, Sydney's population is expected to grow from 5.3 million people to about 6.1 million people, adding over 300,000 homes to the than 2 million+ existing dwellings. As new and more dense urban forms emerge, reducing the cost of home energy bills is driving electrification of heating, water and cooking in the residential sector, with the NSW Government also exploring a home energy rating disclosure system.

For commercial and industrial buildings, the cost of operation is joined by the 2025 introduction of mandatory climate disclosures for large businesses, who must now measure and report on greenhouse gas emissions across their portfolio. The demand from some investment funds for only electrified and renewable energy powered assets is also driving leading edge business.

By 2030, EVs are expected to represent more than 50% of new car sales and the vast majority of new car sales by 2035.[3] All of Metropolitan Sydney's bus fleet will also be electrified by 2035 creating new demand for electricity that will need to be managed.

Data centres are major new 'hyper-scale' sources of demand, often located in cities to reduce latency or performance lag. While still a relatively small proportion of overall demand, the rapidly increasing size and energy intensity of data centres has implications for parts of Sydney (like Macquarie Park), that may need new electricity infrastructure to cope with deployment of this growing new asset class. Data centre energy demand is predicted to grow to 3,100MW by 2030 due to AI advancement and the doubling of household devices. Sydney will likely host up to 92% of NSW's data centres having significant impact on electricity consumption and demand issues.[4]

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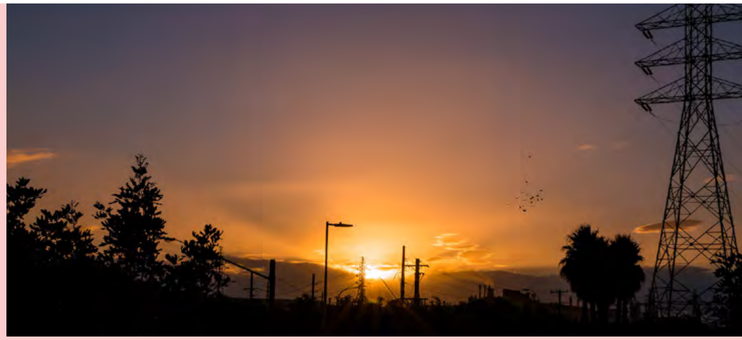

Images © Endeavour Energy

Weather extremes are increasing attention to energy resilience

Australians are grappling with escalating natural disaster-related impacts. 80% of Australians have reported experiencing an extreme weather event at least once since 2019.[5] Since 2020, 12 'significant' events, including bushfires, storms and floods, have been declared in Metropolitan Sydney alone.

Globally, research indicates that power failure consistently appears as the most significant driver of cascading cross infrastructure disruption.[6] The Black Summer bushfires in 2019, as well as the more recent flooding, have highlighted the extent to which some communities are at risk of power failure, and the impact of loss of power on households, businesses and local service providers.

The community is concerned. In 2024, the community ranked power failure overall as the top shock in Northern Sydney, and in the top 3 in Northwestern and Eastern Sydney.[7] Infrastructure failure was the top concern.

Over the next decade, Sydney's climate is projected to warm by an average of 0.7°C, increasing the frequency and severity of extreme rainfall, flooding and other extreme events. We are now faced with the challenge of determining how we will accommodate this growth, while building economic and social resilience to growing natural hazard risk.

In the wake of Cyclone Alfred, Queensland households and businesses with home batteries and connected electric vehicles (vehicle to load) used these assets to power their lights, fridges and other essential services during a multiple day power disruptions.[8] In the Australian Capital Territory,[9] a vehicle to grid (V2G) trial has shown initial resilience benefits. When major storms caused a blackout, a fleet of government owned electric vehicles trial plugged into the grid to help manage the power outages by adding capacity back into the grid.

Distributed network operators across Australia have also been developing 'islandable' micro-grids for the most vulnerable parts of their networks to increase energy resilience. This approach connects rooftop solar with home and neighbourhood scale batteries to keep the lights on during outages and demonstrates how orchestration of local distributed energy resources (DER) can improve reliability at the grid edge.

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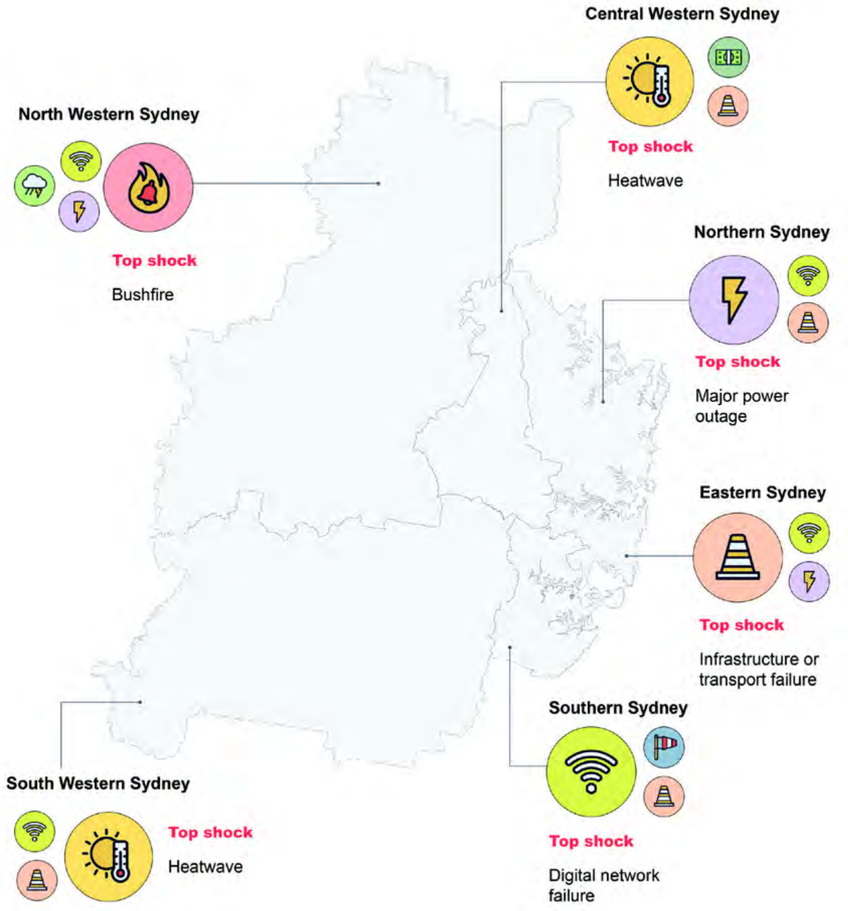
Communities across Sydney are worried about the impacts of extreme weather



Source: Cred Consulting in Resilient Sydney (2025) Resilient Sydney Strategy 2025-2030

NSW is not on track to meet its 2030 net zero target

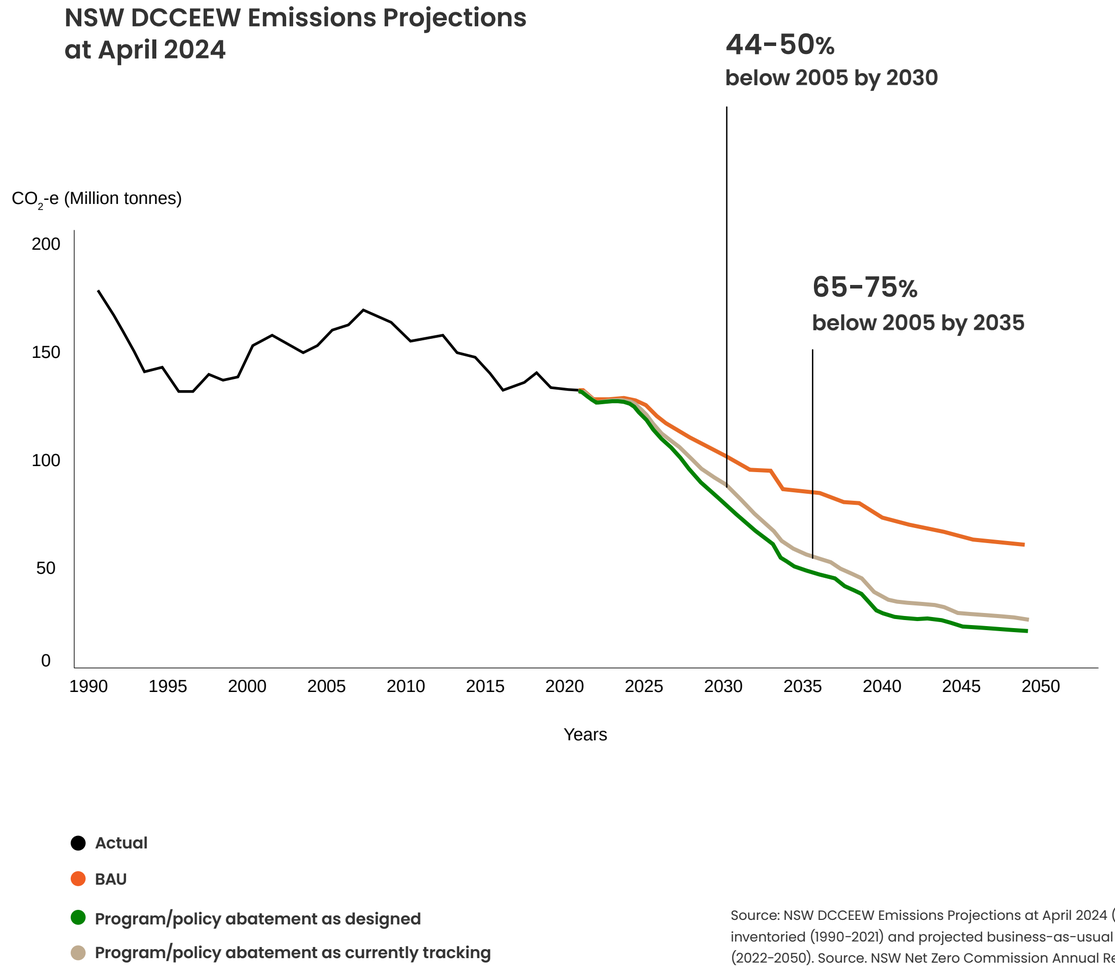
2024 was the hottest year on record globally, with average temperatures in NSW the fourth highest in over a century (all 5 of the warmest years have occurred in the past decade). The science is clear that carbon in the atmosphere is linked to rising average temperatures, which is causing increased variability in weather conditions and extreme weather events (Net Zero Commission Annual Report 2023-24).

The NSW Government has committed to a 50% carbon emission reduction by 2030, and a 70% reduction by 2035 as key steps in the pathway to net zero emissions by 2050. Reaching these goals will require an economy wide transition, both to take advantage of more cost-effective sources of energy, and to prepare our economy for changing global market low carbon expectations.

Electricity produces 40% of NSW's carbon emissions, the most of any sector, creating the impetus to replace ageing carbon intensive energy generation (coal) with renewable energy. Guided by the NSW Electricity Strategy and Electricity Infrastructure Roadmap, the state has a target of generating 12 GW in renewable energy within the next 20 years to meet these commitments, supported by 2 GW of long-duration storage.

Sydney also needs to do its fair share when it comes meeting net zero targets. Metropolitan Sydney is responsible for 38% of NSW's greenhouse gas emissions and transport (36%) and buildings (31%) are the largest emitting end-use categories in Sydney today.

In addition to accelerating the amount of renewable energy generation in the grid, this report also recommended the need for rapid electrification of buildings and transport, and the increased uptake of distributed energy resources, including rooftop solar, batteries and smart meters.



Source: NSW DCCEEW Emissions Projections at April 2024 (NSW greenhouse emissions as inventoried (1990-2021) and projected business-as-usual and current policy scenarios (2022-2050). Source. NSW Net Zero Commission Annual Report 2023-24

The success of rooftop solar has created challenges for our grid

The introduction of the Small Scale Renewable Energy Scheme (SRES) in 2001 was a turning point in Australia's energy landscape. Australia wide, rooftop solar is now our second largest source of renewable energy generation.

In 2024, the energy transition broke new ground with rooftop solar providing for more than 50% of energy demand for the first time.[10] Continuing growth means that by the end of 2024 there will more rooftop solar installed capacity (25GW) than black and brown coal combined (21.3GW).[11]

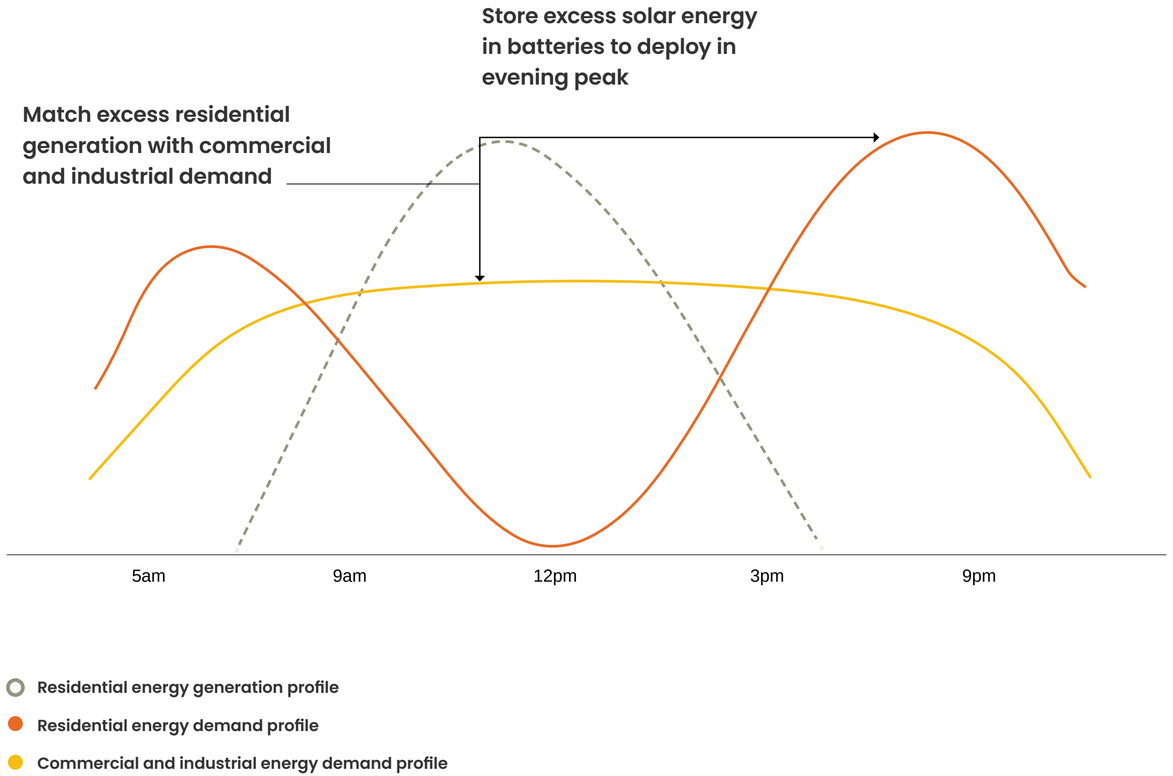
However, growing rooftop solar is bringing its own challenges. As rooftop solar provides more and more electricity during the middle of the day, the demand for energy from the grid at that time is falling. This falling daytime minimum demand creates challenges for the stability of a grid that was originally designed to distribute energy from centralised power plants. Networks designed for one-way flows of energy now need to manage complex two-way flows as rooftop solar flows back into the grid.

Equally, prices are low or even negative during the middle of the day when cheap solar energy supply exceeds demand. But as the sun sets and solar generation drops, rising household demand leads to more expensive gas and coal setting the electricity price.

The more rooftop solar we have, the more batteries and storage technologies are required to help meet evening demand when the distribution network is close to its peak and wholesale electricity costs are higher.[12]

'Buildings as batteries' can help better match daytime demand with solar. Commercial and industrial buildings (and potentially data centres) have an almost inverse energy profile to household with the majority of energy demand during the day.[13] Matching excess solar with daytime demand from businesses presents a significant opportunity.

Residential and commercial buildings have complementary energy profiles



Energy equity is non-negotiable as rising cost of living hits

The cost of living is biting nationwide and rising electricity and natural gas prices have placed immense financial pressure on households and businesses. Planning for the state's energy future must prioritise affordable and equitable access to abundant, clean energy.

While the transition to renewable energy will lower costs over time, many people are unable to access these benefits now due to high upfront costs or structural barriers. This includes renters, low-income households, apartment residents and small businesses.

Rooftop solar is already saving money for some. Almost 30% of residential Sydneysiders benefit from the cost savings of rooftop solar. This still leaves more than 70% of households who don't yet see the affordability dividend in their monthly bills. For those who rent, live in strata apartments and/or lack rooftop access, the financial benefits of solar can be out of reach.

Given over a third of Sydneysiders rent, it's important to highlight some of the specific and ongoing barriers renters face to participating in the energy transition:

- They cannot install solar on properties they do not own easily and without permission.
- Landlords often lack incentives to invest in renewable upgrades.
- Renters are more likely to have lower incomes and limited access to finance.
- Frequent moves make long-term investments impractical.

Our business communities face similar challenges, with small businesses often feeling the cost-of-energy pressures most acutely and large businesses lacking the right incentives to switch or invest in renewable energy.

The energy transition needs to provide a a fair go for all. To deliver a fair transition, there is a need to:

- Ensure all households and business types can benefit from renewable energy.
- Address structural and market barriers for renters and low-income groups.
- Expand access to scalable, locally connected renewable systems.
- Strengthen coordination across government, energy providers, and industry.

NSW has the opportunity to lead nationally by embedding equity in every stage of its energy transition strategy.

Image © Endeavour Energy

Sydney has untapped renewable energy potential

Metropolitan Sydney could meet up to 75% of its own energy needs

Today, metropolitan Sydney generates over 3 GW from rooftop solar - meeting 10 to 12% of its total electricity demand - with 76% flowing from residential rooftops and another 20% from industrial installations across the city.

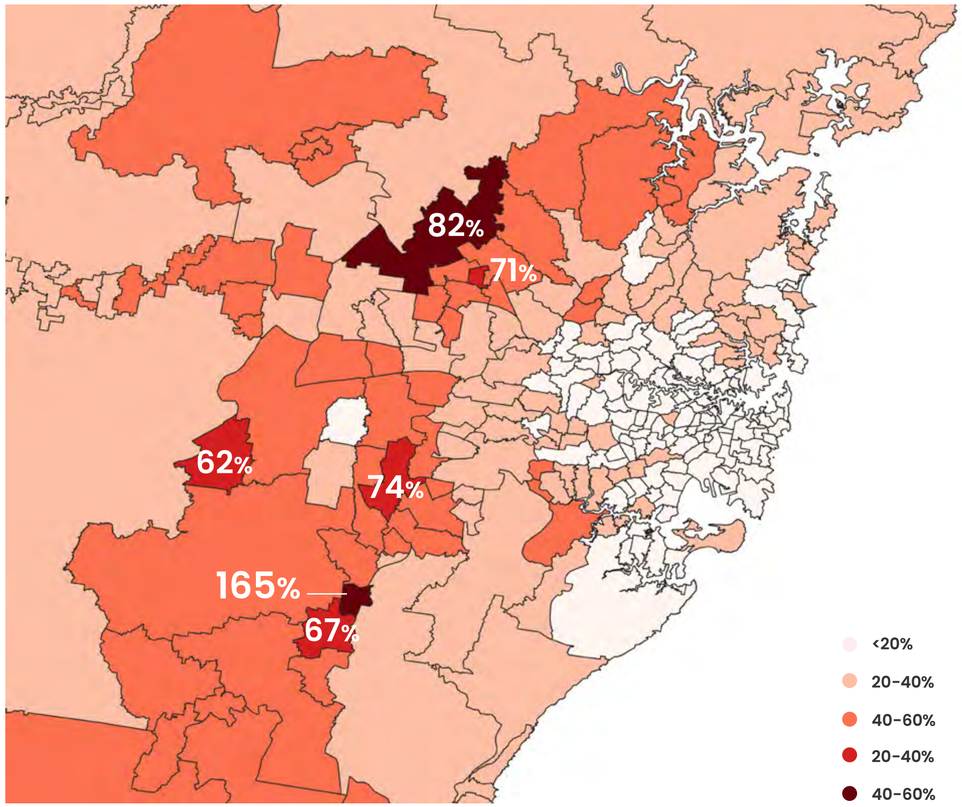
Many parts of Sydney already generate enough electricity to meet a third of neighbourhood demand, with suburbs like Riverstone, Marsden Park, Oakville and Box Hill generating over 100MW of small-scale generation, while Hornsby and the Northern Beaches have the highest share of generation against consumption.[14]

We could do much more. If every rooftop in metropolitan Sydney - residential, commercial and industrial – had solar we could generate up to 21 GW of renewable energy and 75% of our annual energy needs[15] While we may never reach this potential, due to shading, structural or other reasons, the potential opportunity is significant.[16]

In Sydney today there are a growing number of suburbs with more than 80% coverage (Menagle Park, Riverstone, Marsden Park, Oakville and Box Hill), and several more above 70% (Leppington, Austral and the Ponds).[17] Other suburbs with some of the highest electricity generation from rooftop solar include Appin, Camden, Campbelltown, Oran Park, Rouse Hill and Liverpool.

The Australian Energy Market Operator (AEMO) projects that in 20 years, nearly 90% of residential electricity consumption but only 13% of commercial and industrialel ectricity consumption will be met by rooftop solar PV.

Metropolitan Sydney's installed and potential rooftop solar capacity by LGA



Suburbs with highest implied uptake include

Menangle Park
165%*

Riverstone, Marsden Park, Oakville and Box Hills
82%

Leppington and Austral
74%

The Ponds
71%

* >100% due potentially to multiple installations per dwelling over time or installations on small industrial and commerical buildings

Source: Scyne (2025) State of the City Report

Homes and warehouses can generate more energy than they use

Renewable energy generation can occur right across Sydney. Any rooftop can potentially turn a building into a mini power station or battery.

The question is where is the scale of opportunity the greatest.

A commercial tower in a CBD can meet upwards of 5% of its energy demand from rooftop solar. This is due to a combination of available roofspace (where solar PV competes for space with other plant and equipment such as cooling tanks), the relationship between roof area and total floorspace (the building's 'floorspace ratio') and the energy demands created by an office tower.

Urban manufacturing facilities and lower rise commercial or residential buildings, with a smaller floorspace ratio can meet between 15% and 20% of total energy demand. Astra Zeneca's manufacturing plant at Macquarie Park can meet 16% of its own demand with solar on its roof and multi-storey carpark.

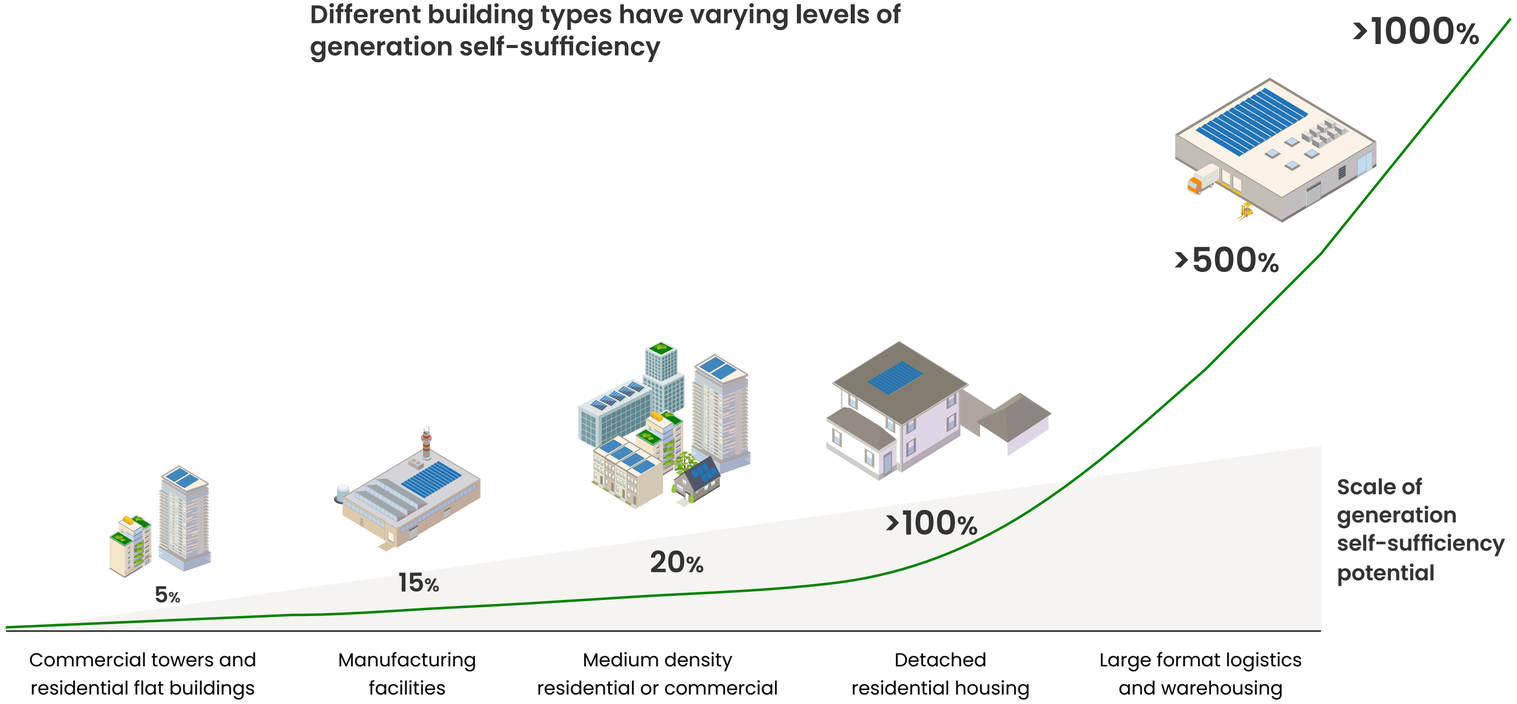
Where the scale of opportunity becomes greatest, however, is at a residential house and industrial building level.

Houses can meet up to 100% of their daytime energy needs with rooftop solar and greater than 100% of their total demand when paired with a household battery.

Industrial warehouses, with their large roof space and relatively low energy demands, can create in excess of 500% of their energy needs. Currently, however, asset owners aim to size rooftop solar only to meet the needs of the user under that roof. This means that often only 10-20% of the roof space needed to meet that demand, leaving significant generation capacity unrealised.

It is these two asset types – large scale industrial and residential – where the scale of opportunity is greatest, particularly when they are aggregated.

Different building types have varying levels of generation self-sufficiency



Battery storage is beginning to shift energy to where and when its required

Sydney is experiencing a boom in battery storage investment across scales.

While only 1 in 40 households with solar have batteries today, this is changing rapidly. Some 45,000 households have installed a home battery in less than a year with the support of the NSW Government 2024 home battery rebate. The Federal Government's $2bn Cheaper Home Batteries Program will cut battery costs up to 50kwh by 30% for homes, community groups and businesses.

Digital virtual power plants (VPP) are also becoming more common. A VPP is a collection of home solar batteries that can help stabilise the grid, prevent blackouts, lower electricity costs, and create financial incentives for participants.

Almost 100 neighbourhood batteries have been delivered by Ausgrid and Endeavour Energy in partnership with the Australian Renewable Energy Authority (ARENA). Councils like Campbelltown are investigating the role of community batteries in community energy sharing, while residents of Wolli Creek are exploring how a battery could support strata apartments.

Grid scale Battery Energy Storage Systems (BESS) are being planned across Sydney to support the increasing integration of renewable energy into the electricity network, including Penrith, Guildford West, Baulkham Hills, Homebush, Cranebrook, Emu Plains, Seven Hills, Maldon, Cawdor, North Leppington, Colo Heights and South Marsden Park.

Battery electric vehicles (BEV's) are creating further battery storage capacity. Car batteries are on average 5 times larger than home batteries. As the technology for vehicle to grid (V2G) becomes more common, there is potential for cars and buses to also play a key role in Sydney's renewable energy future.

Battery scales being deployed across Sydney

Households	Community/neighbourhood	Medium megawatt BESS	High megawatt BESS
~5-15kw	~400kw	~5mw	~>100mw

Behind the meter

In front of the meter

Rooftop solar and batteries can deliver more affordable electricity

Rooftop solar is currently the cheapest domestic energy source in Australia, delivering electricity at up to 20% of the cost of electricity from the grid.

Households with solar and a battery can enjoy an average energy bill reduction in the range of $1000 each year based on a typical household with a battery.[18] However, it is more challenging for those that do not have access to their own roof, particularly renters, people living in apartments and those under a strata scheme.

One option for those without solar, or even without solar and a battery, is to join a community battery program. Under one program in Sydney,[19] users can save between $100-$400 per year, which is far less than the savings for those with access to household batteries. However, beyond direct savings, the batteries will improve power quality, improve solar energy and storage access, and put downward pressure on costs for all customers.

Commercial and industrial tenants are beginning to see significant savings from adding battery storage to rooftop solar. A change in the National Building Code in 2022 means that all new industrial buildings are being built with the structural integrity to host solar across their rooftops.

According to Dexus, installing a 200-kilowatt-hour (kWh) battery in the base build of a new 20,000 sqm warehouse with solar will cut energy costs by $92,000 a year. Tenants relocating from an older warehouse into a battery-enabled one could see reductions in their energy bill of between 50 and 80%.[20]

Image © Endeavour Energy

The distribution network has headroom

Historically, the distribution network has expanded poles and wires to ensure that the supply of electricity can meet Sydney's growing demand.

In the future, the more of Sydney's electricity demand that can be met by decentralised energy resources – through the accelerated rollout of rooftop solar and battery storage, continued energy efficiency and managed demand strategies – the less additional electricity needs to be brought in from large scale energy generators.[21]

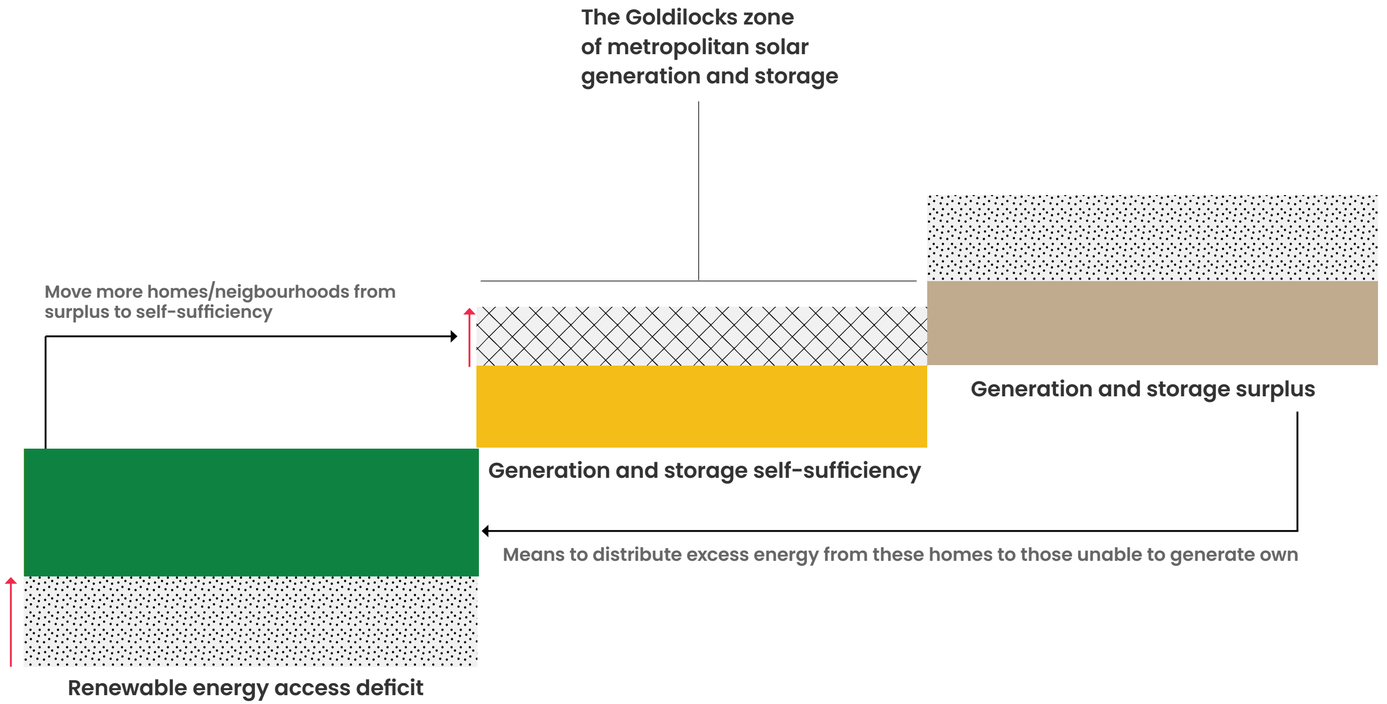
More generation in Sydney also helps to address the challenges with adding new transmission line capacity into Sydney.[22]

The distribution network – the poles and wires that moves electricity from the transmission lines to homes and business across Sydney – has been built to meet peak demand to ensure the lights stay on when the most power is needed. At other times it has head room to do more.[23]

Focusing on new energy generation in Metropolitan Sydney can take advantage of this latent capacity. According to Ausgrid's modelling, 23 of 32 local government areas (LGAs) in their service area could potentially meet their current 24-hour electricity demand through rooftop solar and battery storage and with limited network investment.

If this ability to achieve energy self-sufficiency at an LGA level is the 'Goldilocks' zone (not too little, not too much), there does remain 28% of LGA's (and perhaps more in Western Sydney) that will need different strategies to overcome significant surplus and/or deficit in generation and storage to enable all of Sydney to access equitable access to the benefits of renewable energy outcomes for Sydney.

An equitable approach to balancing sharing excess energy is possible across Sydney



Urban Renewable Energy Zones are emerging

In response to both the rapid uptake in rooftop solar deployment across urban areas and the recognition of the financial benefits of maximising existing distribution network infrastructure, the concept of Urban Renewable Energy Zones (also referred to as Distribution Renewable Energy Zones) has emerged as an alternate approach.

An Urban Renewable Energy Zone is a power sharing model that leans heavily on the integration of consumer energy resources, such as rooftop solar systems and home batteries, as well as community-scale batteries and utilisation of spare government land (where possible) and commercial roof space.

In Sydney, Ausgrid proposes to test a community power network concept with a mixed set of buildings including commercial, industrial, and apartments in Mascot and Botany. An area selected due to its high proportion of renters.

South of Sydney, plans for NSW's first urban renewable energy zone are underway in the Illawarra, with Endeavour Energy and EnergyCo signing an MOU to jointly develop innovative network and battery solutions within the REZ.

Queensland is also piloting a Local Renewable Energy Zones (LREZ) concept to tap the potential of community rooftops supported by efficient network-connected battery use and existing poles and wires. The LREZ model aims to keep upfront distribution infrastructure investment down, 'smooth' Queensland's solar energy profile and prepare the grid for EV growth by collocating EV charging, solar and storage.

Illawarra could be NSW's first Urban Renewable Energy Zone

Image © Endeavour Energy

Sydney is the missing piece in NSW's energy transition

There is a significant level of policy, regulatory and planning action occurring across Australia to drive renewable energy generation and storage investment. Much of this is focused at a national (or National Energy Market) level.

In NSW, leadership on energy transition, renewable energy investment and net zero have been established at the state level. The Renewable Energy Zone approach introduces a sub-state, or regional scale.

What is missing, however, is a focus on urban centres, and particularly Australia's largest city and a significant consumer of energy – Metropolitan Sydney.

Attention needs to turn to Sydney, its 33 local government areas and two distribution networks, to understand how to maximise our potential as a renewable energy zone and realising the equity, affordability, net zero and energy security benefits that this would bring.

Policy snapshot

Federal

- AER Consumer Energy Resources Strategy
- National Consumer Energy Resources Roadmap
- National Electricity Market (NEM) Review
- AEMO Integrated System Plan
- Capacity Investment Scheme
- Federal BESS incentives
- National Construction Code updates
- First Nations Clean Energy Strategy
- Commercial Building Disclosure (CBD)
- NABERS Renewable Energy Indicator
- Household Energy Upgrades Fund
- Home Energy Ratings Disclosure Framework
- Renewable Energy Target (SRES)

State

- Electricity Infrastructure Investment Act 2020
- NSW Net Zero Plan Stage 1: 2020-2030
- NSW Consumer Energy Strategy
- NSW Net Zero Commission Annual Report 2024
- NSW BESS incentives
- NSW Gas Decarbonisation Roadmap
- NSW Community Solar Bank

Metropolitan

- Resilient Sydney Strategy 2025-2030
- Decarbonising Sydney 2022

Delivering on Sydney's potential is challenging

10 key barriers to realising Sydney's renewable energy potential

Through interviews, workshops, and consultation with government, industry and utilities a number of barriers have emerged that could limit Sydney's ability to realise its renewable energy potential.

1. **Equity and access challenges.** While the benefits of realising Sydney's renewable energy potential are clear, they are currently not evenly distributed. Owner-occupiers with resources benefit first, potentially reinforcing inequality. Solutions need targeted approaches for renters and tenants, apartment dwellers, low-income households and smaller businesses.

2. **Risk of imbalanced benefits.** Solutions need to address equity, security, sustainability and affordability simultaneously. Prioritising one at the expense of others risks NSW falling behind when it comes to building the foundations needed for flourishing industry, thriving communities and a healthier planet.

3. **Precinct or place-based approaches are missing.** Incentives have mobilised increased generation and storage for individual consumption. District-scale initiatives are harder to justify, particularly where multiple stakeholders co-exists. Precinct-level governance, planning and financial pathways need to be aligned, defined and streamlined.

4. **Limited regulatory innovation.** The will to shift our energy systems is ahead of the legislative and regulative frameworks we have to do. Sandbox approaches and regulatory flexibility are essential to test new models before scaling and wider implementation.

5. **A need for metropolitan scale leadership.** The lack of metropolitan scale leadership means that Sydney's renewable energy opportunity is not a priority. Initiatives like Resilient Sydney - a collaboration of 33 Sydney local councils - have creates coordination challenges. We need innovative governance models that can operate without traditional hierarchies, broker relationships between different actors, and set direction.

6. **Economic and financial barriers.** Issues raised included the cost of large-scale battery storage, how to maximise their value and uncertainty of who holds the financial risk. Battery storage is key to any incentive to size rooftop solar systems for export, and overcoming split incentives between landlords and tenants in industrial contexts.

7. **The right digital infrastructure.** The transition requires both physical and digital assets working in tandem. This includes smart meters, virtual power plants, and coordination platforms. Solutions must account for rapidly evolving technologies and avoid locking into systems that may soon be obsolete.

8. **We're not there yet on social trust.** The energy transition cannot happen without social license to operate. A shared licence is needed about the potential benefits and impacts of energy infrastructure effecting peoples lives. Honest, clear communication is key to community and business acceptance.

9. **Communicating the benefits.** The benefits and opportunities of renewable energy at a household, district and metropolitan scale need to be better communicated and understood, including competitiveness and productivity, equity and resilience - in addition to climate, reliability and affordability.

10. **Resource recovery will be key.** With most solar panels having a useful lifespan of only 20 years, there is an urgent need to plan now for the end-of-life phase of these panels. Without clear reuse or recycling pathways, valuable materials risk ending up in landfill or causing fires due to improper disposal.

These challenges present in different ways at different scales. The following pages explore in more detail how these barriers look across different approaches to renewable energy generation, storage and distribution.

- Homes and apartments.
- Commercial and industrial buildings.
- Place-based sharing networks (precincts and districts).
- Metropolitan-scale networks.

Deep dive:
Houses and apartments

Political

- Fragmented responsibility for residential energy policy across different levels of government.
- Limited political focus on energy equity across different housing types.
- Competing housing affordability priorities potentially sidelining energy investments.
- No clear authority responsible for coordinating residential energy zones.

Economic

- Difficulties in equitably sharing costs and benefits across diverse household types.
- Split incentives between landlords and tenants regarding renewable investments.
- Financial barriers preventing low-income households from participating.
- Limited funding models for community-scale energy projects.

Social

- Varying capacity for engagement across different socio-economic groups and information barriers and energy literacy challenges.
- Challenges in coordinating collective action across individualistic housing contexts.
- Housing insecurity limiting long-term energy planning for many households.

Technical

- Limited physical space for battery storage in dense residential areas.
- Disparate systems and technologies across households limiting coordination.
- Varied suitability of housing for solar installation.
- Technical challenges in retrofitting older homes with energy technologies.

Legal

- Planning constraints in heritage or conservation areas and complex regulatory environment for community energy projects.
- Limited tenant rights regarding renewable energy access.
- Restrictions on energy sharing between residential properties.
- Strata regulations limiting renewable deployment in apartment buildings.

Environmental

- Physical constraints of existing housing stock and layouts.
- Tree canopy coverage limiting solar potential in established suburbs.

Deep dive: Commercial and industrial

Economic

- No medium or small-scale generation investment scheme to enable energy trading (Capacity Investment Scheme requires projects >30MW).
- Industrial tenants typically have short lease terms making long-term energy investments challenging due to uncertainty of asset ownership or long-term tenancy demand.
- Upfront capital costs for industrial-scale solar and battery systems often compete with core business investments.
- Energy export is not aligned with core business models of industrial property developers and owners.
- Industrial property owners have limited incentives to maximise solar beyond self-consumption.

Social

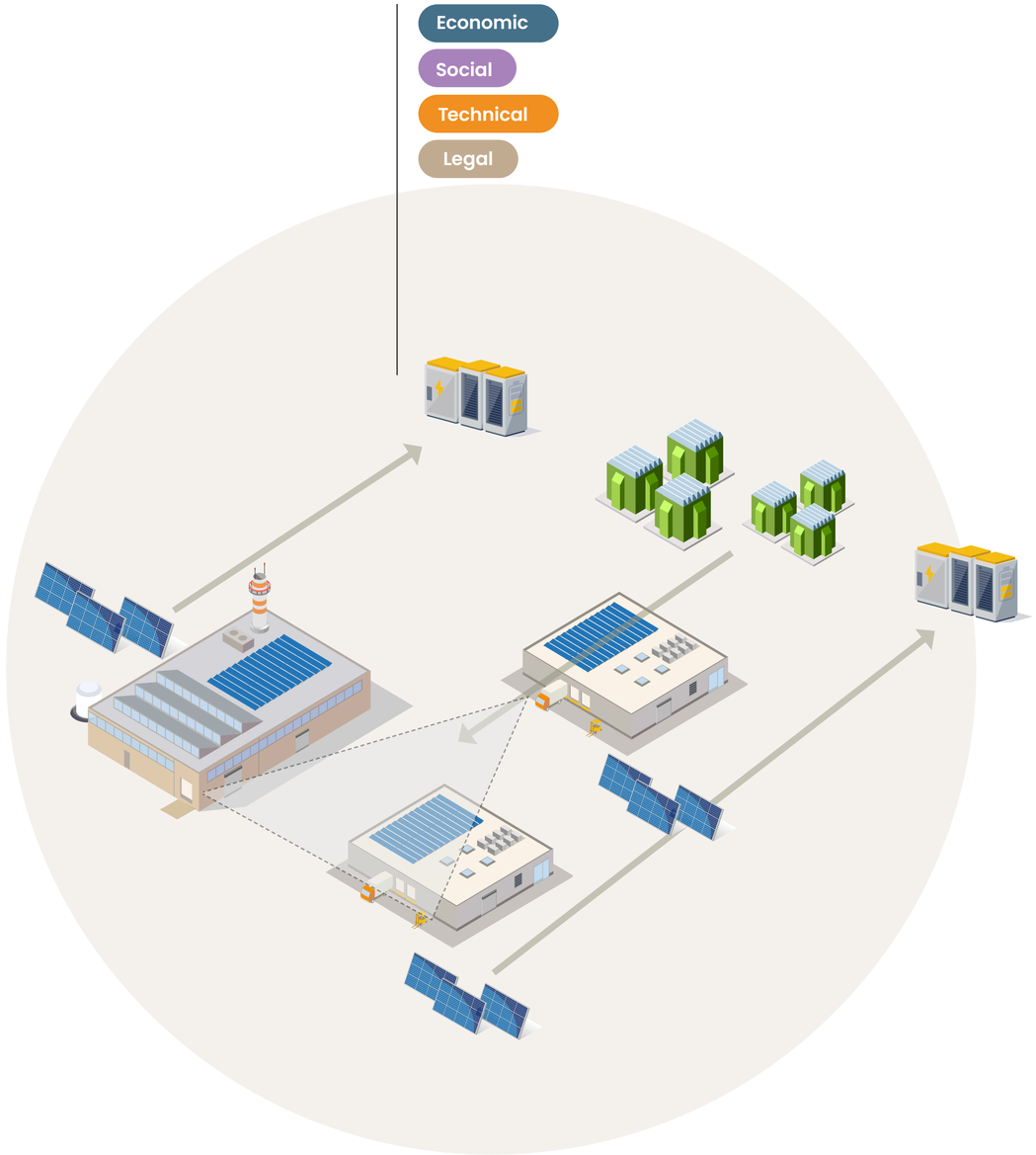
- Limited awareness in industrial sector of the full renewable potential of their assets.
- Industrial precincts rarely have community-focused governance structures for energy planning.

Technical

- Handling high-voltage connections required for industrial-scale generation and energy-intensive users.
- Integrating multiple industrial energy systems across different property boundaries.
- Sizing connection infrastructure for large industrial rooftop arrays.
- Engineering challenges with retrofitting older industrial buildings.

Legal

- Uncertainty around liability and responsibility for shared energy assets in industrial settings.
- Current regulations rarely address precinct-scale energy sharing in industrial contexts.
- Network connection processes not optimised for industrial-scale distributed generation.



Summary of insights from industrial asset owners and advisors

Key challenges

Network Constraints and Export Limitations

Industrial and logistics sites face significant challenges due to hosting capacity, curtailment, zero-export rules and dynamic operating envelopes, restricting solar system sizing.

Structural Constraints

Many industrial buildings are structurally unsuitable, limiting the deployment of rooftop solar.

Brownfield Developments and Leasing Structures

Retrofitting existing sites is complex, especially mid-lease.

Battery Economics and Land Use

Batteries face economic hurdles, particularly behind-the-meter due to high network tariffs and limited revenue opportunities.

Strategic Reallocation of Capital

A shift in investment priorities is underway based on the relatively returns available from different uses of industrial land.

Possible solutions

Battery Storage Strategies

Grid scale, front-of-meter battery systems and community batteries (shopping centres) offer more commercially viable solutions, potentially supported by government funding (ARENA).

Monetisation through Rental Uplifts

A favourable strategy is to Monetise Solar Investments through rental uplifts, providing recurring income streams for asset owners without requiring third-party intermediaries.

Long-term Roof Leasing

Establishing long-term leases for roof spaces.

Partnership and Regulatory Collaboration

Collaboration with DNSPs, third parties, and regulatory incentives can facilitate industrial-solar adoption.

Areas of uncertainty

Embedded Network Viability

Commercial and regulatory viability of embedded networks requires investigation of compliance, benefit sharing models etc. Limited case studies demonstrating large scale implementation.

Market Dynamics and Export Economics

The financial returns from exporting excess solar energy to the grid remains uncertain.

Battery Value Stack and Optimal Scale

The ideal scale for battery storage remains uncertain. While batteries clearly provide grid and tenant value, it’s not mature enough to fully understand and capitalise on the value stack.

Role of Policy Settings

Questions persist regarding the optimal policy mechanisms (e.g., incentives, tariffs, rebates) needed to effectively stimulate market creation, ensure long-term revenue certainty, and balance stakeholder interests.

Deep dive: Precincts and districts

Political

- Competing priorities between housing affordability and sustainability requirements.
- Fragmented governance across mixed-use precincts involving multiple authorities.
- Limited coordination between precinct planning and energy infrastructure planning.

Economic

- Higher upfront development costs for integrated energy systems.
- Difficulty in equitably allocating costs and benefits across diverse stakeholders.
- Uncertainty around long-term management models for shared energy assets.
- Complex value exchange between different users in mixed-use environments.

Social

- Diverse needs and expectations and potential conflicts between commercial and residential stakeholder preferences.
- Challenges in collective decision-making across different property types, due to varying levels of energy literacy.

Technical

- Need for technologies that can balance diverse load profiles across building types.
- Complexity of managing energy flows in densely populated, multi-use environments.
- Challenges in integrating systems across buildings with different ownership structures.

Legal

- Regulatory constraints on creating microgrids spanning residential and commercial properties.
- Challenges in establishing energy sharing arrangements across different property titles.
- Unclear responsibility for ongoing energy system governance in mixed-use settings.
- Complex strata and property law implications for shared energy assets.

Environmental

- Managing environmental impacts of energy infrastructure in close proximity to residential areas.
- Balancing renewable infrastructure with other sustainability features, integration challenges in mixed-use developments.

Deep dive: Metropolitan Sydney

Political

- Fragmented governance (33 LGAs with variable commitments) and a lack of a metropolitan authority with clear responsibility for energy planning.
- Limited coordination between energy planning and other metropolitan planning domains.
- Tensions between local and state government priorities and approaches.
- Short political cycles hindering long-term energy transformation.

Economic

- Inequitable access to capital, inconsistent incentives and price signals for renewable investments across different parts of Sydney.
- Different economic contexts affecting viability of renewable projects.
- Lack of metropolitan-scale financing mechanisms and limited mechanisms for value capture from metropolitan-scale benefits.
- Misalignment of costs and benefits across geographical areas.

Social

- Variable community awareness and engagement across different areas.
- Fragmented community networks limiting knowledge sharing and limited platforms for metropolitan-scale community engagement.
- Inconsistent messaging from different authorities.

Technical

- Interoperability challenges between systems in different locations, within different networks.
- Suboptimal placement of technologies due to lack of system-wide planning.
- Fragmented data collection and sharing and limited metropolitan-scale monitoring

Legal

- Regulatory barriers to energy sharing across jurisdictional boundaries.
- Varying approval processes and requirements and complex and overlapping governance structures.
- Limited mechanisms for coordinated regulatory reform.
- Inconsistent planning frameworks across different local government areas and uncertainty around responsibility for cross-boundary projects.

Environmental

- Variable environmental priorities across different areas.
- Different balancing of environmental and energy objectives.

A multi-scale approach is urgently needed

Explore, enable and support multiple scales of action

Renewable energy generation and storage solutions for Sydney can be delivered at a number of scales. And what's more, these scales can be both mutually reinforcing and delivered concurrently.

Each scale has its own benefits, infrastructure needs, orchestration requirements, regulatory and incentive structures and level of generative capacity. They also involve different stakeholder groups.

There are four connected scales that can create a multi-layered approach to metropolitan-wide renewable energy generation and storage:

Building scale

Precinct or neighbourhood scale

District or suburb scale

Metropolitan scale

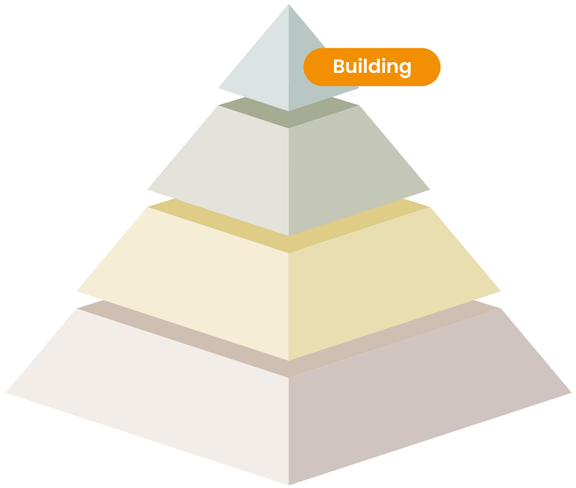
There is also another way to sharing energy – the **Virtual power plant (VPP) model.** The VPP can apply at multiple scales and potentially beyond the boundaries of metropolitan Sydney.

There are likely to be consideration which mean that the next scale up will be a more appropriate scale in which to maximise generation and storage capacity.

These might include:

- Investing in a neighbourhood /community battery if individual residential properties are generating excess rooftop solar and do not have sufficient behind-the-meter storage to capture it.

- Creating a sub-district scale 'local energy zone' linked to the reach and capacity of a sub-station when a business park or neighbourhood battery network is unlikely to be of sufficient scale, or there are challenges with fragmented land and asset ownership.



Single building scale

Household and industrial rooftop-generated renewable energy is the basis for all five of the scales this report identifies. Generation and storage infrastructure at a building or lot level, and using the energy behind the meter (rather than connecting directly into the electricity network) is the smallest scale intervention and one that uses existing or planned buildings.

What does this look like

Residential

- Maximising residential rooftop solar on new and existing homes and apartments.
- Optimising behind the meter household battery storage, balancing household consumption with surplus daytime energy exported back the grid in peak times.
- Can work as part of a VPP system.

Commercial and industrial

- Lifting average industrial rooftop coverage from 10-20% to 100% and matching increased generative capacity with battery storage for single assets behind-the-meter.
- Ensuring that older buildings are structurally able to add additional solar infrastructure to rooftops.

Key players

This scale largely requires property owners or developers to deploy solar and behind the meter batteries:

- For residential, this includes individual home-owners or developers.
- For industrial, it includes commercial and industrial asset owners/developers/tenants.
- Both emerging business models are partnering with households and businesses to install and maintain rooftop solar and batteries, and trade surplus energy generation to create a return for both parties.

CASE STUDY:

Flexible rooftop solar exports

Summary

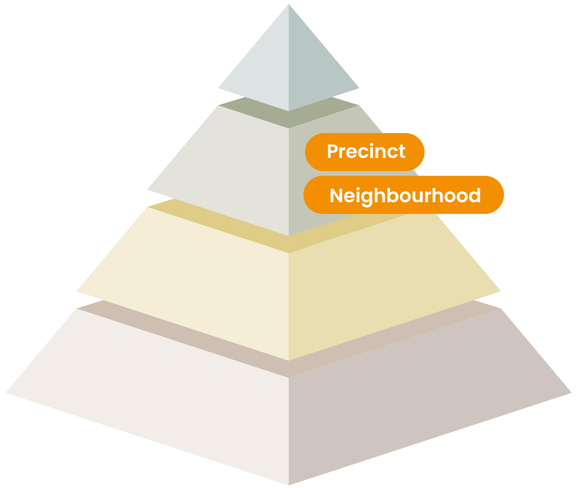
- Endeavour Energy has launched a new, AI-powered flexible export system that will allow rooftop solar customers to export more energy to the grid than the current 5 kilowatt (kW) cap, saving them money while maintaining grid stability. Endeavour anticipates the service could contribute 600 MW of additional renewable energy capacity, enough to power 75,000 homes for a year.

Source: Endeavour Energy

Lendlease and APPF Industrial

Summary

- APPF Industrial has partnered with renewable energy fund Solar Bay to deliver solar systems, energy storage and renewables initiatives for its assets and tenants. The program aims to lower tenants' energy costs and reduce the portfolio's carbon footprint.[24]
- As part of the program, Solar Bay will install, operate and maintain solar photovoltaic systems on the industrial assets in the APPF Industrial Fund (the Fund). This approach to solar implementation provides a capital light strategy for installing solar.
- The tenants are offered a Power Purchase Agreement (PPA) to buy the electricity generated on the assets.
- Large Scale Generation certificates (LGCs) created by the solar arrays are attributed to the Fund to enable it to be 100% renewably powered from 2023. In the future as the solar roll out expands across more assets, excess LGCs created will be offered to tenants to support their own renewable electricity ambitions.
- This APPF Industrial solar initiative supports our Mission Zero targets, as well as supporting tenants in meeting their own environmental commitments.



Precincts and neighbourhoods

Neighbourhood and precinct-scale renewable energy generation and storage networks can share locally-generated energy in residential, campus and industrial settings. Individual homes, public and commercial buildings are connected to a suburb scale battery. Surplus energy generated locally by rooftop (or carpark) solar is stored in this battery, balancing energy flows in the local grid and creating financial benefits.

What does this look like

Residential

- Residents in a local area can sign up to a community battery program, whether they have rooftop solar or not, and receive up to $400 per year.
- Energy access can be prioritised for those who are not able to afford or install solar and storage.

Commercial and industrial

- Business parks or a campus creating a local network of generation, storage and distribution for tenants to offset power bills.
- Maximising rooftop coverage of larger format commercial and industrial buildings. Often, larger format buildings often only cover 10% of rooftops. Precinct-scale networks can incentivise owners to increase coverage beyond what is needed to meet tenant demands.
- Investing also in precinct-scale battery can store excess energy and distribute back to other tenants in the precinct – those with higher energy needs or those who may require energy in evening and over night.

Key players

- For residential neighbourhood models, this requires coordination with the distribution network system providers (DNSP's), retailers and local councils.
- For campus and business parks, this also includes master developers and owners, as well as an understanding of tenant energy needs.

CASE STUDY:

Revenue and retrofit models Madrid, Spain

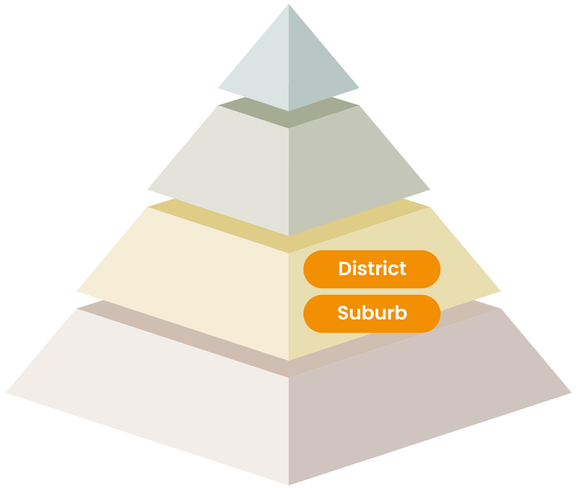
Summary

- In Madrid, new regulations help apartment buildings to install shared rooftop solar systems, allowing all residents to collectively benefit from cheaper, cleaner electricity. Known as 'collective self-consumption', the model is gaining momentum in dense urban areas where traditional rooftop solar has struggled to reach renters and strata communities.[25]
- The model is extending to retrofit. One multi-tenant apartment block recently installed a communal solar system to generate around 60,000 kWh annually and is expected to cut each household's electricity bill by roughly $1,500 per year while reducing emissions by 38 tones of CO_2. The installation was funded by the building owner, supported by public subsidies that reduced upfront costs offering a scalable pathway for more equitable urban decarbonisation.

La Trobe University, Melbourne

Summary

- La Trobe University recently announced that Victoria's largest urban solar farm – at their Bundoora campus in Melbourne's north east – has cut the University's emissions by 15%.
- The facility consists of a 2.9 MW solar system and a 4.5MWh battery energy storage solution, that provides renewable energy to the Bundoora campus and reduces that campus' emission by 65%.[26]



Districts and suburbs

District-scale renewable energy networks combine residential, commercial, industrial, and retail neighbourhood and precincts, often centred on a district-scale electricity sub-station or larger geographic area (the Illawarra).

The diversity of land uses within the district mean that there is an increased ability to match generation with demand, supported by large scale battery energy storage systems (BESS) matched to the network's demand.

What does this look like

Residential

- District scale networks covering more than precincts and neighbourhoods, often linking several together.
- Larger scale battery storage are connected to the distribution network rather than behind the meter, balancing generation and demand across the district.
- District scales allow aggregation of a range of different generation sources that have surplus energy to share.
- Success in establishing this district scale or 'local' renewable energy zones requires strong leadership from both local and state government, innovative approaches from the private sector, and new models of collaboration across property boundaries.

Key players

- Distribution Network Service Providers (DNSPs) due to their operation of distribution infrastructure such as sub-stations.
- Local Councils and State Government (particularly for land and approvals processes).
- Third party market battery storage providers, in coordination with government and DNSPs based on locational and regulatory requirements.
- Community groups and advocates.

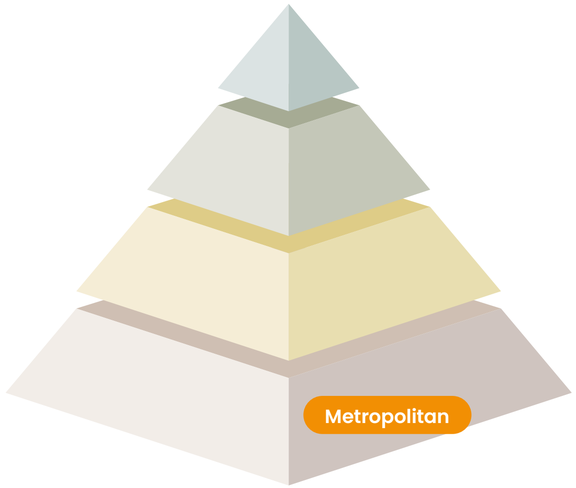
CASE STUDY:

Ausgrid Community power networks

Summary

- Ausgrid is planning the concept of a 'Community Power Network,' which involves the accelerated deployment of both supply and demand Distributed Energy Resources (DER) and Consumer Energy Resources (CER) in a local network area. This initiative is planned and funded by Ausgrid.
- The Community Power Network will pool surplus solar energy generated on available rooftops in the zone to redistribute during the evening peak as an affordable form of power for all customers. The strategically placed storage across the network will provide grid balancing and power quality management functions, improve grid utilisation, flatten National Electricity Market (NEM) demand, and reduce the capital required by the traditional grid to meet the demands of a more electrified and distributed energy ecosystem.
- Ausgrid proposes to test the concept in two different regions: one largely residential (Charmhaven on the Central Coast), and the other a mixed set of buildings including commercial, industrial, and apartments (Mascot-Botany in Sydney). Both areas selected have a high proportion of renters compared to their peers.

Community Battery Presser image © Ausgrid



Metropolitan scale

In an optimised future, Metropolitan Sydney functions as an integrated network of complementary renewable energy buildings, precincts and districts, where resources, infrastructure, and investment are strategically coordinated across the metropolitan area.

Each scale discussed so far proposes distinct opportunities and challenges, but they share many common barriers that could require coordinated intervention at the metropolitan scale. By taking a system-wide view, we would also be able to plan for the full spectrum from an equity perspective - including those parts of the city with very low access who have the highest need, and areas with generation beyond their needs.

What does this look like

- Coordinated planning across local government and DNSP boundaries to align renewable energy development with broader metropolitan priorities.
- Equitable distribution of benefits, ensuring all communities participate in and benefit from the energy transition.
- Infrastructure investments that enable energy sharing between areas with high generation potential and those with high demand.
- Metropolitan-scale governance mechanisms that enable coordination, and integration with other metropolitan systems like transport, water, and waste, while respecting local autonomy.

Key players

- Distribution Network energy Service providers (DNSPs).
- Local Councils and State Government (particularly for land and approvals processes).
- Third party market battery storage providers.
- Transgrid.
- Community groups and advocates.

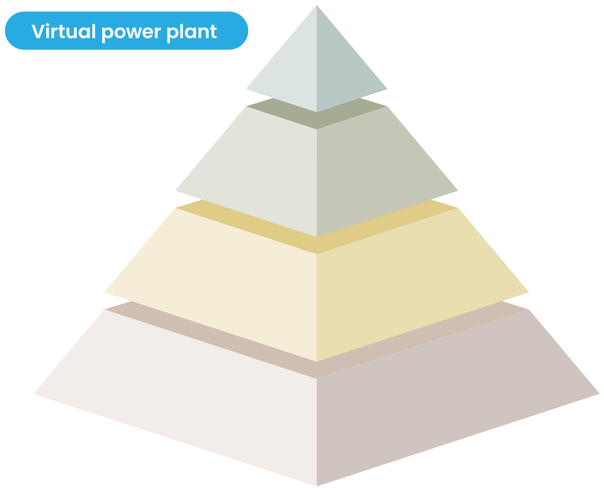
CASE STUDY:

Copenhagen, Denmark

Summary

- Denmark's 2012 and 2018 Energy Agreements provide stable, bipartisan direction for offshore wind, district heating and biomass-fuelled cogeneration. These national frameworks underpin Copenhagen's city-scale decarbonisation strategy, enabling coordinated investment in one of the world's largest district energy networks.
- Policy consistency has given investors confidence and enables major local projects - including Copenhagen's expansive district energy network.
- Copenhagen didn't rely on national policy alone. The city used its planning powers to introduce mandate such as district heating connections in designated zones - ensuring new developments integrated with the wider energy system. These rules were backed by municipal partnerships and incentives to help building owners switch from oil or gas.
- This integrated approach to planning, delivery and infrastructure is captured in CopenHill - a waste-to-energy plant that supplies heat and electricity to the city, while also offering social amenity by housing a ski slope, hiking trail and climbing wall. Since 2010, Copenhagen has reduced CO_2 emissions by 77.9% and cut the carbon intensity of district heating by 72%.[27]

CopenHill image © BIG



What does this look like

A VPP:

- Connects individual behind-the-meter batteries together.
- Can be wholly residential, industrial or a mix of the two.
- Can be installed by home and business owners who don't have rooftop solar, charging from the grid during the day when energy prices are low/negative.

Key players

- Energy retailers.
- Consumers, whose battery storage is accessed at peak times.

Virtual power plant (VPP)

A virtual power plant (VPP) is an aggregation of household and small business battery storage that can provide on demand support to the electricity grid in peak periods. VPP's can help stabilise the grid, prevent blackouts, lower electricity costs, and create financial incentives for participant. VPPs are connected across energy retailer platforms and so do not align to a particular scale.

Digital VPPs are becoming more common - if still seeking mainstream acceptance by consumers, with trials in places like South Australia starting to demonstrate how virtual power plants can reduce energy costs for participating households, while also contributing to energy system strength, reducing energy costs for other grid users.

CASE STUDY:

Stockland and Energy Bay

Summary

- In 2020, Australian property group Stockland, recognised that there was a significant underutilisation of the renewable energy rooftop generation potential across its logistics warehouse portfolio.
- In collaboration with the Clean Energy Finance Corporation (CEFC) and renewable energy partner Energy Bay, Stockland implemented a system that enables energy sharing across 50 sites, with the aim of matching the company's annual energy consumption with on-site solar generation.
- The program, which began in 2020, now includes 50 MWp of solar capacity and up to 102 MWh of battery storage. Energy Bay, acting as a retailer, installer and operator of the infrastructure sell energy to Stockland's tenants, with Stockland guaranteeing to buy the energy - creating a strong symbiotic relationship between the two organisations.[28]

South Australia VPP

Summary

- Established in 2018, the South Australian virtual power plant (SA VPP) aims to create Australia's largest virtual power plant by bringing together as many as 50,000 solar plus home battery systems. Early phases of the project have involved installing systems in public housing.
- The SA VPP was the first virtual power plant in Australia to help stabilise frequency levels in the grid and has helped ensure supply during significant transmission interruptions, including: Supply outage caused by a power station trip in Queensland in October 2019, and provision of power to Port Lincoln residents during catastrophic fire conditions in November 2019.[29]

A call to action – at all scales of opportunity

Image © Ausgrid

1. Activate, support and learn from trials at multiple scales

A. Activate, support and learn from trials at multiple scales to determine how best to increase equity of access to low-cost, resilient renewable energy for households, commercial and industrial businesses and other organisations with a property portfolio.

CASE STUDY:

Endeavour Energy, Illawarra Urban Renewable Energy Zone

Summary

- Endeavour Energy and EnergyCo are exploring the potential to create an Urban REZ in the Illawarra region of NSW, south of Sydney.
- The Illawarra region contains unique features that make it an ideal location for a REZ. The region already hosts major energy, port and transport infrastructure, has a skilled workforce and has strong demand for future renewable energy projects.
- The proposal combines generation, storage, and smart network tools across the Endeavour Energy network to maximise generation across rooftops (both residential and commercial/ industrial) and connect it to customers across the network. It would be supported by investment in energy storage solutions across the network to increase generation capacity and boost reliability.

Electrifying homes can save households thousands

Summary

- The Electrify 2515 pilot in Northern Illawarra postcode of 2515 is an example of a pilot scheme that can be established comparatively quickly, by focusing on people over technology.
- The pilot will be rolled out without the need for regulatory sandboxes or additional distribution network infrastructure investment and provide an experiment to see how households can drive change at scale.[30]

Source and image: © Endeavour Energy

2. Take a metropolitan approach to support NSW's energy future

A. State Government leadership: Identify a dedicated body responsible for convening diverse stakeholders to create a shared view and pathway, and ensuring renewable energy. Equity and net zero targets are set and met across the metropolitan area.

B. Establish an urban renewable energy roundtable across government, industry, community and utilities to collaboratively define the shared equity, security, affordability and net zero outcomes for Sydney. Involve state and local govt, community orgs. Industry, DNSPs, AEMO, ARENA, AER and retailers. This is an opportunity to think beyond the hardware of the electricity network.

C. Develop a spatial energy strategy for Metropolitan Sydney to increase visibility on the opportunities for renewable energy investment and orchestration, identify where the greatest needs for access and affordability, and respond to growing demand from housing, industry, transport and data centres. Build on the distribution integrated system plan from Ausgrid, Endeavour Energy and Essential Energy.

D. Increase metropolitan scale visibility of storage needs and opportunities. Create a transparent way of sharing place-based energy balance and opportunity, increasing awareness of solar and battery storage opportunities and that optimises placement based on local and system-wide considerations.

E. Set renewable energy generation and storage targets for Metropolitan Sydney to support to track progress and support both green finance requirements and mandatory disclosure reporting.

CASE STUDY:

NSW Distribution System Plan

Summary

- Metropolitan Sydney is covered by two DNSPs – Ausgrid and Endeavour Energy. Delivering a metropolitan-wide solution to renewable energy generation and storage and distribution requires a coordinated approach – something that Ausgrid and Endeavour Energy are exploring with Essential Energy in a proposed NSW Distribution System Plan, to gain a deeper understanding of the needs and opportunities and ensure effective integration with the broader grid.

3. Increase equity of access to low-cost, resilient renewable energy for households

A. Solar for Rentals Programs: Financial incentives and rebates to encourage landlords to install solar on rental properties, with mechanisms ensuring tenants share in the benefits through reduced bills.

B. Mandatory Rental Energy Standards: Phased introduction of minimum renewable energy requirements for all properties, including minimum property energy performance and mandatory display of the energy rating and annual energy cost equivalence to prospective tenants.

C. Community Batteries with Equitable Access Models: Ensure community-scale storage is accessible to apartments, renters, and others with limited access, including those in strata-titled properties.

D. Community share or strata-owned batteries as a community ownership model to facilitate community acceptance and community revenue benefits.

E. Virtual power plants with inclusive participation: VPP models that allow participation from households without their own generation or storage assets.

CASE STUDY:

Increasing solar uptake through grant programs - NSW Solar for Apartment Residents grant

Summary

- NSW government has announced a grant to support apartment residents in the funding of shared solar systems on multi-unit dwellings across NSW. Owners and corporations can apply for funding to install shared solar systems on apartment buildings.
- The grants will cover 50% of the cost, which will add value to homes and help residents save on their electricity bills.[31]

4. Unlock renewable energy potential with commercial and industrial businesses

A. Sydney-wide Industrial renewable mapping: Create a comprehensive mapping of all industrial and commercial roof space, energy demand, and network capacity to identify highest-value opportunities across the metropolitan area.

B. Business park energy concierge: Create a 'concierge' type service that supports commercial and industrial owners to oversize their rooftop solar, connect to battery storage, and link to Government incentives and commercial models that can overcome barriers.

C. Explore changing incentive mechanisms like the SRES and/or Capacity Investment Scheme to underwrite larger scale industrial rooftops solar, and/or more attractive value sharing and/or tariffs to encourage rapid deployment and oversizing of solar systems by residential and commercial customers. (Note: Endeavour Energy offers a value share approach to incentivise commercial and industrial rooftop solar. Ausgrid is proposing to provide commercial and industrial customers with a more favourable tariff).

D. Explore creating a local market for surplus battery storage underwritten by local storage. Batteries would buy all energy from Industrial assets and sell when market prices are high offering a revenue stream and facilitating a community acceptance through planning involvement.

E. Timing demand to absorb growing solar: to reduce the impact of increased solar generation during the day by matching EV charging, energy use of commercial and industrial users (load) with times of renewable energy generation (buildings as batteries).

CASE STUDY:

Incentivising renewable energy across homes and businesses

Summary

- Germany's updated Renewable Energy Act (EEG 2023) introduced a dual feed-in tariff for rooftop solar that enable households to choose between a lower rate ($0.13/kWh) for surplus feed-in or a higher rate ($0.21/kWh) for full-feed-in systems. The policy encourages residents to install larger systems that fully utilise rooftop space, rather than sizing only for their own energy needs. Crucially, it also allows households to install two separate systems on the same property - one optimised for self-consumption, the other for exports.

Image © Ausgrid

5. Implement mandates, approval pathways and regulatory flexibility to accelerate investment

A. Review heritage conservation zone constraints: The City of Sydney has recently updated planning controls in local heritage conservation areas to enable solar panels. There is opportunity to broaden this approach across metropolitan Sydney to expand opportunity for rooftop solar where appropriate.

B. Implement mandates for rooftop solar on new residential or industrial buildings, and fast track approval pathways for battery energy storage systems (BESS).

C. Ensure the renewable energy generation and storage potential of new large scale urban renewal/build projects (Bays West, Western Sydney Airport, TOD precincts), and existing large demand centres (desalination plant, ports, manufacturing hubs).

D. Seek regulatory flexibility for urban renewable energy innovation: Create safe regulatory environments to test options for local energy sharing to inform business cases that articulate the benefits to consumers and the network. This could also allow innovators and new market entrants to test different business and ownership models (such as local energy hubs) new partnerships. e.g. peer to peer trading, blockchain.

CASE STUDY:

A spotlight on innovation

Summary

- Policy reform and major infrastructure dominate energy transitions but smaller-scale initiatives are also shifting the landscape. These examples illustrate how diverse technologies and behavioural strategies are accelerating decarbonisation at the local level.

- **Vehicle-to-grid integration**
  In Utrecht, Netherlands, over 500 bidirectional EV chargers allow parked electric cars to discharge power to the grid.[32] The system supports load balancing and helps accommodate high levels of local renewable generation.

- **Community energy switching in Hamburg**
  A 2018–19 campaign by Hamburg Energie used social norms and visual prompts to encourage uptake of green power. It secured 9,500 new customers - 5,000 from dominant supplier Vattenfall - surpassing targets by 90%.[33]

6. Integrate solar panel and battery recycling into energy planning

A. Product stewardship schemes or regulation for solar panels and batteries. There have been several efforts to establish solar panel product stewardship programs across Australia to enable the regulation of PF recycling and materials recovery. The Australian Government should finalise this as a matter of urgency.

B. Facilitate formal partnerships between universities and recycling businesses as pathways to graduate programs for engineers. It is essential that photovoltaic, chemical and other engineers and manufacturers associated with solar and battery systems are educated in the materials recovery and resource stewardship of the products they design to ensure that they are manufacturing with end-of-life materials recovery in mind.

CASE STUDY:

Planning for end of life now

Summary

- Both the speed and scale of rooftop solar deployment across Australia – domestic and commercial – is an unheralded success story. However, with most solar panels having a useful lifespan of only 20 years, there is an urgent need to plan now for the end of life phase of these panels. Australia is facing a fast-growing wave of solar and battery waste, with 1.4 million solar PV modules to reach end-of-life in 2025 in Australia. Without clear reuse or recycling pathways, valuable materials risk ending up in landfill.

- In Brisbane, Pan Pacific Recycling is developing commercial-scale solutions to extract silver, silicon, and copper from retired panels.[34] Elecsome, with facilities in Keysborough and Kilmany (Vic), is focused on reuse. With up to 50% of decommissioned panels still functional, it partnered with CSIRO to build a testing rig and has installed a 100 kW second-life solar system in Wagga Wagga. [35]

- Further afield, Phoenix (USA) has adopted reuse-focused procurement policies, integrating second-life batteries and panels into public lighting and infrastructure creating approach creates market pull.[36]

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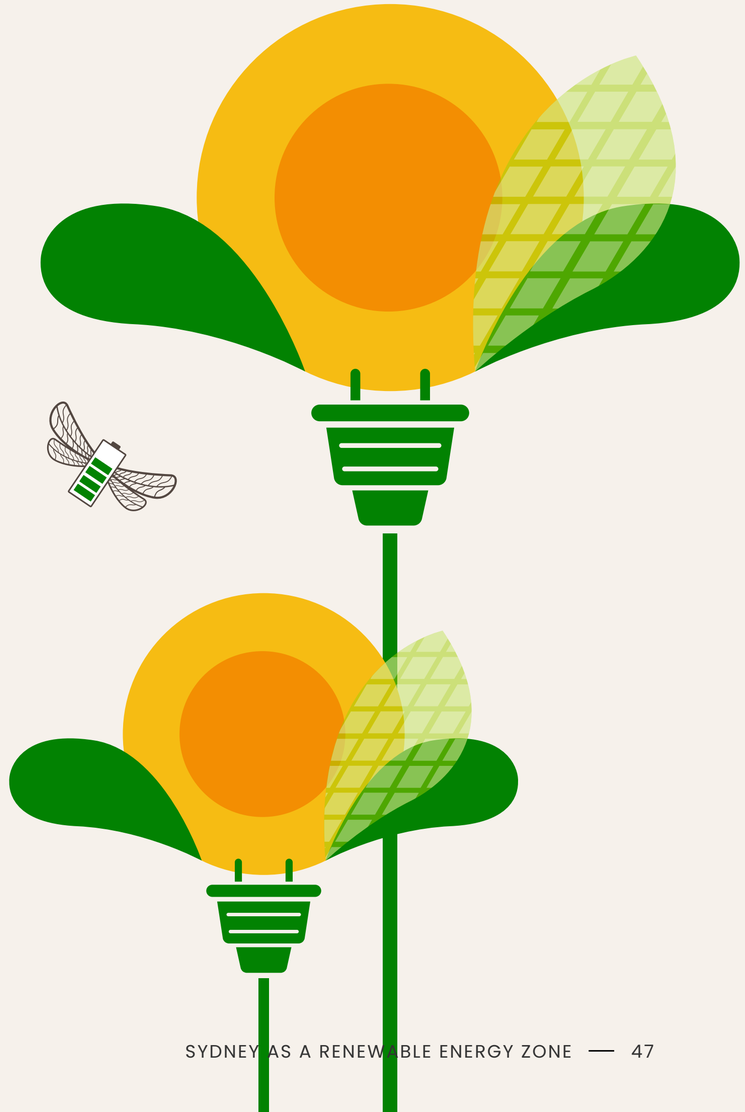
List of Abbreviations

Abbreviation	Full term
AEMO	Australian Energy Market Operator
APVI	Australian Photovoltaic Institute
ARENA	Australian Renewable Energy Agency
BESS	Battery Energy Storage System
CER	Consumer Energy Resources
CIS	Capacity Investment Scheme
C&I	Commercial and Industrial
DER	Distributed Energy Resources
DNSP	Distribution Network Service Provider
EII Act	Energy Infrastructure Investment Act
ESG	Environmental, Social, and Governance
EV	Electric Vehicle
GW	Gigawatt (1 GW = 1,000 MW)
GWh	Gigawatt-hour (1 GWh = 1,000 MWh)
ISP	Integrated System Plan (AEMO)
kW	Kilowatt
kWh	Kilowatt-hour
LCOE	Levelised Cost of Energy
LEH	Local Energy Hub
LGA	Local Government Area
LREZ	Local Renewable Energy Zone
MW	Megawatt (1 MW = 1,000 kW)
MWh	Megawatt-hour
NEM	National Electricity Market
NSW	New South Wales
PESTLE	Political, Economic, Social, Technical, Legal, Environmental
PV	Photovoltaic (solar)
REZ	Renewable Energy Zone
SydREZ	Sydney Renewable Energy Zone
TfNSW	Transport for New South Wales
VPP	Virtual Power Plant

Glossary of Terms

Term	Definition
REZ (Renewable Energy Zone)	A designated area that combines renewable energy generation (e.g. solar, wind), storage, and transmission infrastructure to deliver clean, reliable, and cost-effective electricity. Traditionally applied to regional areas, this report explores the potential of a metropolitan REZ in Sydney.
SydREZ	Proposed Sydney Renewable Energy Zone – a concept to harness Greater Sydney's rooftop solar and battery potential to contribute to the energy transition, reduce costs, and improve resilience.
Distributed Energy Resources (DER)	Small-scale electricity generation or storage technologies (e.g. rooftop solar panels, batteries, electric vehicles) that operate locally and can connect to the grid.
Consumer Energy Resources (CER)	A subset of DER that are installed, owned, and controlled by consumers, such as home solar panels, batteries, or smart appliances.
Virtual Power Plant (VPP)	A system that integrates multiple distributed energy resources to act like a single power plant. It uses software to manage, coordinate, and dispatch energy generation and storage to the grid.
Community Battery	A shared battery storage system, typically located in a neighbourhood, that stores excess solar energy generated by nearby homes and releases it when needed.
Dynamic Operating Envelope	A flexible limit set by network operators that adjusts how much electricity a household or business can export to the grid, based on real-time network conditions.
Zero Export Constraint	A technical or regulatory limit that prevents electricity from being exported to the grid from certain solar systems, usually to avoid overloading local infrastructure.
Energy Trilemma	The challenge of simultaneously achieving energy security, affordability, and sustainability – often seen as competing priorities in energy planning.
Solar Garden	A shared solar project where participants (often renters or apartment dwellers) can buy or lease a portion of a remote solar array and receive electricity bill credits.
Embedded Network	A private electricity network that serves multiple customers (e.g. within an apartment block or industrial precinct) using a single connection to the main grid.
Capacity Investment Scheme (CIS)	A government program to underwrite new renewable generation or storage projects by providing revenue certainty, typically for large-scale infrastructure.

Term	Definition
Energy Infrastructure Investment (EII) Act	NSW legislation enabling coordinated investment and planning for energy infrastructure to meet the state's electricity roadmap objectives.
Hosting Capacity	The ability of the electricity network to accommodate additional distributed generation (like rooftop solar) without requiring upgrades.
Solar Soaking	A strategy to absorb excess solar generation (e.g. through batteries or smart appliances) to avoid curtailment and make better use of solar energy during the day.
Levelised Cost of Energy (LCOE)	A metric that represents the average cost of electricity generated over the lifetime of an energy asset, useful for comparing energy generation technologies.
Strata Scheme	A type of property ownership and management in Australia, often applying to apartment buildings, where multiple owners share common property. Strata rules can complicate solar installation.
Precinct-scale Energy	An approach to energy planning where renewable energy generation and storage is coordinated across a local area or neighbourhood rather than at an individual building level.
Social Licence	The ongoing approval and trust of the public and local communities for infrastructure or development projects, including energy initiatives.
Lazy Spaces	Underutilised urban areas (e.g. rooftops, carparks, water reservoirs) that could be used for renewable energy generation or storage.
Regulatory Sandbox	A controlled environment that allows regulators and innovators to trial new energy technologies or models without full regulatory compliance, to test their benefits and impacts.
Electrification	The process of replacing fossil fuel-based systems (e.g. gas heating, petrol vehicles) with electric alternatives powered by clean energy.
Solar PV (Photovoltaics)	Technology that converts sunlight into electricity using solar panels, typically installed on rooftops or ground-mounted systems.
Net Zero	A target to balance greenhouse gas emissions produced and removed from the atmosphere, usually by 2050, through emissions reductions and offsets.
Smart Meter	An advanced electricity meter that records consumption in real time and enables two-way communication between customers and energy providers.



Innovation Fund Partners

We would like to thank our Innovation Fund Partners for their support of the Committee for Sydney's research.

Our Innovation Fund Partners are future focused, and outcome driven. They are leaders of change. Their combined investment underpins our annual research program and together with our members, enables us to grow our impact and output – striving to create a better Sydney that offers unparalleled opportunity and quality of life for everyone.

Resilience Program Partners

We would like to thank our Resilience Program Partners for supporting the Committee for Sydney's work to drive solutions to our most pressing resilience challenges.

Our Resilience Program Partners are leaders in their respective fields, embracing the transition to a decarbonised future, and adapting to a changing climate.

The Resilience Program focuses on:

- Identifying opportunities for innovation and economic growth for business, government, and the community in the transition to net zero.
- Determining where and how we invest to ensure system-level resilience and reduce impacts on businesses and communities.
- Building on experience of extreme heat, flood, storms, and fires to reduce direct risks to life, assets and productivity, now and into the future.

Committee for Sydney

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