Flexible Demand for Commercial Buildings

DISCOVERY REPORT

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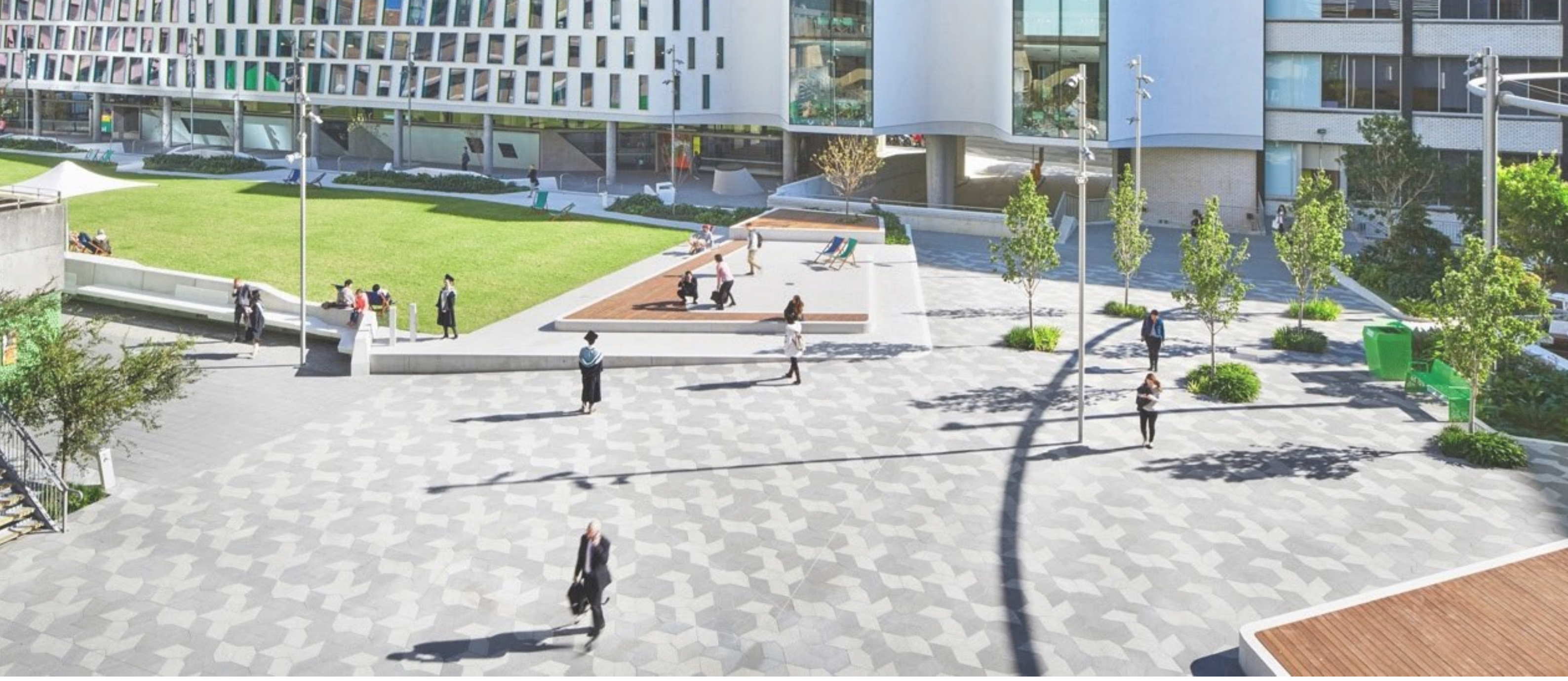
Prepared for the City of Sydney and Better Buildings Partnership

Institute for Sustainable Futures



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Acknowledgment of Country

UTS acknowledges the Gadigal People of the Eora Nation, the Boorooberongal People of the Dharug Nation, the Bidiagal People and the Gamaygal People upon whose ancestral lands our university stands. We would also like to pay respect to the Elders past, present and future, acknowledging them as the traditional custodians of knowledge for these lands.

EXECUTIVE SUMMARY

Introduction

Australia's non-residential buildings play a critical role in the energy transition, accounting for around a quarter of national electricity consumption and a significant share of emissions and peak demand. While the Better Buildings Partnership (BBP), led by the City of Sydney, has delivered substantial emissions reductions through energy efficiency and electrification, the next frontier is improving the flexibility of electricity demand in commercial buildings.

As fossil gas use in the sector declines and electrification accelerates, unmanaged demand growth risks increasing peak loads. Flexible demand offers a largely untapped opportunity to reduce costs and emissions while supporting a more resilient, renewable-dominated electricity system. Against this backdrop, the City of Sydney commissioned the Institute for Sustainable Futures, in partnership with Positive Zero and Buildings Alive, to investigate how commercial buildings can more effectively participate in demand-side management and flexible demand.

This discovery report represents the first phase of a three-phase project. It establishes an evidence base by synthesising desktop research, technology scans, case studies and targeted stakeholder engagement with BBP members and industry experts. The work clarifies the current demand-side management landscape, assesses enabling technologies, maps key stakeholders and processes, and captures practical insights into capabilities, barriers and opportunities.

The findings provide a clear foundation for the next phases of the project: the co-design and delivery of best-practice guidance and targeted masterclasses to support commercial building owners and managers in activating flexible demand as part of their net-zero strategies.

Flexible demand and why it matters

Flexible demand refers to the ability of electricity users to vary when and how they consume energy in response to generation, network or market conditions. In the context of commercial buildings, it complements long-standing energy efficiency efforts by shifting the focus from simply reducing total energy use to optimising when electricity is consumed. This distinction is increasingly important in an electricity system that is rapidly transitioning towards renewable generation.

Australia's grids are now characterised by abundant, low-cost solar power during the day and higher prices, higher emissions intensity and greater system stress during early morning and evening peaks. Flexible demand helps address this imbalance by shifting controllable loads into periods of low prices and low emissions, while reducing demand during peak periods. In doing so, it improves grid stability, reduces renewable curtailment, and lowers the need for costly network augmentation.

For landlords, the case for engaging in flexible demand is driven by a combination of financial, operational, regulatory and strategic factors:

- **Lower energy costs**, including shifting electricity use to periods of low or negative wholesale prices, typically during the middle of the day when solar generation is abundant, reducing exposure to high morning and evening peak prices, and avoiding or reducing peak demand charges through load shifting, pre-cooling/pre-heating and on-site storage.

- **New revenue and incentive opportunities** through accessing price-based and market incentives such as network demand payments, demand response programs, Wholesale Demand Response Mechanism (WDRM) and Frequency Control Ancillary Services (FCAS).
- **Reduced electricity and carbon risk as buildings electrify**. Electrification removes on-site fossil fuel use but can increase electricity demand, particularly at peak times. Flexible demand helps reduce peak demand and avoid amplifying the impacts of electrification on electricity networks.
- **Lower Scope 2 emissions and stronger ESG performance** by aligning electricity consumption with low-emissions periods of the grid, particularly during solar-rich daytime hours. It strengthens the credibility of net-zero and ESG claims as grid emissions intensity becomes increasingly time-dependent, and takes advantage of the alignment between low prices and low emissions.
- **Improved grid resilience and avoided future costs** by reducing contribution to system peaks, helping defer network augmentation, supporting integration of higher levels of renewable energy with reduced curtailment, and helping maintain grid stability as the energy system becomes more dynamic.
- **Use existing building assets** by leveraging the inherent thermal inertia in buildings to shift HVAC loads, making use of flexible assets such as electric water heating, batteries and EV chargers.
- **Future-proofing building operations** by positioning buildings to respond to evolving policy, market and reporting requirements, and moving from an energy strategy focused only on "using less" to one focused on "using energy at the right time".

Stakeholders

Activating flexible demand in commercial buildings requires coordinated action across a complex and interdependent set of stakeholders. No single actor controls the conditions for success. Instead, implementation depends on engagement at multiple leverage points across the energy, property and regulatory ecosystem.

- **Building owners and managers** play a central role through their control over capital investment, lease structures and participation decisions, while **facility managers** are critical gatekeepers for day-to-day implementation and risk management.
- **Tenants** influence outcomes where they control internal loads or where comfort and operational impacts affect acceptance of flexible demand strategies.
- **Energy retailers, aggregators and virtual power plant (VPP) operators** shape the commercial viability of flexible demand through tariffs, contracts and market access, and can simplify participation by bundling loads across multiple sites.
- **Networks** have a role through connection arrangements and demand charges.
- Market bodies such as the **Australian Energy Market Operator (AEMO)** and **Australian Energy Regulator (AER)** devise market rules and administer incentive schemes that determine how flexible demand is valued and dispatched.
- **Governments, building standards bodies, NABERS** and the **Green Building Council of Australia** also shape incentives and expectations through policy settings, ratings and voluntary leadership programs. **Investors** and **lenders** increasingly reinforce these signals through capital allocation tied to energy and emissions performance.

Incentives and the business case for flexible demand

A wide and evolving set of incentives underpin the business case for flexible demand in commercial buildings, including electricity pricing, explicit schemes and emerging regulatory and reporting frameworks. Understanding how these incentives interact—rather than relying on any single mechanism—is critical to unlocking value.

Price-based incentives are the most widespread and immediate. They include:

- **Time-of-use tariffs, dynamic tariffs and wholesale price exposure**, which reward buildings that shift load away from morning and evening peaks towards the middle of the day, when solar generation is abundant and prices are low or even negative.
- Flexible demand can materially reduce energy bills through lower **peak and network demand charges**.
- Load shaping also improves **retail contract pricing**, as retailers offer better rates to customers whose demand profiles align with low-cost generation.
- Under **partially firmed corporate PPAs**, flexible demand further enhances value by helping manage residual price and volume risk.

Scheme-based incentives provide additional value streams, usually mediated via a retailer or aggregator. These include:

- AEMO markets that pay for flexibility or capacity: **Wholesale Demand Response Mechanism (WDRM), Frequency Control Ancillary Services (FCAS)** and **Reliability and Emergency Reserve Trader (RERT)**.
- **Network payments**, where flexible demand can defer or avoid network augmentation.
- The **NSW Peak Demand Reduction Scheme (PDRS)**, which creates a clear incentive for capacity reductions during summer peak periods, often monetised through upfront rebates for enabling technologies such as HVAC controls.
- **Battery incentives and VPP participation** can further strengthen the business case for highly responsive loads.

Regulatory, reporting and strategic incentives are becoming increasingly important.

- The transition from LGCs to time-stamped **Renewable Energy Guarantee of Origin (REGO)** certificates, alongside proposed changes to **Scope 2 emissions accounting**, will favour buildings that can align electricity use with renewable generation.
- **Updates to the National Construction Code** will make new buildings 'flex-ready' by mandating metering, controls and monitoring capabilities.
- **NABERS** is expected to evolve to incentivise flexible demand.

Taken together, these incentives position flexible demand as a multi-value proposition—reducing costs, managing risk, supporting credible emissions reporting and future-proofing commercial building portfolios.

Technologies and products

Commercial buildings already possess many of the physical assets needed to participate in flexible demand. The opportunity lies in how these assets are controlled, integrated and operated.

HVAC systems are the single most important source of flexibility, typically accounting for up to half of a commercial building's electricity consumption. Modern building management systems allow HVAC demand to be shaped, shifted or temporarily reduced while maintaining acceptable comfort levels. Common strategies include pre-cooling or pre-heating using building thermal mass, adjusting temperature setpoints within agreed bands, optimising fan speeds and plant staging, and shifting ventilation schedules. Building design matters: well-insulated buildings with exposed thermal mass and modern controls are generally more flexible and better able to reduce peak demand.

Electrification, particularly replacing gas boilers with heat pumps, both increases electricity dependence and expands the scope for flexibility. When combined with demand-aware controls, electrification upgrades can reduce peak demand, avoid network and substation upgrades, and strengthen the overall business case.

Thermal energy storage (TES) further enhances HVAC flexibility by decoupling electricity use from thermal comfort. Chilled-water or hot-water storage enables energy-intensive plant to operate during low-cost, low-emissions periods while meeting demand during peak periods without running equipment. TES can also improve system efficiency and reduce required plant capacity.

Hot water storage, battery energy storage systems, and electric vehicle charging provide additional, highly flexible loads. Batteries and EV chargers are particularly well suited to dynamic tariffs and market participation due to their rapid responsiveness, while hot water storage systems can be readily scheduled to avoid peak demand.

Underlying these assets is a growing stack of digital control systems, including BMS, energy management systems, asset-specific controllers and market-facing platforms such as virtual power plants (VPPs).

Together, these technologies transform buildings from passive energy consumers into dispatchable, grid-interactive assets capable of responding to prices, emissions signals and network needs.

Industry insights

Industry stakeholders widely agree that flexible demand is important for commercial buildings, but practical adoption remains at an early stage. Survey respondents rated their personal understanding of flexible demand at 3.72 out of 5, yet organisational capability to implement it scored only 3.22 out of 5. Enthusiasm is consistently tempered by uncertainty about execution, tenant impacts and risks.

The most significant gaps are not conceptual but practical. Stakeholders are unsure which loads can be shifted, what control strategies to use, and how to integrate flexibility with existing building systems without breaching lease agreements or disrupting tenant comfort.

The business case remains unconvincing for many: financial returns are unclear, and there are fears that flexibility measures could trigger lease penalties, reduce energy efficiency ratings, or become obsolete as technologies and market conditions evolve. Complex energy contracting and limited in-house expertise further slow progress.

To move from interest to action, stakeholders identified three conditions that must align:

1. energy procurement arrangements that reward flexibility
2. enabling technologies such as smart controls and on-site storage, and
3. sufficient operational capability, whether through internal skills or third-party support, to manage flexible loads reliably.

Additional enablers include practical guidance tailored by asset class, credible real-world case studies, simplified and automated participation models, and policy or rating frameworks that reward flexible demand rather than inadvertently penalising it. Addressing resource constraints through aggregator partnerships or outsourced delivery was also seen as critical.

Key barriers include implementation complexity, tenant and lease constraints, physical limitations of some buildings, demand patterns that restrict flexibility, and a perceived lack of reward for effort.

Risks centre on battery safety and insurance, stranded assets from shifting market conditions, and reputational damage if flexibility programs coincide with service disruptions, whether or not the program is the cause.

Despite these concerns, stakeholders identified clear opportunities: energy cost savings or revenue, alignment with electrification and net-zero strategies, and strategic positioning as industry leaders. Collaborative approaches, such as pooling flexible loads across sites via aggregators, could also broaden participation and address equity concerns.

Contents

1 INTRODUCTION

Australia's non-residential buildings account for approximately 25% of total electricity consumption and 10% of overall carbon emissions (DCCEEW, 2022). Recognising this, the City of Sydney, through the Better Buildings Partnership (BBP), has been leading significant reductions in emissions from commercial buildings through energy efficiency and electrification.

Commercial buildings also account for a significant proportion of peak electricity demand on hot summer afternoons. Reducing peak demand from non-residential buildings by 33% would add an estimated 2.6 GW of capacity (5.6%) to Australia's electricity grids (Denniss & Roussac, 2024).

The 39 PJ of fossil gas currently used by commercial buildings is expected to largely electrify by 2050, increasing electricity demand on the grid. A new phase for innovation leaders in the commercial building sector is to increase the flexibility of this electricity demand. Flexible demand represents a largely untapped opportunity to save money and reduce emissions while supporting an orderly transition to a more resilient, low-carbon electricity system.

To harness this opportunity, the City of Sydney, through the BBP, has commissioned the UTS Institute for Sustainable Futures, together with its partners Positive Zero and Buildings Alive, to investigate how the commercial building sector can better engage in flexible demand. The project responds to a clear need for practical guidance that demystifies the business case, barriers, benefits and opportunities associated with load shifting, grid-interactive buildings, and enhanced demand flexibility, as key strategies on the path to net zero for commercial building owners.

The project will be delivered in three phases, with this discovery report forming the first phase. It aims to establish a robust evidence base on how commercial office buildings within the BBP can participate in flexible demand by consolidating existing information, case studies, scenarios and technologies. This will clarify the drivers for change, as well as associated costs, benefits, barriers, gaps and opportunities.

Specifically, this report will:

- **Clarify the demand-side management landscape** by reviewing definitions, market mechanisms, NSW and Australian activity, international best practice, seasonal renewable generation and price profiles, and the range of incentives available (explicit and implicit).
- **Assess what works in practice** through case studies that illustrate best practice, and identify approaches suited to different building types, operational scenarios and contractual arrangements (e.g. PPAs).
- **Evaluate enabling technologies** that support demand flexibility, highlighting benefits, risks and current limitations.
- **Map stakeholders** to understand who needs to be involved and when, how definitions and responsibilities differ across stakeholder groups, and what practical obstacles exist in implementing demand-side management at the building level.
- **Capture industry insights** through BBP member surveys and interviews to identify awareness levels, capabilities, barriers, enablers, risks and opportunities for coordinated action.

- **Integrate learnings from existing and forthcoming initiatives** such as the GBCA Time of Energy Use Leadership Challenge, while exploring alignment with NABERS, proposed changes to calculating Scope 2 emissions under carbon reporting frameworks, and broader net-zero requirements.
- **Define the business case and change drivers** across financial, network, operational, and certification perspectives.

Grounded in current evidence, industry needs and practical implementation pathways, these insights will directly inform the scope, design and content of the next phases—the co-design and delivery of best-practice guidelines, and the delivery of two Masterclasses.

2 METHODOLOGY

The discovery phase applies a combination of desktop research and stakeholder engagement to build a comprehensive understanding of the opportunities, barriers and enablers for flexible demand in BBP commercial buildings. The key activities are outlined below:

Inception and project planning

The project commenced with an inception meeting between the project team and City of Sydney representatives. This session confirmed the proposed approach, clarified next steps, and began identifying priority references, case studies and stakeholders to inform the discovery phase.

Literature and market review

A detailed review of existing literature, data sources and case studies was undertaken to map the current landscape of flexible demand in commercial buildings. This included examining national and international best practice, regulatory settings, market mechanisms, and incentive schemes relevant to the NSW context.

Technology scan

The team identified technology products and systems that enable flexible demand and time-of-use or dynamic procurement strategies. This assessment included building analytics platforms, smart metering solutions, automation tools, and AI-based forecasting technologies, with a focus on their benefits, risks, and applicability across different building profiles.

Stakeholder process mapping

Stakeholder process mapping identified key actors (including building owners, facility managers, retailers, aggregators and regulators) and documented their roles, interests and influence in the implementation of flexible demand. This mapping clarified engagement points across the ecosystem.

Survey and interview design

Targeted survey and interview questions were developed to capture stakeholder insights, capability gaps and practical barriers. The questions were tailored to ensure the discovery work accurately reflects industry practice and supports the development of relevant guidance for the commercial sector.

Stakeholder engagement: surveys and interviews

Surveys and interviews were conducted with BBP members and industry experts to gather both qualitative and quantitative insights on current practices, challenges and opportunities for activating flexible demand. This engagement ensured the findings were grounded in operational reality.

Case studies

Drawing on stakeholder suggestions, several relevant case studies have been identified. These will be further developed through the guide to illustrate best-practice approaches to flexible demand in commercial buildings.

Engagement with GBCA and NABERS

Meetings with the GBCA and NABERS ensured alignment with existing industry initiatives and standards. These discussions provided important context for integrating relevant frameworks, such as the Time of Energy Use Leadership Challenge and NABERS recognition pathways, into the project outputs.

Output: discovery report (internal use only)

Findings from the market review, technology scan and stakeholder engagement were synthesised into this discovery report. This document identifies key themes, gaps and opportunities specific to BBP office buildings and forms the foundation for the development of the forthcoming best-practice guidance.

Partner review

Feedback from BBP members has been incorporated into this report. This iterative refinement ensures that the outputs are accurate, relevant and responsive to stakeholder needs.

3 BACKGROUND

3.1 Terminology

In this report, we focus predominantly on *flexible demand* (FD), which is defined by the Australian Renewable Energy Agency (ARENA) as "the capability to vary customer demand in response to generation, network, or market signals" (Briggs *et al.*, 2024).

Demand-side management (DSM) is a broader term that encompasses flexible demand as well as demand reduction through long-term energy efficiency programs, while *demand response* (DR) is a specific type of flexible demand that usually involves temporarily reducing consumption, often in response to a network or other external signal.

3.2 What is flexible demand?

There are several types of flexible demand, such as:

- **Shape**—Permanently changing an energy consumption profile (e.g. setting a water heater to operate only during off-peak windows to take advantage of a lower tariff or avoid a peak demand charge).
- **Shift**—Bringing forward or delaying consumption (e.g. pre-cooling a building in the middle of the day to take advantage of low prices when there is surplus solar generation).
- **Shed**—Avoiding high prices by temporarily reducing consumption (e.g. switching off or reducing HVAC loads in response to an event notification and in exchange for incentive payments).
- **Shimmy**—Very rapid changes in demand to manage frequency over millisecond-to-second timescales (e.g. charging or discharging a battery to access FCAS payments).

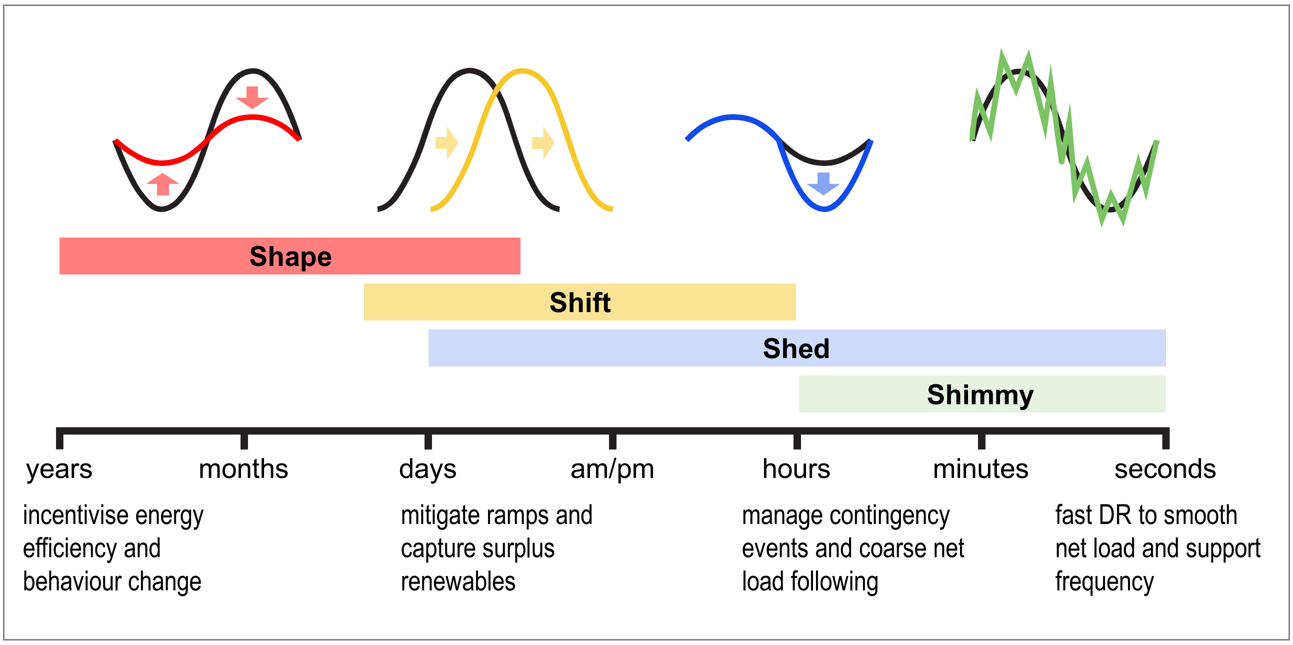

Figure 1. The different types of flexible demand operate over different timescales, from years to fractions of a second.

Flexible demand can also be classified in other ways, such as:

- **Flexibility action**—*permanent* (e.g. setting the timing of water heaters from nighttime to midday), *regular* (e.g. shifting the timing of HVAC to pre-cool a building in response to price signals), or *event-based* (e.g. shedding load during a high-price event in response to a network signal).
- **Responsiveness**—*passive* (i.e. responds to predictable incentives such as time-of-use tariffs) or *active* (i.e. responds in near real time to market signals such as wholesale prices or network stress).
- **Incentives**—which include non-financial incentives (largely related to emission tracking and ESG reporting) and price-based incentives such as electricity tariffs, the Wholesale Demand Response Mechanism (WDRM), Network Demand Management, FCAS (fast frequency response via flexible loads), RERT (Reliability and Emergency Reserve Trader), the Peak Demand Reduction Scheme (PDRS) and network payments. Multiple incentives can sometimes be stacked. See *Incentives* on page 23.

3.3 Why does flexible demand matter?

The rise of renewables

Australia's electricity grids are rapidly changing. As shown in Figure 2, we are roughly halfway through a transition from a grid dominated by fossil fuels (coal and gas) to one dominated by renewable energy (solar, wind and hydro). In the last quarter of 2025, about half of Australia's grid electricity was supplied from renewable sources (AEMO, 2026).

This transition is being driven by both the environmental imperative to decarbonise our economy and the economic reality that renewables are now the cheapest source of electricity.

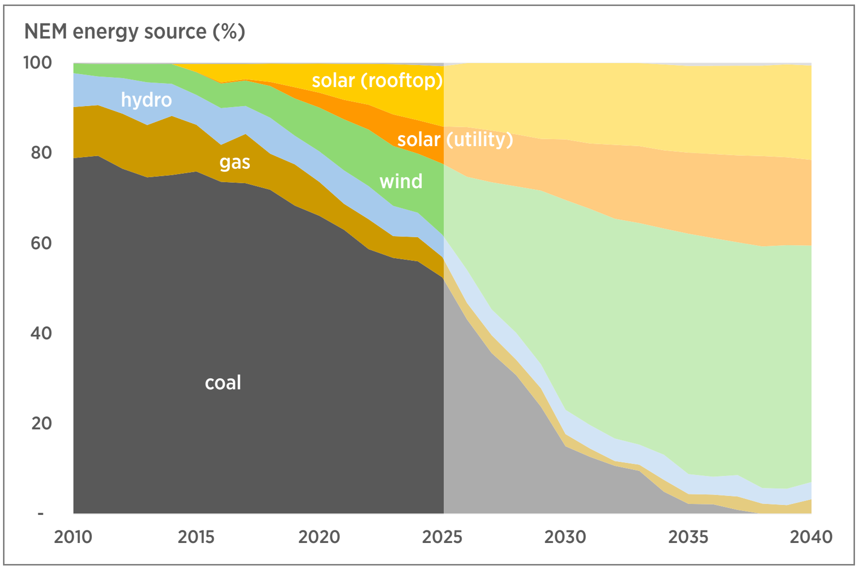

Figure 2. The historical and projected proportion of electricity generation in the NEM from fossil (coal, gas) and renewable (hydro, wind, solar) sources. Data source: Open Electricity, using historical data and AEMO's Step Change 2024 scenario.

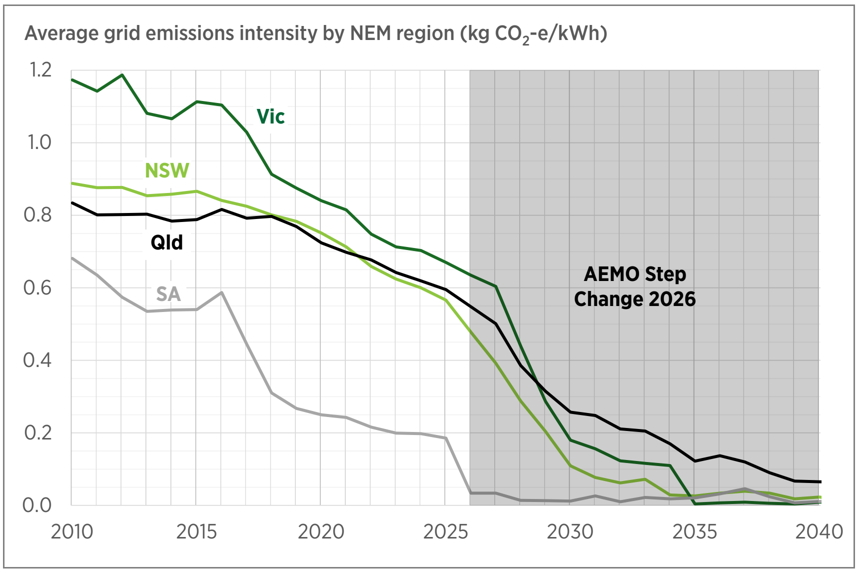

Figure 3. The emissions intensity of the grid has been reducing over time as the proportion of renewable energy increases. Emissions are projected to continue to decrease under AEMO's draft Step Change 2026 scenario. Data source: Open Electricity.

Maintaining grid stability

The influx of cheap renewables into the grid, particularly solar, is pushing down net demand in the middle of the day. Net demand then rises steeply later in the afternoon as solar generation falls and underlying demand increases, resulting in a so-called 'duck curve' (Figure 4 and Figure 5). By shifting flexible loads into the middle of the day, flexible demand reduces oversupply and curtailment of renewables while ensuring there is sufficient daytime demand to maintain grid stability. And by reducing demand during the evening peak, it reduces or defers the need to augment the grid, reducing the cost of distributing electricity.

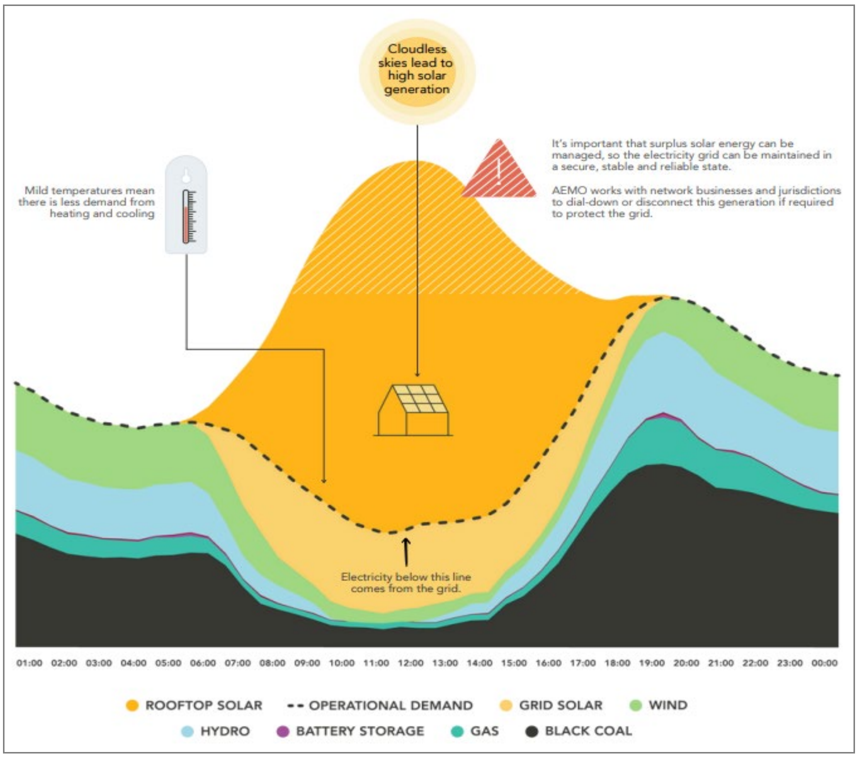

Figure 4. Much of our daytime electricity demand is now met by rooftop solar, which can result in a very low net demand during the day. Source: Solar Sharer Offer (SSO) Consultation Paper 2025–26, DCCEEW.

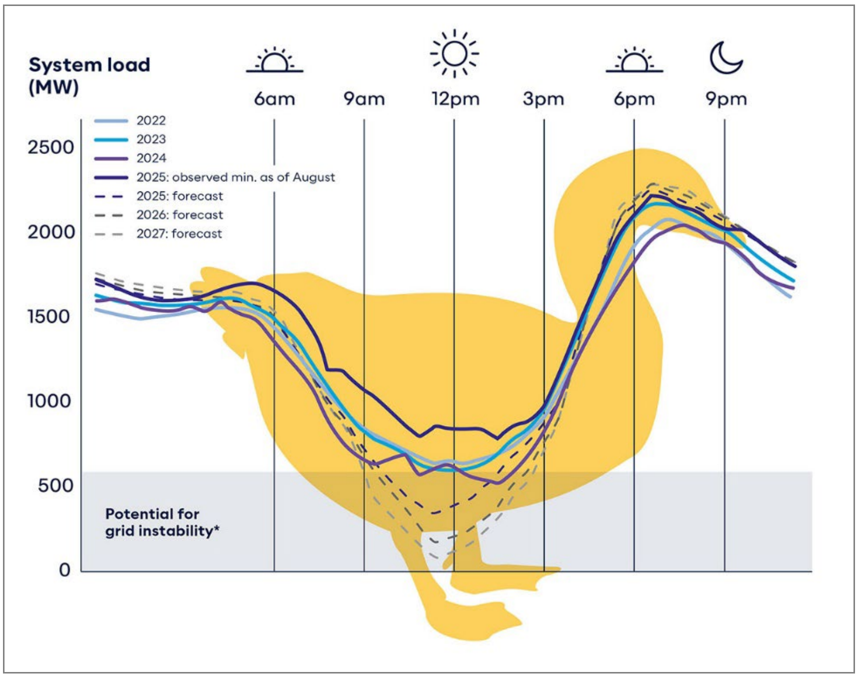

Figure 5. The 'duck curve' results from increasing availability of solar, which is pushing down net demand in the middle of the day and can make the grid unstable. Source: synergy.net.

Saving money by controlling time of use

The abundance of cheap solar energy in our grid is also having a dramatic effect on wholesale electricity prices. There is now such an abundance of solar and wind generation that much of it is wasted or 'curtailed'. In 2025, curtailment levels exceeded 20% for utility-scale solar and 10% for wind. As a result, prices are often very low (or even negative) throughout much of the day and relatively high during the morning and evening peak demand periods, as shown in Figure 6 and Figure 7.[1]

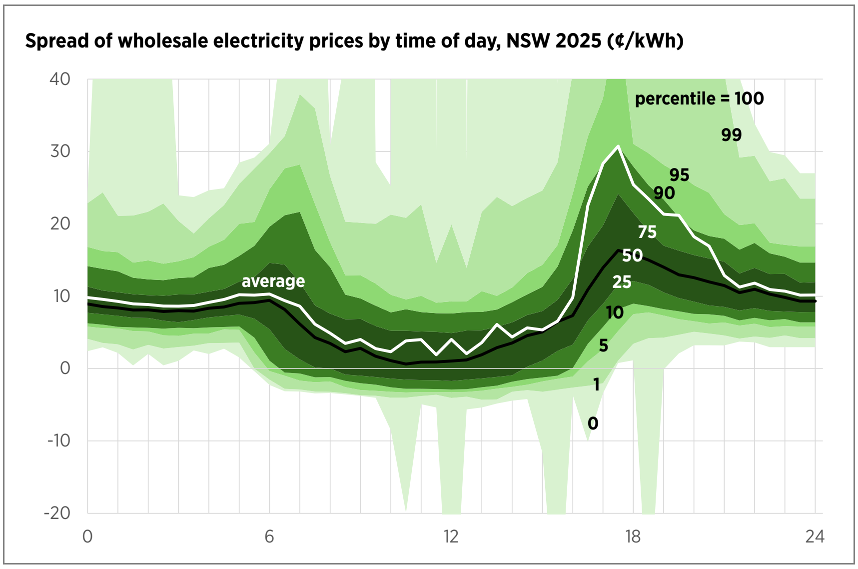

Figure 6. Current wholesale electricity prices are usually much lower in the middle of the day than in the morning or early evenings. Data source: AEMO.

1 Examples given are for NSW, which is broadly representative of most other Australian states. The exceptions are Tasmania, which has a very high proportion of low-emissions hydroelectricity, and South Australia, which has no coal generation, a much higher proportion of solar and wind, and a high proportion of electricity imports from Victoria and NSW.

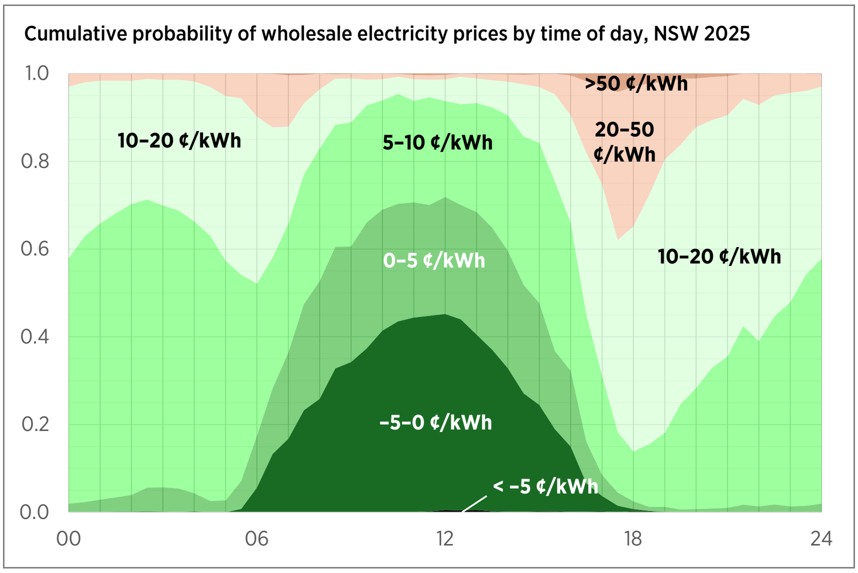

Figure 7. A large surplus of solar power in the middle of the day is driving low-to-negative wholesale electricity prices. Data source: AEMO

Variable wholesale pricing presents significant opportunities to businesses that can change when they use electricity. In particular, shifting demand away from morning and (especially) evening peaks and towards the middle of the day can reduce energy bills.

Reducing emissions

As shown in Figure 3, the emissions intensity of the grid has been decreasing in recent years, and is projected to continue decreasing as renewable energy displaces fossil fuels.

As a result of the high penetration of solar into our grid, daytime electricity emissions can be several times lower than evening emissions, as shown in Figure 8.

There is now a strong synergy between the price and emissions intensity of grid electricity. That is, energy is generally more expensive when it is dirty and cheaper when it is clean, as illustrated in Figure 9.

In summary, flexible demand can save businesses money, reduce carbon emissions, help make the grid more stable and efficient, and facilitate increased penetration of renewables in the grid.

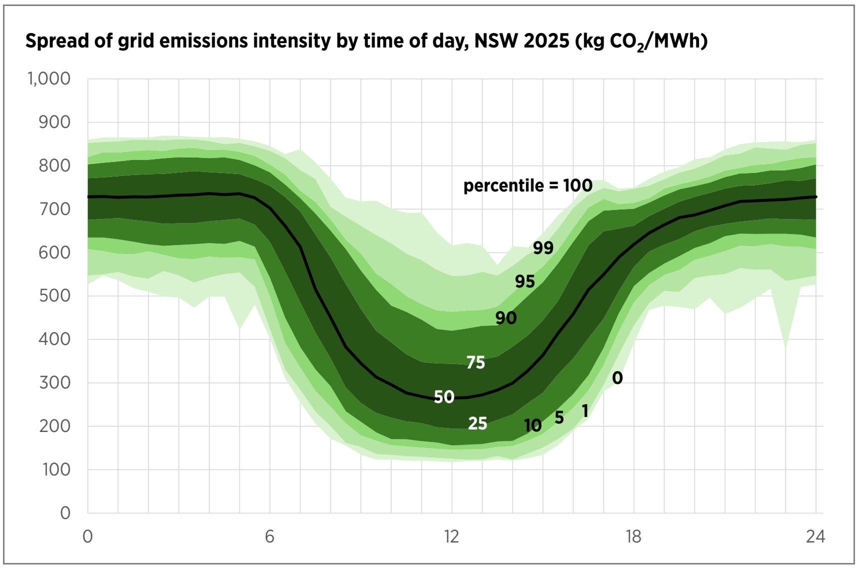

Figure 8. When the emissions intensity of the grid is tracked in real time, abundant solar power is dramatically reducing daytime emissions, while evening emissions remain high. Data source: Open Electricity.

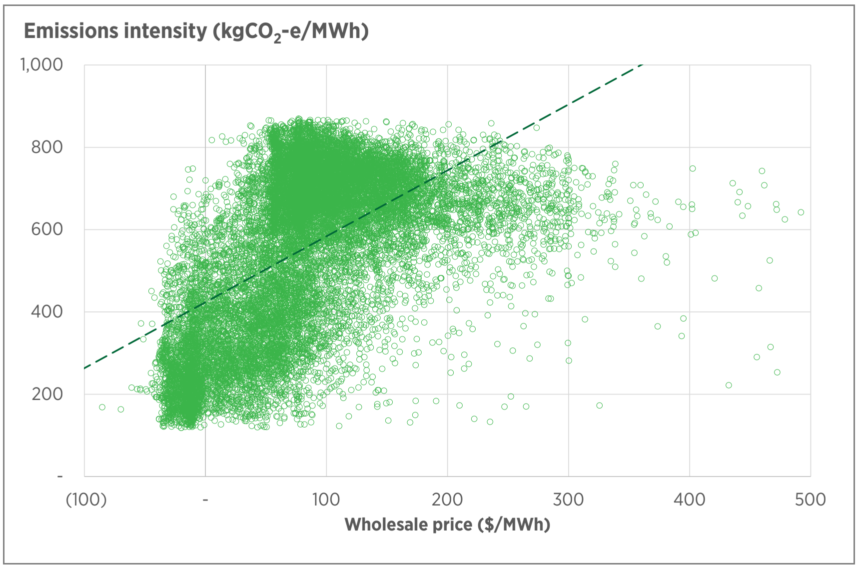

Figure 9. NSW/ACT emissions intensity as a function of price for 2025. Time resolution = 30 min. Prices above $500/MWh removed. Data sources: AEMO and Open Electricity.

Efficiency and flexibility

Demand management includes both flexible demand and energy efficiency. Efficiency is important for reducing overall energy use, which can reduce bills, reduce emissions, and reduce costs for energy networks to benefit all electricity customers. Importantly, energy efficiency can reduce peak demand, which is one of the key objectives of flexible demand.

The increasingly dynamic nature of both energy prices and emissions intensity means that flexible demand can complement energy efficiency in meeting the objectives of reducing costs and emissions.

Delivering flexible demand requires three main conditions: controllability, timing and responsiveness. However, efficiency-only thinking can undermine all three of these conditions.

In our rapidly changing energy system, the mindset of energy consumers should shift from simply 'use less energy' to 'use less energy when the grid is dirty'. That is, energy consumers should focus less on minimising total energy consumption and more on minimising costs and emissions. As explained above, not all megawatt-hours of electricity are equal. Some are cheap and some are expensive. Some are created by burning fossil fuels, while others are created from renewables.

An approach to optimising energy use that focuses on flexible demand is likely to use more energy than one that focuses only on minimising overall energy demand. However, much of this additional energy will come from zero-emissions renewable sources that otherwise would have been wasted. For example, using more energy in the middle of the day can reduce curtailment of abundant solar energy, whereas using energy in the evening during the peak demand window does not.

Despite the current abundance of excess renewable energy, demand for electricity is growing rapidly, driven by population growth, electrification, and data centres. Hence increasing energy productivity through efficiency will remain an essential part of best practice for energy management in commercial buildings.

3.4 Flexible demand in commercial buildings

Commercial buildings often use more electricity at certain times, such as:

- **Cold or hot weather**—more heating or cooling load is required to maintain comfortable temperatures. More heating load is required in winter if it is cloudy or windy, and more cooling load is required on hot afternoons to maintain temperatures, especially after morning cloud has 'burned off' and the building's thermal inertia has been exhausted.
- **Early mornings** (especially Mondays)—more heating or cooling load may be required to bring the building to within the desired temperature range after a period of overnight inactivity, and much equipment starts up for the working day.
- **Evenings**—when restaurants and entertainment venues provide services and food stores replenish refrigerated food.
- **Overnight**—when many buildings' electricity consumption has historically been designed to make use of cheap coal-fired electricity.

The main flexible load of a commercial building is its heating, ventilation and air conditioning (HVAC) system (see *HVAC systems* on page 33). Commercial buildings inherently have a large amount of thermal inertia, meaning they can take a while to heat up or cool down. A high thermal inertia helps the building to maintain a relatively constant temperature. It also means that the time at which the building is heated or cooled can be varied, within reason. For example, by 'pre-cooling' or 'pre-heating' a building, i.e. running the HVAC system earlier than usual, the building load can be shifted to lower cost and/or emissions.

To increase the amount of thermal inertia in a building's HVAC system, a thermal energy storage (TES) system can be added, such as a closed-loop water system and thermal storage tank (see *Thermal energy storage systems* on page 34).

Simple procedure changes can also aid in reducing peak demand from HVAC systems. For example, a poorly timed stair pressure test can add to peak demand and increase peak demand charges. A simple procedure change to conduct such tests outside the peak demand window can save money.

Another highly flexible load is electric water heating. Heated water is typically stored in an insulated tank, meaning it can be heated during the day and used as required.

While most other commercial building loads, such as lighting and lifts, tend not to be very flexible, there are two other flexible loads worth considering: batteries and electric vehicle chargers.

A grid-connected battery is a relatively easy way for a commercial building to flex its load (see *Battery energy storage systems* on page 36). The battery can be charged during the day or when the rest of the building load is low, and discharged during peak demand periods to reduce net demand. Batteries can provide other key advantages, such as supplying critical loads during outages, improving power quality to protect sensitive equipment, and reducing reliance on other backup options such as a diesel generator.

An increasing number of commercial buildings include electric vehicle (EV) chargers (see *Electric vehicle chargers (EVSEs)* on page 38). An EV is essentially a large battery on wheels. Vehicles that are plugged in for an extended period do not need to be constantly charged. Instead, a charge management platform can be used to schedule charging for during the day to reduce costs and emissions.

3.5 Flexible demand and electrification

The electrification of commercial buildings and the rise of flexible demand are increasingly interdependent stages in the transition to low-carbon buildings. A few years ago, widespread electrification of commercial heating systems was not seen as business-as-usual, but this has changed rapidly. In new commercial buildings, all-electric designs are now common, and across the existing stock gas boilers are progressively being removed as part of plant upgrades and decarbonisation strategies. With electrification becoming the norm, flexible demand represents the next step in the evolution of low-carbon commercial buildings, shifting the focus from what energy is used to when and how it is used.

A central driver for electrification has been the desire to eliminate Scope 1 GHG emissions associated with on-site gas combustion. For many organisations, reliance on offsets to neutralise Scope 1 emissions is increasingly viewed as inconsistent with credible net-zero claims. Electrification removes this exposure but, in doing so, transfers responsibility to managing Scope 2 emissions, making the emissions intensity and timing of electricity consumption far more consequential. This strengthens the case for flexible demand, as buildings seek to align electricity use with lower-emissions periods of the grid and to actively manage their contribution to peak demand.

However, electrification also increases the technical and operational challenge for the electricity system and for building owners. Higher winter electrical loads are an obvious concern, but a subtler issue is the potential increase in electricity consumption owing to dehumidification strategies. Many commercial buildings currently cool air with electric chillers and then reheat it using gas boilers, even in summer conditions such as hot, humid days in Sydney. If gas reheat is replaced with heat pumps without rethinking the underlying dehumidification and air-handling strategy, electricity demand can increase significantly. Flexible demand—through load shifting, thermal storage, adaptive HVAC control, and revised dehumidification approaches—is therefore critical to ensuring that electrification delivers genuine emissions reductions without simply transferring and amplifying peak electricity demand.

3.6 Maintaining thermal comfort

Adjusting temperature control bands and setpoints is a simple and cost-effective way to improve a building's energy efficiency. However, building owners are reluctant to employ this as a flexible demand strategy because of risks associated with rigid tenancy agreements that have stiff financial penalties for breaching thermal limits.

Thermal adaptation is an effect where people adapt their perception of comfort to their thermal environment, including lower temperatures in winter and higher temperatures in summer. With seasonal temperature setpoints and encouraging staff to dress appropriately for the season, energy savings of 10–15% can typically be achieved. Recommended HVAC settings for maintaining acceptable comfort conditions with reasonable energy efficiency are 20–22°C for winter and 24–26°C for summer. By comparison, typical commercial setpoints are 22–22.5°C all year round. Comcare guidelines for Air Conditioning and Thermal Comfort in Australian Public Service buildings suggest 20–26°C as an acceptable temperature range for indoor workspaces in Commonwealth buildings. Importantly, any changes to indoor temperature setpoints should be applied gradually to reduce the perceived impact of the change for occupants (AIRAH, 2015).

Although much of the literature on the topic is focused on the energy savings available from widening temperature bands, a quick scan indicates that there is evidence this can be done without adversely affecting occupant comfort if carefully monitored and undertaken in consultation with occupants. Evidence is available to support lease negotiations for less-stringent temperature controls, reducing the risks associated with using HVAC for flexing demand.

- A review of the literature (Aghniaey & Lawrence, 2018) concerning the impact of temporarily increased cooling setpoint temperatures on occupant thermal comfort during demand response events in commercial, air-conditioned buildings found that, although increased zone setpoint temperatures during the cooling season can adversely affect building occupants, in some cases improved occupant thermal comfort owing to warmer zone setpoint temperatures during DR events was also reported.
- A Netherlands study (Coutinho, 2023) on the impact of lowering temperature setpoints on occupants' thermal comfort in office buildings emphasised the need to consider individual differences and the importance of adequate thermal control in office design and energy saving measures.
- A Korean study (Jeong *et al.*, 2025) combining energy simulations and occupant *in situ* surveys found that adaptive thermal comfort-based setpoint temperature control in public buildings could improve energy efficiency without compromising occupant comfort.
- A Sydney University laboratory study (Zhang *et al.*, 2017) tested a change in temperature setpoint on the productivity and comfort of 26 office workers and found that test results and thermal comfort were not jeopardised by a higher temperature of 25°C. An earlier experiment (Zhang, 2016) to test subjects' acceptance of condition changes due to direct load control events (a form of DR) found that subjects' thermal comfort zone was wider than predicted by models and concluded that ASHRAE 55-2013 is overly conservative in defining the limits for temperature cycles, ramps and drifts.

4 STAKEHOLDER MAPPING

4.1 Stakeholders

Implementing flexible demand in commercial buildings is complex and involves multiple interrelated stakeholders. **Figure 10** illustrates the financial and other relationships among these stakeholders.

Table 1 provides a summary of the roles, interests and influence of the various stakeholders. Multiple stakeholders are rated as having a medium or high influence, indicating that there is no single gatekeeper that controls this space. Instead, multiple stakeholders must be engaged at multiple leverage points to implement and activate flexible demand in commercial buildings.

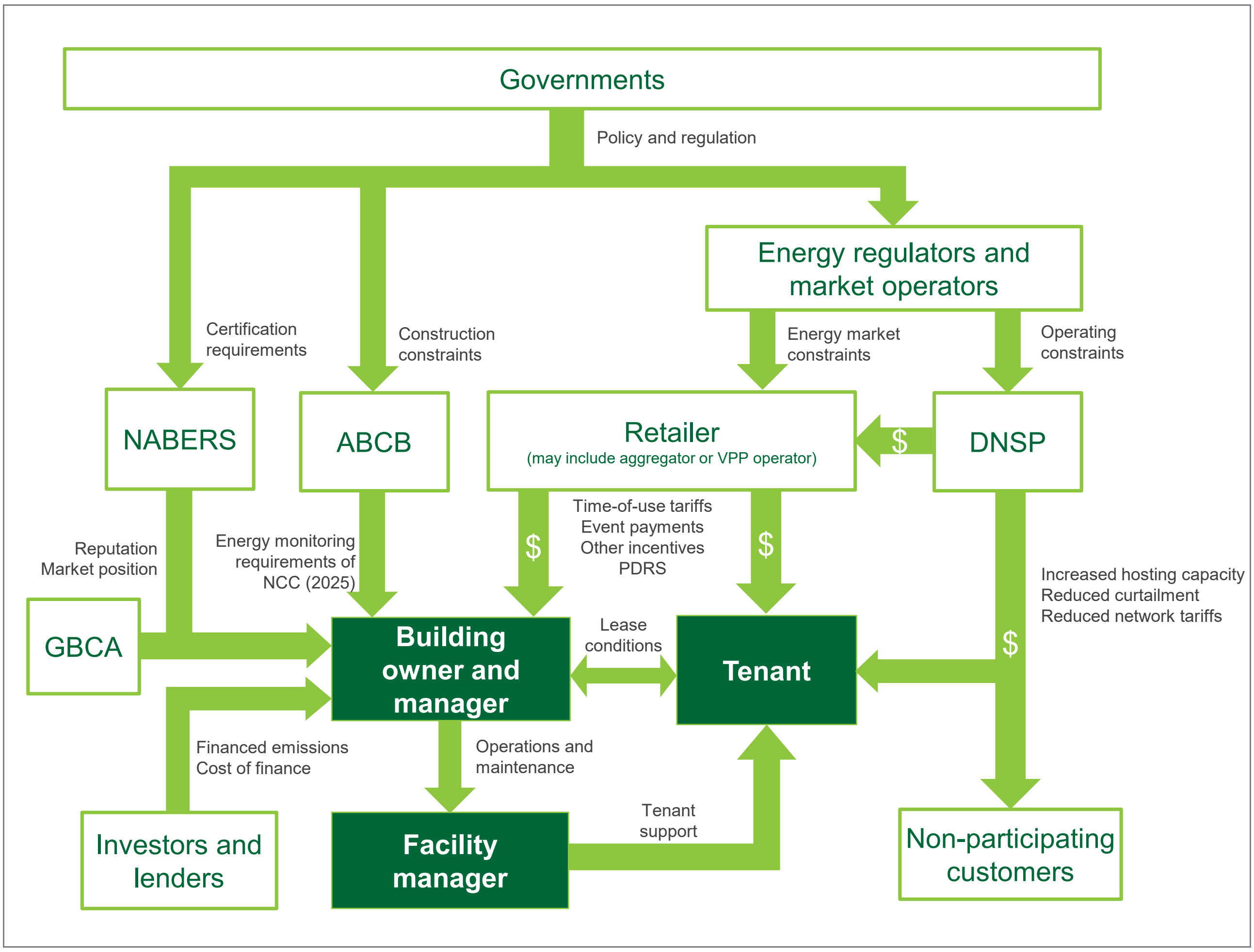

Figure 10. *A map of key stakeholders relevant to implementing and activating flexible demand in commercial buildings, and the financial and other relationships between them.*

Table 1. A summary of the roles, interests and influence of stakeholders relevant to implementing and activating flexible demand (FD) in commercial buildings.

Stakeholder	Role	Interest	Influence
Building owners and managers	Control major capital decisions (HVAC plant, controls, storage) and decide whether a building participates in FD programs.	Reducing opex, improving asset value, meeting ESG commitments, and maintaining reputation. Interest is often conditional on tenant acceptance and contractual arrangements.	**High.** Can enable or block FD through investment decisions and lease structures, even if they do not directly operate building systems.
Facility managers	Operate and maintain building systems (HVAC, BMS, lighting, lifts). Implement and sustain FD actions.	Reliability, occupant comfort, risk management, and operational simplicity. Cost savings are attractive, but only if flexibility does not increase fault risk or workload.	**High.** Critical gatekeepers for implementing FD.
Building tenants	End users of energy services and often control internal loads and schedules that enable or constrain FD.	Energy cost reductions, comfort, business continuity, and increasingly corporate decarbonisation targets. Interest varies depending on who pays the energy bill and how leases allocate benefits.	**Medium.** Strongly influence outcomes where they control loads or resist changes, but typically lack authority over base-building systems.
Australian Building Codes Board (ABCB)	Responsible for NCC, which sets minimum energy performance requirements, including physical capability of buildings to enable or constrain FD.	Delivering safe, functional, energy-efficient buildings aligned with national emissions-reduction and energy-productivity goals.	**Medium**. NCC requirements strongly influence long-lived building design choices, including FD capabilities.
Distribution Network Service Providers (DNSPs) (e.g. Ausgrid, Endeavour Energy)	Manage local network capacity and reliability and increasingly procure FD to ease network capacity constraints.	Maintaining power quality, and managing minimum-demand and peak-demand risks at lowest cost, for example through deferred network augmentation.	**High.** Set connection arrangements, DOEs and network incentives such as capacity (demand) charges that strongly affect value of FD.
Energy retailers (e.g. AGL, Origin, Flow Power)	Aggregate customer load, offer tariffs and DR programs, and interface with wholesale and ancillary service markets.	Reducing peak procurement costs, managing risk, developing differentiated products, and capturing value from FD.	**High.** Shape customer incentives and can make FD financially attractive through pricing and contract design.
Aggregator VPPs (e.g. Enel X, Diamond Energy, DNA Energy)	Bundle flexible loads across sites and dispatch them as a coordinated resource into wholesale, ancillary service, or network support markets.	Access to reliable, scalable FD with predictable performance and clear contractual rights.	**High.** Can unlock participation by simplifying market access, but depend on DNSP and customer cooperation.
Energy regulators & market operators (AEMO, AEMC, AER)	Set rules, market frameworks, and operational requirements for demand participation and system security.	System reliability, consumer protection, efficient markets and integration of CER and FD at scale.	**High.** Regulatory settings determine whether FD can be valued, dispatched and trusted at system scale. AER regulates demand charges and tariffs, while AEMO regulates the NEM and other markets.
Governments	Set policy direction, fund pilots, regulate energy and buildings, and act as large building owners and tenants.	Emissions reduction, system reliability, cost-of-living outcomes, economic efficiency.	**High.** Governments shape incentives, funding and regulation that determine viability of FD in practice.

Stakeholder	Role	Interest	Influence
NABERS	Provides mandatory energy performance ratings that influence investment, leasing, and reputational outcomes for commercial buildings.	Maintaining credible, outcome-based energy ratings while adapting to current trends of electrification and FD.	**Medium.** Its metrics strongly shape owner and tenant behaviour. Current lack of recognition and hence incentives for FD. To the extent FD increases energy consumption there is a disincentive.
Green Building Council Australia (GBCA)	Responsible for voluntary Green Star rating scheme. Green Star rated buildings demonstrate sector leadership.	Enabling zero-carbon, electrified buildings through Green Star ratings and programs such as the Time of Energy Use Leadership Challenge.	**Medium.** Green Star shapes owner and tenant behaviour. Peak demand reduction for grid resilience and energy-efficient performance is rewarded.
Investors and lenders	Provide capital for buildings, retrofits, and enabling technologies.	Risk-adjusted returns, asset resilience, and alignment with sustainability and disclosure requirements (including 'financed emissions').	**Medium.** Capital availability and cost increasingly depend on demonstrated energy and emissions performance, indirectly supporting FD.
Non-participating customers	Other electricity customers who do not actively participate in FD programs.	Reliable supply and fair cost outcomes.	**Low.** Policy justification for FD often rests on delivering system-wide benefits to all customers.

Energy retailers, VPPs and aggregators

Privatisation of our electricity industry has resulted in three main electricity businesses—generators (which generate electricity), network service providers (which transmit and distribute electricity), and retailers (which sell electricity to customers). To this mix must now be added a fourth player, the aggregator.

Aggregators can offer their customers services that involve flexible demand, such as participation in a virtual power plant (VPP). A VPP is a network of consumer energy resources (CERs), such as rooftop solar, batteries and flexible loads, coordinated by software to operate as a single power plant. By aggregating many small systems, a VPP can act like a generator of electricity. The VPP reduces demand or provides grid services during peak periods, improving reliability and enabling greater use of renewable energy. VPPs are big enough to participate in wholesale and other electricity markets that are open only to larger participants. VPP customers can therefore receive some of the benefit from participating in these markets through their VPP operator.

VPPs can also create value for DNSPs through reduced peak demand on network assets. The DNSP may pay the VPP operator for providing these network services.

In addition to VPPs operated by aggregators, many electricity retailers operate their own VPPs. The retailer can use the VPP to reduce its operating costs. These retailer VPPs sit alongside and compete with aggregator VPPs.

5 INCENTIVES

Incentives for flexible demand can be grouped into price signals, explicit schemes, and regulatory or reporting drivers. These incentives operate differently, target different decision-makers, and vary in visibility and reliability. Understanding how they interact is critical to building a robust business case for commercial buildings.

There are a range of incentives for rewarding energy customers for flexing their demand, as summarised in Table 2. Incentives can be price-based (e.g. delivered through electricity tariffs), scheme-based (i.e. delivered through programs, contracts or certificates), or driven by regulatory, reporting or strategic considerations.

Table 2. A summary of the different incentives that apply to flexible demand, and the types of flexible demand they typically incentivise.

Price-based incentives	**Shape**	**Shift**	**Shed**	**Shimmy**
Time-of-use tariffs	✔	✔		
Dynamic tariffs and wholesale exposure	✔	✔	✔	
Peak and network demand tariffs	✔			
Improved retail offers and contract pricing	✔			
Corporate PPAs	✔	✔		
Scheme-based incentives				
WDRM		✔	✔	
FCAS				✔
RERT			✔	
Network services and DNSP payments	✔	✔	✔	
Peak Demand Reduction Scheme (PDRS)	✔			
Battery incentives and rebates		✔		
Regulatory, reporting and strategic incentives				
Emissions reporting and Renewable Energy Guarantee of Origin (REGO)	✔	✔		
Updates to National Construction Code requirements	✔	✔		
NABERS and building performance ratings	✔	✔		

5.1 Price-based incentives

Price-based incentives involve changing the cost of electricity over time, rewarding customers who shift or reduce demand when electricity is expensive, and increase demand when it is abundant or cheap. They operate continuously and usually require no enrolment beyond being on the relevant tariff or contract.

Time-of-use tariffs

A time-of-use (ToU) tariff means the energy cost depends not just on how much electricity is used but when it is used. In most Australian states, ToU periods are defined as peak, off-peak and shoulder, although the times of these periods vary between network areas. In Victoria, ToU tariffs are typically peak and off-peak only. Some off-peak periods are also labelled 'solar soaker' to reflect the abundance of daytime solar in the grid. An example is illustrated below.

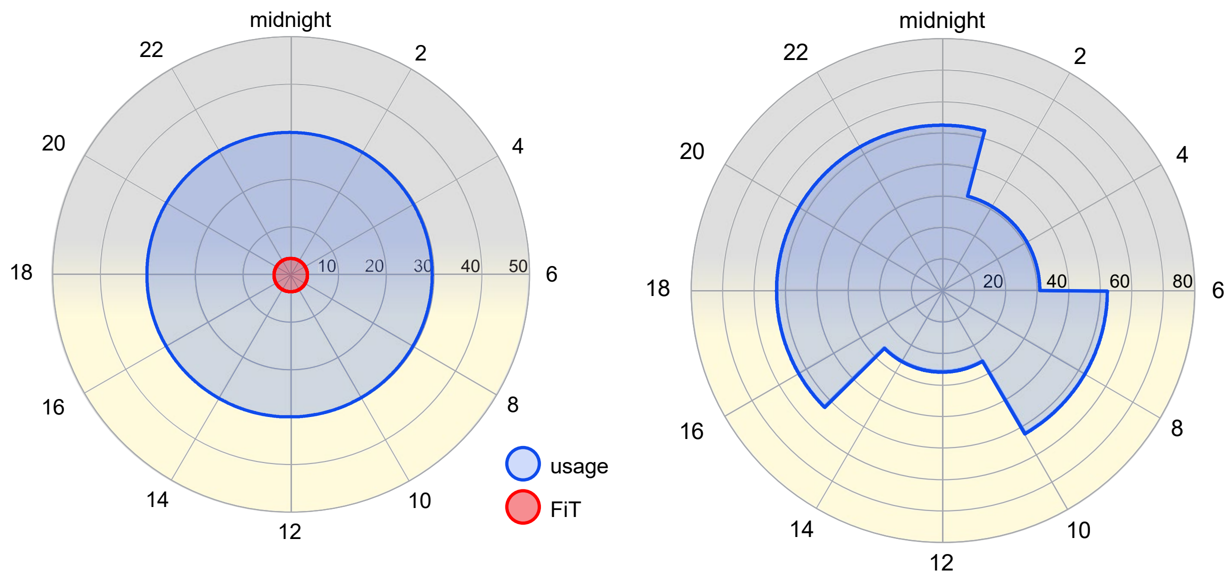

Figure 11. Typical flat (left) versus time-of-use (right) tariffs. Time of day (0–24 h) is represented on the polar axis and the tariff rate (0–80 ¢/kWh) on the radial axis.

By shifting demand from peak to off-peak times, flexible demand can significantly reduce bills.

Although ToU tariffs are a little more complicated than flat tariffs, a study by the ACCC found that residential customers on ToU tariffs have, on average, lower calculated annual electricity bills than those on flat tariffs.

Dynamic tariffs and wholesale exposure

Several electricity retailers now offer dynamic tariffs, notably Flow Power and Amber Electric (the latter largely services residential customers). A dynamic tariff is one that changes in response to changes in wholesale prices, such as via a pass-through of wholesale electricity prices or via a formula that also reflects load shape.

Australia's main electricity network is the National Electricity Market (NEM), which encompasses all eastern states, the ACT and South Australia. The NEM refers to both the physical network itself and the wholesale electricity market operated by AEMO through which wholesale electricity and other system services are traded. AEMO also operates the much smaller Wholesale Electricity Market (WEM) on the South-West Interconnected System (SWIS), which covers the main population centres in the south-western corners of Western Australia.

As illustrated in Figure 6 and Figure 7, wholesale electricity prices can vary every five minutes, from negative values to over $20/kWh. Customers that can shift demand away from times of high prices (e.g. evening peaks) towards times of low prices (e.g. the solar window) create value through arbitrage of these varying wholesale prices.

Some dynamic tariffs involve pure wholesale exposure. That is, the customer effectively pays the wholesale electricity price plus some additional charges for network usage, environmental levies and retailer margin, as illustrated in Figure 12.

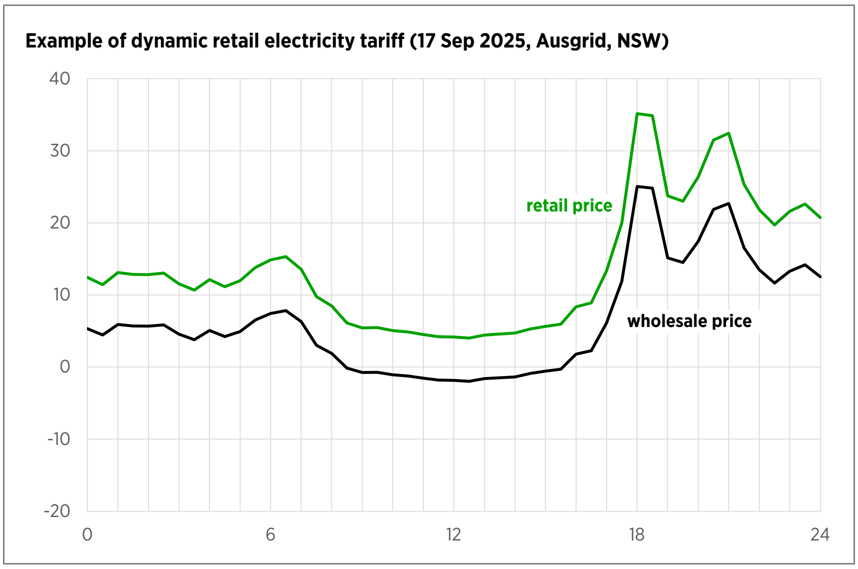

Figure 12. A dynamic tariff with pure wholesale exposure tracks the underlying wholesale price. The price difference includes retailer margin, network costs and other charges. Data sources: Open Electricity (wholesale), Amber Electric (retail).

There are several ways that wholesale pricing can be applied; either directly, as in the case of Amber Electric, or indirectly in the case of Flow Power's Price Efficiency Adjustment (PEA). The PEA is a bill adjustment calculated monthly by subtracting the time-averaged spot price from the customer's demand-weighted average price.

In addition to pure wholesale exposure, customers can choose dynamic tariffs that include only partial or capped exposure to wholesale markets, to reduce risk from high price events.

One of the main features of dynamic tariffs is that a few times per year, prices may 'spike' to very high levels. Price spikes can exceed $20/kWh ($20,000/MWh), over 1000 times more than the average level. Both Amber and Flow Power provide a degree of price protection to avoid customers being charged excessively when prices stay high for extended periods (as occurred in mid-2022). As a result, most customers are better off with dynamic tariffs, and even more so if they can flex their demand.

As with a ToU tariff, flexible demand can significantly benefit customers on a dynamic tariff by reducing demand when prices are high and increasing it when prices are low. Dynamic tariffs are particularly well suited to highly flexible loads such as batteries and EV chargers, which can quickly respond to price changes. Customers with batteries can also insulate themselves from price spikes and even benefit financially by exporting surplus power while enjoying the benefits of low wholesale pricing at other times.

Peak and network demand tariffs

Demand tariffs are often applied in addition to usage tariffs. A demand tariff is a cost per unit of power (kW or kVA), based on the peak power demand during a specific period. It is intended to encourage customers to manage and reduce peak electricity usage to improve grid efficiency and reliability. Demand tariffs may be seasonal.

> **Example**
>
> XYZ Property Group owns and operates a building in the Sydney CBD, which is serviced by Ausgrid. Ausgrid applies demand charges for eight months of the year, November to March and June to August, with a peak demand window of 3–9 pm.
>
> XYZ's retailer passes on the Ausgrid demand charge using a tariff of 33 ¢/kW/day.
>
> The building has an average load of 50 kW and a typical peak load of 200 kW. Each month, the building operator's bill includes a demand charge of around $0.33/kW/day × 200 kW × 31 days = $2,046, on top of their usual usage charges and service fees.
>
> One afternoon, the building manager decides to run a safety test. The test doesn't take very long, but results in a peak load of 1000 kW during one 30-minute interval.
>
> At the end of the month, XYZ is hit with a demand charge of $0.33/kW/day × 1000 kW × 31 days = $10,230, an additional $8,184 for running the test.

One approach to reducing demand charges is to change the schedule for equipment to avoid creating an expensive monthly peak—a form of load shaping.

Improved retail offers and contract pricing

When a large electricity user negotiates with a retailer for a supply contract, the retailer will usually account for the customer's load profile when calculating the offer. This is because the retailer needs to match the electricity they supply to the customer with generation, some of which it may own or control, and some of which it purchases from other generators through the wholesale market.

By shaping a customer's load profile to better match the cheapest generation sources (particularly solar), flexible demand can significantly reduce the average price of electricity that retailers will offer that customer.

Corporate PPAs

A corporate power purchase agreement (PPA) is a long-term contract between an electricity generator and an electricity buyer, either contracting directly as a 'wholesale PPA' (or financial contract-for-difference) or integrated into the retail supply agreement (a 'retail PPA'). As most wholesale PPAs generally require loads of around 50 GWh per annum and upwards to justify the transactions and underpin a new project, most commercial buildings would only be able to procure a retail PPA.

Under a corporate PPA, the buyer agrees to purchase electricity at a fixed price (subject to contracted provisions) for a set period, usually 5–10 years in Australia. Renewable energy PPAs help businesses reduce their exposure to fluctuating and volatile energy costs—especially the 'time-to-market' risk that prices could be spiking at the time a business is tendering for a new retail supply agreement—while meeting ESG commitments and supporting renewable energy projects through guaranteed demand.[2]

PPAs can be fully or partially firmed. Under a fully firmed PPA, the buyer receives a guaranteed, continuous supply (often 24/7) because the variable renewable generation is fully backed by firming such as storage, multiple projects across the retailer portfolio or market hedges. Under a fully firmed PPA, the retailer takes the price and volume risk for the 'overs and unders' in terms of load match between consumption and generation, which reduces the buyer's incentives to flex demand.

With a partially-firmed PPA, only some of the price variability is covered; the buyer receives renewable energy when it is generated, with some firming, but retains some exposure to market prices or residual volume risk. All things being equal, pricing for a partially firmed PPA is more competitive than a fully firmed PPA, as the buyer takes on some of the responsibility for managing risk. Flexible demand can help the buyer manage this risk and improve their energy pricing.

Example

XYZ Property Group manages a portfolio of mid-sized commercial office buildings across Sydney. Their annual electricity consumption is around 12 GWh—too small for a wholesale PPA, but suitable for a retail PPA. It signs a seven-year, partially firmed retail PPA with a renewable energy retailer, sourcing electricity from a regional solar farm.

Under the agreement, XYZ receives solar electricity at a fixed rate when the sun is shining. During cloudy periods or at night, the retailer provides partial firming through market purchases, but XYZ remains exposed to some wholesale price fluctuations.

To manage this exposure, XYZ implements a flexible demand strategy across its buildings. This includes:

- adjusting HVAC schedules to pre-cool buildings during sunny midday hours
- shifting non-critical loads, such as EV charging, to align with solar availability, and
- using building analytics to forecast demand and automate load shifting in response to price signals.

By aligning its energy use with the timing of renewable generation, XYZ reduces its exposure to high spot prices during low-generation periods. This improves its financial performance and demonstrates leadership in sustainability, supporting their ESG goals.

2 See businessrenewables.org.au for further information and guidance on renewable energy procurement, including PPAs.

5.2 Scheme-based incentives

Scheme-based incentives attempt to explicitly incentivise flexible demand or capacity.

AEMO market schemes

In addition to the wholesale electricity market, AEMO also operates several markets that pay for flexibility or capacity. These include:

- **Wholesale Demand Response Mechanism (WDRM)**—Under the WDRM, some retailers and aggregators known as demand response service providers (DRSPs) aggregate and bid load reductions into the NEM. When dispatched by AEMO, customers reduce consumption and are paid the spot price for the measured reduction against a baseline. This enables demand response to compete with generation in dispatch, improving reliability and lowering prices during high-demand periods. Given the scale required to operate in this market, participation is limited to larger players such as AGL Energy, Energy Australia, Shell Energy and Enel X. Several of their DR programs involve commercial buildings, particularly shopping centres and refrigerated warehouses.
- **Frequency Control Ancillary Services (FCAS)**—AEMO operates several FCAS markets to keep our networks operating close to 50 Hz. FCAS providers can include large electricity generators, battery operators and controllers of large flexible loads. Providers bid capacity to raise or lower frequency, while AEMO co-optimises FCAS with energy for every five-minute interval, enabling the lowest-cost bids. While few commercial building owners or facilities managers are likely to operate in FCAS markets, they can be an important revenue stream for some VPPs controlling flexible assets such as batteries.
- **Reliability and Emergency Reserve Trader (RERT)**—The RERT scheme is a mechanism that allows AEMO to contract emergency reserves when forecast supply is insufficient to meet demand. If a reliability shortfall is identified, AEMO can procure standby generation or demand response that is not otherwise available to the market. RERT is used only after normal market options are exhausted and can be activated at long, medium or short notice. Providers are paid for availability and activation, and costs are recovered from market participants under the National Electricity Rules. Like FCAS, few commercial building owners or facilities managers have enough capacity to operate directly in the RERT scheme, but this may be relevant for some VPPs.

Network services and DNSP payments

The main non–market-based mechanism through which flexible demand and aggregators of flexible demand such as VPPs can create value is through network services. Building network infrastructure to meet peak demand is very expensive. Activities that reduce peak demand can eliminate or defer the need for network upgrades while increasing utilisation of existing network assets. Such activities may be in response to a DNSP tender for provision of ‘non-network options’ as an alternative to network upgrades, so tend to be time and place specific. These activities can benefit energy customers directly through reduced solar curtailment and increased hosting capacity, and indirectly through reduced network tariffs.

VPP operators can monetise network value by working with DNSPs. Such opportunities typically arise when DNSPs release tenders for ‘non-network options’ as an alternative to upgrades, and are therefore very time- and place-specific.

Peak Demand Reduction Scheme (PDRS)

The NSW Government operates a certificate-based scheme designed to reduce electricity demand during peak periods, particularly hot summer afternoons and evenings when the grid is most stressed. The Peak Demand Reduction Scheme (PDRS) was introduced in 2022 and runs to 2050.

The PDRS operates much like the Energy Savings Scheme (ESS), which places an obligation on electricity retailers to deliver verified reductions in electricity demand by creating or purchasing Energy Savings Certificates (ESCs). The PDRS places an obligation on electricity retailers to meet peak demand reduction targets by creating or purchasing Peak Reduction Certificates (PRCs). Each PRC represents a verified reduction in peak demand of 0.1 kW, averaged over one hour, during the peak summer period for a single compliance year. The peak summer period is defined as between 1 November and 31 March, 2:30–8:30 pm AEST (3:30–9:30 pm AEDT), as illustrated in Figure 13. The number of certificates that can be calculated from an implementation is based on the reduction in capacity in each of the six hours in that period. PRCs currently trade for about $3 each (greenenergytrading.com.au/prc-spot-price)

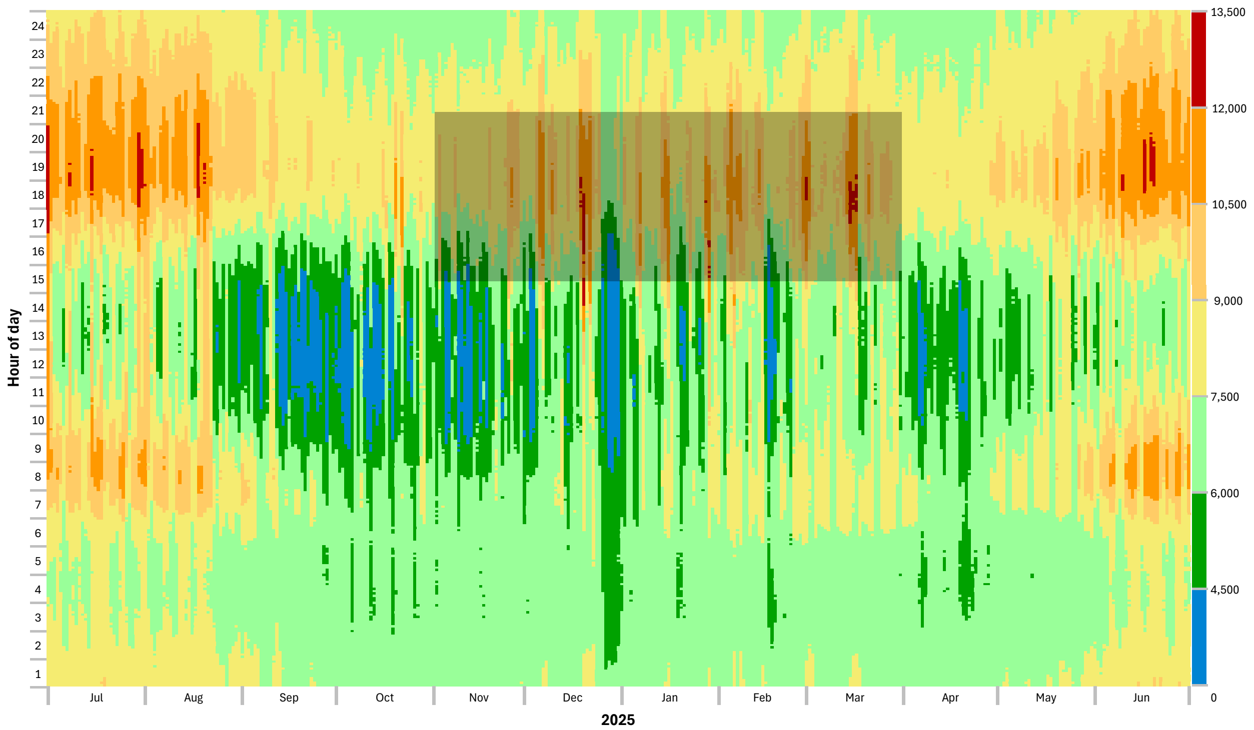

Figure 13. A heat map of net electricity demand in NSW/ACT for 2025 (in MW), showing the summer peak period used for the PDRS. Although there are similar peaks (>12 GW) during the winter months, thermal stresses are less during these months and network capacity less constrained. Times are in AEST. Data source: AEMO.

Example

XYZ Property Group engages a contractor to implement HVAC controls that can reduce demand from one of its buildings during the peak summer period by 100 kW.

This activity is eligible to create 100 kW ÷ 0.1 kW/PRC × 6 h = 6,000 PRCs per year.

At a PRC price of $3, the annual value created is $18,000.

Although NSW now experiences winter peak demand comparable to summer peak demand, as shown in Figure 13, the PDRS targets summer peak events as these coincide with heat waves, which affect network thermal limits and are therefore the main constraint on network and system reliability.

In practice, a contractor responsible for installing a control system that reduces peak demand may be an Accredited Certificate Provider (ACP). The contractor can then monetise the PRCs and pass the value back to the building owner as an upfront rebate for installing the control system.

For buildings, the PDRS supports flexible demand by rewarding technologies and upgrades that can reduce or shift load during these peak times. While the scheme primarily incentivises demand capacity reductions rather than real-time dispatch, it complements other flexible demand incentives.

Battery incentives and rebates

The Australian Government's Cheaper Home Batteries program currently provides support for households and small businesses to reduce the cost of installing eligible small-scale solar batteries. The NSW government also currently provides up to $1,500 for a battery connected to a VPP. The NSW scheme is explicitly designed to avoid subsidy stacking, so this subsidy is in lieu of claiming PRCs.

5.3 Regulatory, reporting and strategic incentives

Greenhouse Gas Protocol

The current GHG Protocol Scope 2 Guidance (2015) does not require time-based emissions tracking. However, the Scope 2 Guidance revision now under development explicitly introduces time-based concepts, most notably hourly matching, as part of its proposed updates. Under this proposal, renewable electricity claims would need to be matched to the same hour in which electricity is consumed. While not yet finalised or mandatory, if adopted this change would represent a significant shift from annual averaging to time-aligned electricity emissions accounting.

Australia has not yet committed to automatically adopting future GHG Protocol Scope 2 changes into either the National Greenhouse and Energy Reporting (NGER) scheme or AASB S2.

Emissions reporting and Renewable Energy Guarantee of Origin (REGO)

Large-scale Generation Certificates (LGCs) have been the dominant instrument used in Australia for market-based electricity emissions accounting under frameworks such as the National Greenhouse and Energy Reporting (NGER) scheme and corporate PPAs. Each LGC represents one megawatt hour of renewable electricity generated. LGCs are not time-specific: they do not record when electricity was produced, only that it occurred at some point within the year. As a result, organisations commonly use LGCs to make annual '100% renewable electricity' or net zero electricity claims, even though the timing of their actual consumption may still coincide with high-emissions periods on the grid. In practice, LGCs function as a financial and accounting mechanism that supports renewable generation investment and matches consumption with renewable across the year, rather than as a tool for reflecting real-time grid emissions.

Ongoing changes to Australia's NGER scheme will enable time-based tracking of Scope 2 emissions. These changes will affect all entities subject to mandatory GHG reporting and mandatory climate risk disclosure. The new requirements for tracking, certifying and integrating renewable energy across supply chains have prompted the development of a new national certification system: Renewable

Energy Guarantee of Origin (REGO) certificates. REGOs will replace the current LGC scheme from 2031 onwards, with a phased transition underway in the meantime. REGOs will be 'time-stamped', based on when they were generated, and can include other information such as the type of generation, year etc.

Example

On 1 July 2028, SUN Solar Farm generates 100 MWh of electricity in the period 4–5 pm and 50 MWh of electricity in the period 5–6 pm. Under the LGC system, SUN would have created and sold 150 LGCs for the electricity it generated during this two-hour period. However, under the REGO system, it creates 100 REGOs explicitly tagged 4–5 pm, 1 July 2028, and 50 REGOs tagged 5–6 pm, 1 July 2028. It then sells the earlier REGOs for $10 each and the latter REGOs, which are less abundant, for $20 each.

On the same day, XYZ Property Group owns a building that typically uses 2 MWh of electricity at 4–5 pm and another 2 MWh at 5–6 pm. Under the LGC system, all four hours are treated the same and can be offset by purchasing four LGCs. However, under the REGO system, each hour is treated differently and must be covered by purchasing two REGOs tagged 4–5 pm, 1 July 2028, and two REGOs tagged 5–6 pm, 1 July 2028, at a total cost of $60.

XYZ pre-empts this price differential by bringing 1 MWh of load forward by one hour. They then cover their consumption by purchasing three of the cheaper REGOs and only one of the more expensive REGOs, saving $10.

For commercial building owners, this transition to REGOs has several implications. Although the scheme is voluntary, REGOs will allow more accurate tracking of the renewable energy used within buildings, strengthening the credibility of net zero claims, sustainability reporting and tenant disclosures. As REGOs incentivise flexible demand and better alignment with renewable generation profiles, they encourage building owners to invest in load shifting, automation, building analytics and storage technologies that enable participation in time-varying energy procurement and new market opportunities.

Updates to National Construction Code requirements

Section J9D3 of the National Construction Code covers the requirements for energy monitoring facilities in new large buildings, including provision of energy meters configured to enable individual time-of-use metering.

In February 2026, the Australian Building Codes Board (ABCB) issued a preview version of the National Construction Code (NCC) 2025 (ABCB, 2025). The proposed updates to the NCC include several changes relevant to flexible demand, notably:

- J9D3(3) requires energy meters to be interlinked by a communication system that collates time-of-use energy data to a single interface monitoring system where it can be stored, analysed and reviewed.
- J9D3(6) requires that any Environmental Management Information System (EMIS) must:
  - allow demand management control of the building's renewable energy system (including batteries), HVAC system and EV chargers
  - allow scheduling, supervisory level setpoint override and modulation setback of the HVAC system

- incorporate monitoring and verification in accordance with IPMVP options B or C, and
- include forecasts of the building's renewable energy production.

Once implemented, these changes will require commercial buildings to meet minimum requirements that make them 'flex-ready'. Requiring metering to be linked to a single interface for remote users and supervisory controls for demand management will facilitate access to the data required to enable flexible demand; monitoring and verification per IPMVP options B or C should enable buildings to be paid for providing flexible demand; while renewable energy forecasting will enable buildings to modulate their loads to improve their self-consumption of solar and other renewables.

NABERS and building performance ratings

NABERS (National Australian Built Environment Rating System) provides a sustainability rating system for commercial buildings that is largely focused on energy, water, waste and indoor environment. NABERS ratings range from one to six stars. Disclosure of a NABERS rating is mandatory at the point of sale or lease for spaces within office buildings of 1,000 square metres or more.

NABERS Energy ratings are currently calculated using metered energy consumption data, normalised for factors such as building size, climate, hours of operation and occupancy. The system focuses on the intensity of annual energy consumption and uses static grid emissions factors to convert energy use into emissions-related performance. These static grid emissions factors are updated every five years to account for the ongoing decarbonisation of Australia's electricity grids (NABERS, 2026).

In November 2025, NABERS released a consultation paper on proposed changes to NABERS Energy that would shift it away from using emissions factors. The proposal changes are intended to encourage buildings to optimise for both energy and emissions intensity simultaneously via two measures:

- a **Star Rating**—which rewards low energy intensity (i.e. energy efficiency), and
- a **Renewable Energy Indicator** (REI)—which rewards low operational emissions.

NABERS Energy does not currently account for the timing of electricity use, meaning buildings are assessed on how much energy they use over a year, not when that energy is consumed. As NABERS Energy evolves, the NABERS team is also exploring ways to encourage buildings to shift electricity use to times when renewables are plentiful by investigating (1) time-of-use emissions metrics, such as an evolved REI, and (2) amendments to NABERS Energy rules, so that buildings undertaking energy flexibility practices maintain their NABERS Energy star ratings.

6 TECHNOLOGIES AND PRODUCTS

6.1 HVAC systems

Heating, ventilation and air conditioning (HVAC) systems are widely used in the commercial sector to maintain comfortable, healthy and productive indoor environments. They do this by controlling temperature, humidity, air quality and air movement. In most commercial buildings, HVAC systems are a major energy end-user, typically accounting for up to 50% of total electricity consumption (DCCEEW, 2025).

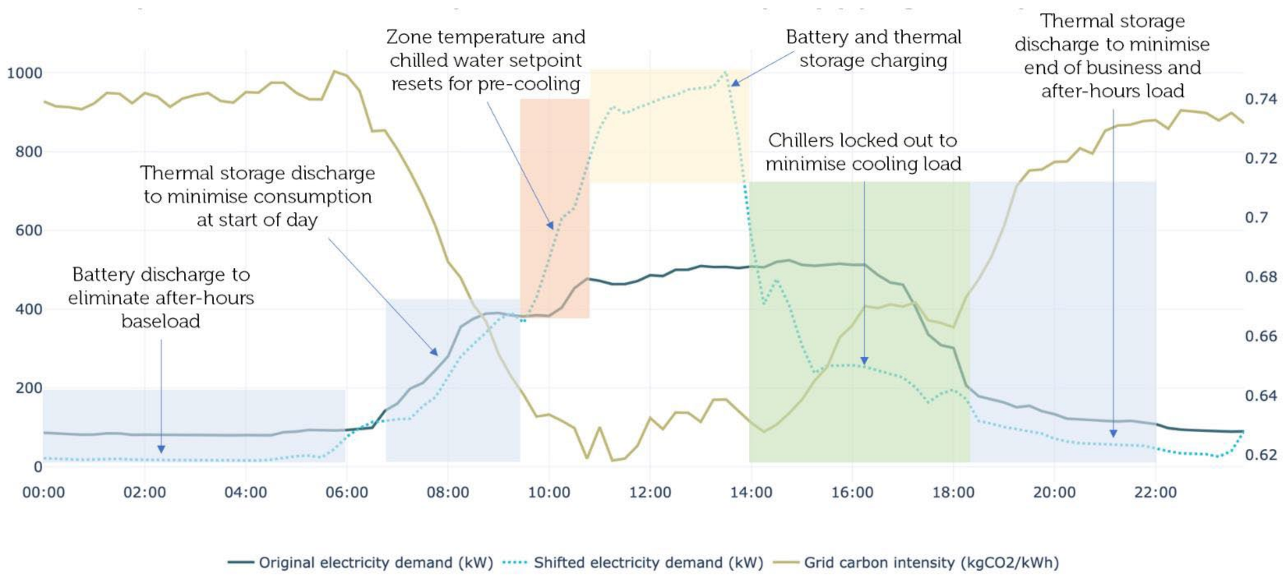

Figure 14. An example of shifting electricity demand for a commercial office building in Sydney during Spring and Autumn. Source: Building Alive.

In some commercial buildings, heating and cooling are generated at a central plant using equipment such as chillers, boilers or heat pumps. Conditioned air is then distributed throughout the building via ductwork or heated and chilled water is piped to localised air-handling units for local air distribution. Other HVAC systems use variable refrigerant flow (VRF), whereby refrigerant is distributed directly to indoor units. In either case, ventilation systems work alongside heating and cooling by controlling the intake of outdoor air and the removal of stale indoor air, ensuring indoor air quality remains within acceptable limits, while system operation is coordinated through a building management system (BMS).

Modern building management systems enable HVAC operation to be adjusted in ways that reduce energy demand while maintaining acceptable comfort levels, particularly over short time periods. Common flexibility mechanisms include adjusting space temperature setpoints within acceptable ranges, temporarily pre-cooling or pre-heating spaces to take advantage of building thermal mass, scheduling plant start-up and shutdown times, and optimising the timing and volume of outside air intake. For example, night purging uses cooler overnight outside air to flush out accumulated heat, thereby reducing cooling requirements during the day. Additional opportunities for flexibility include varying fan speeds or refrigerant flows, adjusting chilled water supply temperatures, staging equipment operation, and applying demand-limiting controls that smooth or cap peak electricity use.

The timing of outside air intake is another important consideration. In a climate such as Sydney's, commercial building HVAC systems typically minimise outdoor air intake during the day when outside air temperatures are higher than return air temperatures. However, if daytime electricity is cheaper and less carbon intense, it may be beneficial to increase outdoor air intake during the middle of the day and reduce it later in the afternoon. Although this may increase overall energy use, it can enhance indoor air quality while potentially reducing costs and emissions.

The extent to which HVAC systems can be flexed is constrained by a range of technical and operational limits. For VRF systems, there is no central chilled-water or hot-water circuit and therefore no natural point to insert a large thermal storage tank. Hence any pre-cooling must be done zone by zone, relying only on building thermal mass.

A building's physical characteristics will have a major influence on how effectively heating and cooling demand can be managed. For example, a building with a high level of exposed thermal mass, such as concrete ceilings or floors, is better able to store thermal energy and therefore provides greater flexibility on when the HVAC system can be operated.

An energy-efficient building that is well insulated and shaded to prevent heat gain on western facades will have a lower heating and cooling load than a less efficient building. Although this means there is less load to flex, efficient buildings are typically more flexible, and naturally contribute less to peak demand.

System design, control system capability and sensor accuracy also play key roles in enabling or limiting HVAC efficiency. These factors must be balanced with occupant comfort, and health and regulatory requirements, which vary depending on building type and use.

Older buildings or poorly commissioned systems may offer fewer opportunities to flex demand, whereas buildings with modern controls and good thermal performance can provide more reliable load shifting or shedding. While new, high-efficiency HVAC technologies can deliver significant energy and cost savings, substantial improvements can also be achieved through management, repair and maintenance of existing systems.

6.2 Electrification

For commercial buildings, electrification is a way to significantly reduce a building's GHG emissions by replacing gas equipment with electrical equivalents. A common scenario is to replace gas boilers with heat pumps.

Building electrification provides an opportunity for enhancing a building's flexible demand capabilities through the HVAC system. In the context of an electrification upgrade to a commercial building, reducing peak demand can provide additional benefits, such as reducing the need for electrical substation upgrades, which can strengthen the upgrade business case. (See also Section 3.5.)

6.3 Thermal energy storage systems

A thermal energy storage (TES) system stores thermal energy so that it can be used later. In addition to facilitating flexible demand, TES systems can improve the performance and thermal reliability of HVAC systems.

Hydronic HVAC systems with a central chilled-water or hot-water circuit provide a natural point to insert a large thermal storage tank. VRF systems are much less suitable for adding TES.

Figure 15. Insulated thermal storage tanks in a Melbourne office building. Source: Energy Smart Water.

There are several categories of TES systems:

- **Sensible heat storage** stores thermal energy by raising or lowering the temperature of a storage medium, such as chilled or hot water in a tank. This is the simplest and most common form of TES in commercial buildings.
- **Latent heat storage** involves phase change materials (PCMs), which store energy through a change in material phase (e.g. between solid and liquid). Latent heat TES systems provide higher energy densities than sensible heat TES systems. Examples range from ice stores in central plant rooms to PCM encapsulated in wall lining products.
- **Thermochemical storage** uses reversible chemical reactions to store thermal energy with very high density.

TES systems can enhance the flexibility of a building's HVAC system by decoupling electricity consumption from the delivery of thermal comfort. By enabling this decoupling, TES transforms HVAC from a passive electrical load into a more dispatchable energy asset.

Example

On a hot day in summer, the chiller of a building with chilled water TES is operated from 10 am to 2 pm, when electricity prices and emissions intensities are at their lowest. The resulting coolth is stored in the TES system. During the 4 pm to 8 pm afternoon/evening peak period, when electricity prices and emissions intensities are much higher, the TES system is used to maintain the building's cooling demand without running the chiller.

In addition to helping lower electricity costs and reduce peak demand, a TES system can reduce the required rating of the HVAC system and improve overall HVAC operational efficiency.

6.4 Hot water storage systems

In residential buildings, domestic hot water storage systems are an easily shifted load. Since the 1950s, Australian electricity companies have been controlling such systems through off-peak hot water programs.

Hot water can be a significant load for some commercial buildings, such as hotels. With sufficient storage, such systems can easily be scheduled or controlled to avoid peak-demand periods or high price events.

6.5 Battery energy storage systems

Batteries are electrochemical energy storage systems that convert electrical energy into chemical energy and release it when required. A battery energy storage system (BESS) combines a battery with a grid inverter and associated control systems.

A BESS can provide several functions, including:

- **Backup power**—A BESS can provide power to critical loads when grid supply is disrupted.
- **Flexible demand**—By storing excess generation during low-demand periods and discharging during peak periods, a BESS can facilitate load shifting and peak demand reduction. As illustrated in Figure 16 below, batteries are a rapidly growing source of coordinated CER in the NEM, and are becoming an increasingly significant resource for short term (hourly) load shifting.
- **Increasing energy independence**—When paired with on-site renewable generation such as rooftop solar, a BESS can allow self-generated energy to be stored for later use, helping to maximise self-consumption and energy independence.
- **Grid support**—A BESS can provide rapid response services such as FCAS to support the grid (see *AEMO market schemes* on page 28).

Commercial battery systems typically comprise battery racks housed in a purpose-built enclosure, along with an inverter and transformer to manage conversion and to interface with building and network systems. Lithium-ion technology is the dominant chemistry in commercial applications. This chemistry includes many technology variants, including cathode materials such as lithium iron phosphate (LFP) or nickel manganese cobalt (NMC), each with their own differing performance, lifecycle and safety characteristics. Other battery chemistries such as sodium-ion and vanadium are now commercially available and may become more widespread in future, depending on cost.

In Australia, installation and operation must comply with electrical and safety standards including:

- **AS/NZS 5139:2019** (*Electrical installations – Safety of battery systems for use with power conversion equipment*)—this is the primary national standard for stationary battery energy storage systems
- **National Construction Code** (NCC)—which applies to installation requirements related to issues such as mounting, housing, egress and fire safety (e.g. dedicated battery rooms and fire-rated enclosures)
- **State and territory electrical-safety laws**—which includes NSW Fair Trading licensing requirements for installers, inspection and compliance processes, and additional guidance on spacing, restricted zones, and fire-safety interpretation
- **AS/NZS 3000** (*Wiring Rules*)—covers the electrical installation as a whole, including earthing, fault protection etc.
- **AS/NZS 4777** (*Grid connection of energy systems via inverters*)—applies to both grid-connected solar and batteries.

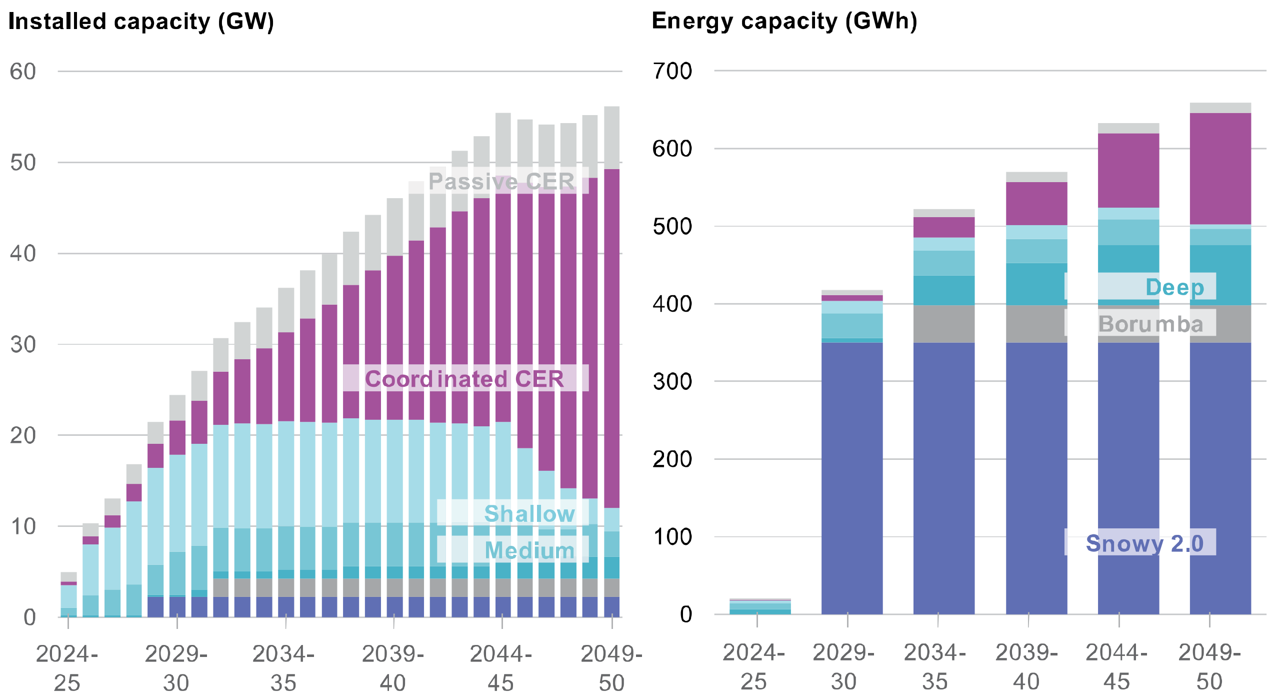

Figure 16. Storage installed capacity and energy storage capacity in the NEM for 2024–25 to 2049–50, under AEMO's Step Change scenario. Source: AEMO (2024).

Installation of BESS in commercial buildings is not yet a straightforward process, as there are currently no Deemed-to-Satisfy (DtS) provisions under the NCC. Traditional DtS elements (fire resistance levels, sprinklers, smoke detection) were written for ordinary combustibles or electrical switchrooms with limited stored energy. As a result, regulators are unwilling to define a 'safe by default' prescriptive recipe. Some Australian fire agencies also actively discourage in-building placement of BESS as they are deemed to increase firefighter and occupant risk, and recommend external siting wherever possible (AFAC, 2025).

6.6 Electric vehicle chargers (EVSEs)

An electric vehicle charger, also referred to as EVSE (electric vehicle supply equipment), falls into one of three main types, depending on its power level (and hence charging speed), and whether it uses AC or DC power.

- **Level 1 or trickle charger**—uses a standard household outlet and is rated at 8–10 A (1.7–2.4 kW). This type of charging is relatively slow. Such chargers are usually portable and generally not part of a commercial building's electrical infrastructure.
- **Level 2 or AC destination charger**—is a dedicated wall charger, typically rated at 32 A (7 kW single phase or 22 kW three phase) and hard-wired. Such chargers are common in homes, workplaces, and shopping centres, and are the most relevant option for commercial buildings.
- **Level 3 or DC fast charger**—delivers high power directly to an EV's battery. Such chargers are typically rated at 50–250 kW and are found on highways and other locations where there is a demand for rapid charging (e.g. for long car journeys).

An increasing number of commercial buildings include multiple Level 2 EVSEs, which allow building visitors to charge their EV while parked in the building.

Most Level 2 EV chargers include a communications link (e.g. WiFi), allowing them to be controlled and monitored remotely. The most common communications protocol is OCPP (Open Charge Point Protocol), a global, open-source standard, which enables interoperability between software platforms and chargers from multiple manufacturers.

An emerging EV charging option is bidirectional or vehicle-to-grid (V2G). This allows an EV to operate as a large 'battery on wheels', both charging from the grid and discharging into the grid in response to pricing or other incentive signals. Enabling V2G requires a compatible vehicle and EVSE. The technology is currently being piloted in Australia. Its relevance to commercial buildings is yet to be established.

6.7 Control systems and platforms

Various software control systems and platforms are usually required to enable flexible demand in a commercial building. These systems may be stacked to perform various functions, such as sensing load, automating control, forecasting opportunities and interfacing with markets. The different layers of this stack need to work together while interacting with the building's digital infrastructure to shift or shape demand in response to price signals, renewable availability or grid needs.

Example

XYZ Property Group operates a building that uses the following set of control systems:

- a building management system (BMS) to control loads at the building-level
- an energy management system (EMS) to optimise and automate some operations, and assist with analysing and verifying performance.
- a virtual power plant (VPP) platform to interface with the market and pre-emptively send signals to the BMS/EMS to pre-heat and pre-cool the building
- a separate control platform for a set of EVSEs in the building basement, to help manage EV charging.

While BMS and EMS systems are well developed, the other layers of the stack continue to evolve as new products and standards emerge. Following are details of systems at each of these levels.

Building-level control and automation

Building-level control and automation platforms manage equipment inside the building and are the foundation for flexible demand.

- A **building management system** (BMS) provides real-time control of major electrical loads such as HVAC, enables automated load shifting (e.g. pre-cooling, temperature resets), and integrates with metering and sensors for granular visibility. Various platforms are available from manufacturers including ABB, Honeywell, Siemens (Desigo), Schneider (EcoStruxure), and Johnson Controls (Metasys).
- An **energy management system** (EMS) adds analytics, optimisation and forecasting on top of the BMS. For example, it can:
  - identify flexible loads and quantify shift potential
  - optimise operation against tariffs, demand charges or carbon intensity, and
  - provide dashboards for operators to track performance.
- An **environmental/energy management information system** (EMIS) can also be used for monitoring, analytics and reporting. An EMIS collects meter and submeter data, tracks KPIs (energy, emissions, NABERS, targets) and supports reporting and compliance. Importantly, an EMIS typically informs decisions but usually does not control equipment.
- A **distributed energy resource management system** (DERMS) is used to coordinate and orchestrate CERs/DERs at scale. It is used to optimise across a portfolio of assets or sites, rather than for a single building.

Grid-interactive and market-facing platforms

Grid-interactive and market-facing platforms connect the building to external signals such as prices or demand response events.

- A **demand response management system** (DRMS) is used by aggregators and large customers to automate participation in demand response programs. A DRMS can usually receive dispatch signals from market operators or retailers, trigger automated load reductions or battery dispatch, and track performance for settlement and reporting.

- **Flexible demand identification and optimisation tools** are newer platforms that help commercial operators quantify and activate flexible demand. An example is Birdwood Energy's Flexible Report Card Platform.
- **VPP and CER orchestration platforms** coordinate CER (solar, batteries, EVSEs, HVAC and other flexible loads) as a single controllable asset. They can optimise behind-the-meter resources for participation in wholesale markets or retailer programs, while providing time-of-use or carbon-aware control strategies. Examples available in Australia include Origin Loop, ENGIE VPP Advantage, ShineHub, Sonnen VPP, Octopus Energy VPP and Amber for Batteries.

Asset-specific control platforms

Asset-specific control platforms manage individual flexible CERs that contribute to flexible demand, including batteries, EVSEs and HVAC systems. Such systems can optimise operation based on a range of factors, including tariffs and demand charges, solar generation forecasts, weather forecasts, occupancy or market signals. An increasing number of such systems use AI-driven optimisation.

Data, forecasting and analytics platforms

These systems provide the intelligence layer that makes flexible demand actionable. They can include:

- **Advanced metering and sub-metering systems** to deliver the real-time load data needed to identify flexible loads and verify performance.
- **Forecasting and optimisation engines** to model load profiles and flexibility windows, CER behaviour and market signals.
- **Carbon-intensity and renewable-matching tools** to allow demand to be optimised based on renewable availability forecasts, certificate costs and/or grid carbon intensity.

7 INDUSTRY INSIGHTS

We engaged with a cross-section of industry stakeholders through a workshop, survey, and several one-on-one interviews. Detailed insights from this stakeholder engagement are provided below. In summary, the sector is conceptually aligned on the importance of flexible demand but is still early in its practical adoption. Understanding outpaces capability, and enthusiasm is tempered by uncertainty around execution, tenant impacts, and risks. Stakeholders consistently pointed to the need for clearer guidance, real-world examples, aligned incentives, and supportive frameworks to translate interest into action.

7.1 Respondents

The survey respondents and workshop participants represent a broad cross-section of roles across sustainability, property, energy and policy functions. They include sustainability consultants, ESG directors, policy officers (including local government), technical advisors, property operations managers, energy procurement specialists, and Green Star technical delivery leads. This diversity suggests that the findings reflect perspectives across both strategic and operational levels of commercial building management and related policy and rating environments.

7.2 Understanding and organisational capability

Survey respondents rated both their personal understanding and their organisation's capability in relation to flexible demand:

- **Understanding of flexible demand** achieved a weighted average score of **3.72** out of 5, indicating moderate to reasonably strong familiarity with the concept among respondents.
- **Organisational capability** to implement flexible demand was rated lower, with a weighted average of **3.22** out of 5.

This divergence suggests a gap between conceptual understanding and practical readiness, highlighting that, while flexible demand is increasingly understood at an individual or conceptual level, many organisations are not yet confident in their ability to implement it effectively.

The workshop echoed this gap with concrete examples:

One participant noted their organisation has access to opportunities through exposure to the spot market, but lacks the practical capability and time to actively manage loads, citing facility management resources as a constraint.

Another indicated that their organisation is "reasonably comfortable" with the risks and opportunities of flexible demand, but acknowledged there is "always more to learn, particularly around contracting and emerging technologies."

These examples illustrate how even well-resourced organisations recognise a meaningful distance between conceptual awareness and operational capacity.

7.3 Key capability and knowledge gaps

The industry engagement revealed key capability and knowledge gaps. The gaps are less about the concept of flexible demand and more about execution, risk management and tailoring solutions to specific building and organisational contexts.

Practical implementation knowledge

Many stakeholders stated uncertainty around how to implement flexible demand in practice. This included questions about:

- which loads can be shifted
- what measures are appropriate
- whether approaches should be automated, predictive, or rule-based, and
- how to configure multiple or legacy building management systems (BMS).

One workshop participant noted that their organisation has "spent a lot of time thinking about flexible demand and [we] keep coming back to whether this is really something commercial buildings should be solving, or whether it's fundamentally a grid issue." This strategic uncertainty about roles and responsibilities can stall practical action.

On the implementation front, some stakeholders expressed a preference for batteries over shifting HVAC loads, primarily to avoid tenant lease risks such as rent abatement.

Understanding value and risk trade-offs

Stakeholders noted limited understanding of:

- the business case for flexible demand
- impacts on comfort and building operations
- asset-specific risks and opportunities, and
- whether flexible demand primarily addresses grid issues rather than commercial building priorities.

One workshop participant articulated a view that "the risks may outweigh the benefits at present," expressing concern about exposure to spot pricing, time-of-use structures, and potential tariff changes. They also raised the risk of unintended consequences, citing cogeneration as an example of something that "made sense at the time but is now being removed as buildings electrify." This highlights a fear that current flexible demand measures could similarly become obsolete if underlying conditions shift.

Another echoed the need for clearer cost–benefit analysis and risk management guidance, noting the challenge of making the case to executives without raising concerns about safety or service levels in community facilities.

Market and system integration

Stakeholders pointed to knowledge gaps around:

- linking building operations to market signals such as pricing
- electricity procurement arrangements, and
- managing maximum demand tariffs.

The complexity of energy contracting and market rules was also cited by workshop participants, including spot price exposure, time-of-use structures, and potential tariff changes.

Another confirmed that while spot market exposure offers opportunities, their team lacks the practical resources to act on them. These contributions emphasise that building teams feel ill-equipped to navigate market integration without clearer guidance or specialist support.

Tenant and lease considerations

Engagement with tenants emerged as a challenge, particularly where lease terms, comfort expectations, and lease abatement risks could constrain operational flexibility.

One workshop participant observed how little tenants typically understand the bigger picture. Discomfort is felt immediately, but system-level benefits are abstract. This lack of tenant awareness means building operators fear pushback or financial repercussions.

Need for real-world examples

Stakeholders highlighted the lack of accessible case studies and practical examples demonstrating how flexible demand is being implemented successfully in comparable buildings. Several cited residential flexible demand programs as evidence that simplicity and automation drive uptake, while comparable commercial building examples remain scarce. This underscores the need for clear, relevant success stories, particularly tailored to the distinct operational contexts of office, retail and public facilities.

7.4 Incentives required to activate flexible demand

Stakeholders identified a range of incentives they believe are necessary to motivate uptake of flexible demand. In summary, incentives need to address both financial outcomes and perceived risk, as well as align with existing performance and recognition frameworks.

Net financial gains must be clear and significant. Attractive financial incentives include direct monetary rewards, operating cost reductions, or mechanisms that compensate teams responsible for managing flexible demand. A lack of strong financial incentives was commonly cited by survey respondents as a barrier.

While community benefits and ESG outcomes are seen as attractive, they are unlikely to justify investment on their own unless risks are well managed. A positive return on investment was seen as a necessary (but not sufficient) prerequisite.

One workshop participant reported that their organisation runs load flexibility programs across office and retail assets, but maintenance costs often offset revenue from participation, which undermines enthusiasm.

Incentives need to be aligned across organisations. Several stakeholders cited a lack of alignment in individual or team-level rewards across their organisation. Enthusiasm and buy-in at one level do not always translate into action, particularly at the operational level. Staff responsible for managing facilities are not always suitably incentivised or resourced to implement flexible demand programs. Education is also a prerequisite for incentive effectiveness.

Clearer guidance is required for carbon-related incentives. Stakeholders expressed interest in clearer guidance on accounting for time-of-use Scope 2 emissions.

There is a need to understand and manage risk. Risks cited by stakeholders include tenant impacts, lease abatement, and business continuity.

Perverse outcomes in rating systems need to be addressed. Survey respondents cited certification and rating schemes as important levers. Several respondents suggested that schemes such as NABERS or Green Star could play a similar role in flexible demand as they historically have for energy efficiency.

One workshop participant noted that some flexible demand strategies, such as pre-cooling or battery charging, can increase total energy use, potentially harming NABERS ratings and, by extension, asset values. This tension means that unless rating schemes adapt to credit flexible demand (or at least not penalise the associated energy increase), building owners face a disincentive.

7.5 What needs to happen to enable flexible demand?

Stakeholders were focussed on how to move from interest in flexible demand to action. They identified that successful implementation requires alignment between three interdependent conditions:

1. electricity procurement that rewards flexible demand
2. technology and infrastructure to enable flexible demand, and
3. operational capability and management systems to execute.

If any one is missing, participation becomes difficult. This framing provides a practical diagnostic for organisations assessing their readiness.

Additional insights include:

- **Build awareness through education and communication**. Flexible demand needs to be demystified. Processes and first steps need to be clarified. According to one workshop participant with experience in flexible demand, when something goes wrong in a building, flexible demand programs tend to get blamed even if they are not the cause. Addressing this requires clear, widespread education and communication.
- **Keep things simple and automated**. A recurring point was that building managers cannot be expected to function as energy traders. Automated demand response systems, AI-based controls, or managed services are necessary to make flexibility feasible within existing team capacities. Residential examples were cited as evidence that simplicity and automation drive uptake.
- **Leverage third-party delivery**. Time and resourcing, particularly for facilities management and sustainability teams responsible for implementation, emerged as a critical issue. One workshop participant described outsourcing their load flexibility operations to a third-party aggregator, so

their teams do not need to actively manage it day-to-day. This arrangement effectively creates an operational incentive by addressing resource constraints and making participation feasible.

- **Leverage other projects**. Flexible demand is often most feasible when aligned with planned capital works or sustainability projects, such as electrification upgrades, battery installations, or HVAC replacements. Embedding flexible demand capability into these investments reduces incremental costs and strengthens the overall business case.
- **Provide evidence and risk management guidance for decision-makers**. There is a need for robust cost–benefit analysis and risk management guidance to make the case to executives without raising concerns about safety or service levels in community facilities. This suggests a need to develop standardised assessment tools, business-case templates, and safety guidelines for flexible demand as crucial enabling steps.
- **Tailor guidance by asset class**. Different asset classes (e.g. office, retail, pools, community facilities) have different opportunities and constraints. Detailed guidance and frameworks may need to be tailored accordingly to be practically useful. Asset-level analysis is also required to understand baselines, constraints, and opportunities specific to each building.
- **Improve systems and infrastructure**. An upgraded BMS or coordination with electrification and storage investments can help drive uptake. Notably, several survey respondents stressed that meaningful action may be possible without immediate upgrades, provided organisations first understand existing operations and switching schedules.

7.6 Barriers and risks

Stakeholders identified a range of barriers and risks. These reinforce earlier themes around uncertainty, risk aversion, and the need for clearer guidance and reassurance.

Key barriers

The main barriers identified by stakeholders include:

- Complexity of implementation and electricity procurement arrangements
- Knowledge gaps and misconceptions about what can be safely adjusted
- Physical constraints, including building envelopes, access to technologies, and space constraints for installing equipment such as batteries.
- Lease and tenant constraints
- Demand patterns that limit flexibility
- Reduced efficiency and its impact, for example, on NABERS Energy star ratings
- Difficulty communicating benefits to diverse stakeholders
- Perceived lack of reward for effort.

Key risks

Fewer stakeholders addressed risks directly, but those that did highlighted the following:

- **Battery safety and insurance**. While some stakeholders prefer battery solutions over HVAC adjustments to avoid tenant comfort impacts, batteries introduce concerns about fire risk and insurance implications.
- **Stranded asset risk**. Some stakeholders expressed concern with unintended long-term consequences, favouring a cautious, no-regrets approach that focuses on operational and control improvements with value independent of any single market arrangement.
- **Reputational risk from service disruption**. If a flexibility program inadvertently coincides with a notable comfort or service issue, whether or not the program caused it, it can damage confidence in the concept for a long time.

7.7 Perceived opportunities

Stakeholders identified a number of opportunities:

- **Energy and cost savings**. Most stakeholders clearly understood the potential for cost savings from flexible demand.
- **Integration into rating and assessment tools**. Several stakeholders saw ratings frameworks, particularly NABERS, Green Star ratings, and Scope 2 emissions reporting, as important drivers for incentivising flexible demand.
- **Electrification**. As noted above, building electrification programs were seen as an opportunity to integrate flexible demand, which can help manage risks associated with increasing electrical loads.
- **Strategic positioning and futureproofing**. Some stakeholders expressed interest in positioning their organisations as industry leaders. Early engagement with flexible demand can align with corporate sustainability commitments and signal proactive adaptation to the energy transition, particularly as buildings incorporate more electric systems and smart technologies.
- **Collaborative and aggregated solutions**. The workshop highlighted an opportunity for collaboration: by aggregating flexible loads across multiple buildings or organisations (potentially through third-party aggregators), even smaller or less flexible sites could collectively provide a meaningful response and share in the benefits. This could help address the equity concerns raised elsewhere and open new revenue streams for a broader set of participants.
- **Indoor environmental quality and productivity co-benefits.** Craig Roussac from Buildings Alive highlighted that flexible demand can leverage abundant midday solar energy to improve ventilation and indoor air quality to enhance productivity and comfort, a narrative that moves away from framing flexible demand as solely a form of curtailment or sacrifice.

8 GLOSSARY

Abatement	A commercial lease arrangement that involves a partial or full rent reduction to compensate the tenant for the premises not meeting acceptable standards. In the context of flexible demand, this can include the temperature in the building being hotter or colder than agreed in the lease.
ABCB	Australian Building Codes Board—The body that maintains the NCC on behalf of federal, state and territory governments.
AC	Alternating current—An electrical system where voltage and current vary continuously in magnitude at a set frequency (50 Hz in Australia).
AEMC	Australian Energy Market Commission—The organisation responsible for making the rules for the NEM, gas markets, and retail energy frameworks, and advising governments on market development and long-term reforms.
AEMO	Australian Energy Market Operator—The organisation responsible for operating Australia's electricity and gas markets, managing the power system, forecasting, and coordinating demand response programs.
AER	Australian Energy Regulator—The organisation that enforces the rules and regulates electricity and gas networks, wholesale markets, and retail markets to ensure affordability and fairness.
Aggregator	A company that pools many CERs so they can participate as a single unit in energy markets as a VPP.
Baseline load	A counterfactual estimate of what a load 'would have been' without a flexible demand intervention.
Behind-the-meter	Assets on the customer side of an electricity meter (as opposed to the grid side).
BESS	Battery energy storage system—A battery, grid inverter and their associated control systems.
BMS	Building management system—A computer-based control system for monitoring and managing the mechanical and electrical equipment of a building, including HVAC, lighting and other electrical loads.
CER	Consumer energy resources—Behind-the-meter energy resources that can be controlled to support grid stability. Examples include solar, batteries, EVSEs, HVAC systems and hot water systems.
CSIP-AUS	Common Smart Inverter Profile – Australia—A national communications standard that enables secure, interoperable control and monitoring of CERs by DNSPs or aggregators.
Curtailment	Reducing or stopping electricity generation from a power source (e.g. solar), even though it could produce more, usually to ensure grid operating limits are not breached.
DC	Direct current—An electrical system whereby voltage remains relatively constant.
Demand response	A type of flexible demand that involves customers reducing or shifting load when asked by a market operator, retailer or aggregator.
DER	Distributed energy resources—An alternative term for CER.

DNSP	Distributed network service provider—The owner and operator of the poles, wires, substations and related infrastructure that deliver electricity from the transmission network to homes and businesses.
DOE	Dynamic operating envelope—A flexible limit placed on how much electricity a customer can export or import at any moment. It adjusts in real time based on network conditions to allow more rooftop solar and batteries to operate safely without overloading local grids.
DRMS	Demand response management system—A platform used by aggregators and large electricity customers to automate participation in demand response programs.
DRSP	Demand response service provider—An organisation that aggregates, enables and manages electricity demand response on behalf of customers and participates directly in the WDRM.
Duck curve	A visual description of one or more daily demand profiles, characterised by morning and evening periods of high demand, interspersed by a daytime period of low demand.
EMIS	Environmental Management Information System—A software system used to collect, analyse and report energy and environmental performance data, typically without direct control of building systems.
ESG	Environmental, Social and Governance—A widely used investment and corporate reporting framework for assessing how responsibly and sustainably an organisation is managed and operates in terms of its environmental impacts (e.g. carbon emissions), social factors (e.g. labour practices) and governance (e.g. transparency and board oversight).
EV	Electric vehicle.
EVSE	Electric vehicle supply equipment—the charger or other infrastructure that delivers electricity from the grid to an EV.
FD	Flexible demand—The capability to vary customer electricity demand in response to generation, network or market signals.
FCAS	Frequency control ancillary services—An electricity market where fast-responding loads and batteries help maintain grid frequency.
GBCA	Green Building Council of Australia—A national industry body that develops and administers the Green Star sustainability rating system for buildings, fitouts and communities, which promotes best-practice design, construction and operation to improve environmental performance across the built environment.
HVAC	Heating, ventilation and air conditioning—Systems used to regulate temperature, humidity and indoor air quality in buildings.
LGCs	Large-scale Generation Certificates—Tradeable certificates created for every megawatt-hour of renewable electricity generated by accredited large-scale power stations in Australia. They are part of the Renewable Energy Target scheme and can be sold to businesses or electricity retailers, who use them to meet their renewable energy obligations or sustainability goals.
Minimum demand	A grid condition when net electricity demand is very low, usually in the middle of the day, when solar output is abundant.

NABERS	National Australian Built Environment Rating System—A government-run framework and rating system that measures how efficiently a building uses energy, water, waste services, and how well it performs for indoor environmental quality.
NEM	National Electricity Market—The system that connects electricity generators, retailers, and consumers across Australia's eastern and southern states. It operates as a wholesale market where electricity is bought and sold, and it also manages the physical flow of power through the grid to keep supply and demand balanced in real time.
NCC	National Construction Code—Australia's primary set of technical design and construction requirements for buildings, setting the minimum standards for safety, health, amenity, accessibility, and sustainability.
Net zero	Balancing the amount of greenhouse gases emitted with the amount removed from the atmosphere. This can be done by reducing emissions as much as possible and then offsetting any remaining emissions through actions like carbon capture or purchasing offsets. The goal is that net emissions equal zero.
NGER	National Greenhouse and Energy Reporting scheme—Australia's mandatory national framework for large corporations to measure and report greenhouse gas emissions, energy production and energy consumption.
PDRS	Peak Demand Reduction Scheme—A NSW government program that provides financial incentives for customers to reduce electricity use during peak demand periods.
Peak demand	A grid condition when electricity demand is very high.
Peak demand charges	Electricity charges based on a site's highest level of power demand during a billing cycle, aimed at reducing strain on the grid during peak times. Can comprise up to 40% of customers' bills.
PPA	Power purchase agreement—A long-term contract between an electricity generator and a buyer. Under a PPA, the buyer agrees to purchase electricity at a fixed price for a set period, usually several years.
Pre-cooling or pre-heating	Running HVAC earlier than usual to shift cooling/heating loads to periods of lower cost or lower emissions intensity.
REGO	Renewable Energy Guarantee of Origin—Certificates that show electricity was generated from renewable sources. They provide transparency and allow businesses, energy retailers, and consumers to prove the origin of their electricity. Each certificate represents a specific amount of renewable energy and can be used for reporting, compliance, or sustainability claims.
REI	Renewable Energy Indicator—A component of a NABERS Energy rating that displays the proportion of a building's energy that comes from on-site renewable energy generated and off-site renewable energy procured.
SWIS	South West Interconnected System—Western Australia's main electricity network, servicing Perth and surrounding areas.
TES	Thermal energy storage—A system for storing thermal energy, such as water tanks, used to store thermal energy (heat or coolth) for later use.

ToU	Time of use—An electricity pricing structure where the rate changes by time of day to encourage load shaping and shifting. Three tiers are typically used: peak, shoulder and off-peak.
V2G	Vehicle-to-grid—A system by which an electric vehicle can discharge energy from its battery back into the electricity grid. Also referred to as bidirectional charging.
VPP	Virtual power plant—An aggregation of CERs (e.g. batteries, EVSEs, solar and flexible loads) that can be coordinated to act like a power plant in electricity and ancillary service markets.
WDRM	Wholesale Demand Response Mechanism—An Australian market mechanism that allows large energy users to reduce load during high-price periods and get paid directly through the wholesale electricity market.

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