COMMERCIAL BUILDINGS ELECTRIFICATION ROADMAP

Stage One – Research Report

January 2026

eec

Acknowledgment of Country

This report was produced on the lands of the Wurundjeri people of the Kulin nation.

Design by **Minus Plus Multiply**.

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EXECUTIVE SUMMARY

Electrification of the commercial buildings sector represents a key opportunity for emissions reduction in the built environment. Replacing fossil fuel use in buildings with efficient electric technology allows for buildings to be powered with low-emissions renewable electricity and can integrate commercial buildings within the broader energy transition. Under the AEMO Step Change scenario, Australia's gas consumption within commercial buildings will decline from 45.8 PJ in 2024 to 9.3 PJ in 2050.[1] A higher level of ambition, to reduce commercial buildings' gas consumption to zero by 2050, would require 3.5% of the current commercial building stock to disconnect from the gas network each year, up from about 1% currently.[2]

A key challenge for governments and industry is to deploy electrification solutions into existing building stock. While the technology for efficient electrification of commercial buildings is maturing and increasingly available, electrification pathways and least-cost strategies for replacing complex centralised systems are not yet widely understood or adopted within the sector. While important drivers are likely to increase the focus on electrification, a range of barriers are slowing down or preventing uptake and relatively few examples of completed electrification retrofits are available across the sector. Clear signalling and strategic policy intervention are required to overcome inertia and mitigate the risk of continued fossil fuel use beyond a critical time frame.

This report provides the findings of Stage 1 of the Commercial Buildings Electrification Roadmap project. It includes a review of existing evidence, analysis of drivers and barriers, a proposed typology of commercial buildings, and proposed priority policy recommendations.

The project undertook targeted, expert consultation and reviewed available data and evidence on the extent and characteristics of gas consumption in commercial buildings. Data analysed included gas and electricity use in the sector by jurisdiction and by building type; gas intensity; end uses of gas within buildings; and scenarios for emissions reduction, electrification and energy efficiency.

1 Strategy. Policy. Research. (2025a), *Commercial Buildings Baseline Study 2024 update – revised February 2025.*
2 Department of Climate Change, Energy, the Environment and Water (2025), *The Trajectory for Low Energy Buildings Update, Commonwealth of Australia 2025*, p.8.

Qualitative information about electrification of commercial buildings was also gathered through consultation to identify perceived market 'drivers' and 'barriers' to retrofit buildings and / or replace gas appliances with an all-electric equivalent. The key identified drivers and barriers were:

Drivers	▪ Market demand for decarbonisation and sustainability ▪ New opportunities in energy transition ▪ Gas supply risks ▪ Reduced operational costs ▪ Incentives and finance ▪ Ratings, disclosure and consumer information ▪ Regulations and standards
Barriers	▪ Financial barriers ▪ Physical and practical constraints ▪ Information gaps in an emerging market ▪ Disruptions to tenancies and operations ▪ Electricity infrastructure and network capacity ▪ Ownership and tenancy structures ▪ Skills and workforce development ▪ Supply chains ▪ Owner / tenant knowledge and motivations on electrification ▪ Consultant, facility manager and technician knowledge and motivation ▪ Social motivations related to cooking ▪ Mixed use buildings ▪ Metering and monitoring ▪ Refrigerants ▪ Heritage considerations

One of the key findings to emerge from this analysis is that significant gaps remain in our understanding of the opportunities for commercial buildings' electrification, with data gaps impacting on the ability of policymakers, industry and building owners to prioritise effective measures. The electrification of existing commercial buildings with gas connections is a new and emerging focus, with a relatively small handful of buildings in Australia having been successfully completed. Accumulated experience and industry know-how are required to move beyond the early adoption phase. A lack of clear examples or demonstrations to follow represents a clear barrier for the expansion of commercial building electrification, in particular for building types where fewer or no case studies are available.

An analysis of building types was undertaken to determine shared characteristics that may inform electrification pathways. Considerations included existing classifications; energy use characteristics; drivers and barriers to electrification; stakeholders; size; and additional factors. Based on this analysis, it is proposed that a **Typology for Commercial Building Electrification** is as follows:

Building type	Description
Small buildings	Smaller buildings with domestic-level only appliances, leading to similar electrification measures. Occurs across range of sectors, including offices, retail, accommodation.
Office	Medium and large offices, defined as 1,000m^2 floor space or greater. Primary gas use space conditioning.
Retail and hospitality	Shopping malls, retail, supermarkets, and restaurants and hospitality. Primary gas use profiles including space conditioning and cooking.
Hotels	Hotels and other short-term accommodation with central services. Gas uses include space conditioning, cooking, hot water, and laundry.
Apartments	Apartment buildings with central services including hot water or space conditioning.
Health and specialist	Hospitals, health care facilities, aged care, and research facilities. Characterised by specialist requirements for gas processes.
Public buildings	Diverse range of buildings including entertainment, assembly, public facilities, schools, sports facilities and aquatic centres. Space conditioning a primary gas use, with additional specialist uses such as swimming pools.
Mixed use	Mixed use buildings incorporate multiple categories, resulting in additional complexity in electrification.
Industrial	Industrial processes within buildings are considered outside scope.

Drawing on the analysis and the development of the typology, the report furthermore provides a selection of recommendations for policy measures available to governments to accelerate private sector investment in electrification. A summarised list of recommendations is as follows:

Recommendations

Regulation

1. Disallow gas connections in new commercial buildings and apartment buildings
2. Implement proposed improvements to energy efficiency requirements within NCC25
3. Expand Commercial Building Disclosure Program to incorporate mandatory disclosure of energy performance in more building types and progression towards minimum energy performance standards (MEPS) and full electrification
4. Expand and monitor minimum energy performance standards for key electric equipment

Strategy and targets

5. Set and communicate targets and timelines for the electrification of the existing commercial building stock
6. Set ambitious electrification targets for government owned buildings
7. Align electrification agenda to strategy for refrigerant decarbonisation

Research and data

8. Invest in demonstration projects
9. Address research and data gaps on energy use in commercial buildings

Industry development

10. Enable electrification of commercial buildings by ensuring energy system capacity
11. Develop workforce with training and certification
12. Support supply chain development

Information and incentives

13. Align energy efficiency schemes with electrification objective
14. Commit to the ongoing and adequate funding of NABERS to support continuous improvement and expanded availability of rating tools
15. Provide information, resources, advice services and assessments for building owners, managers, and key cohorts
16. Provide funding for improved usage of metering

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BACKGROUND

There is clear evidence that Australia must quickly address emissions in the built environment sector to meet decarbonisation targets and our commitment to achieve net zero emissions.

The built environment sector accounts for nearly one quarter of Australia's national emissions, with commercial buildings alone accounting for over 10% of the national total.[3] Unlike other harder-to-abate sectors, technologies are available for immediate deployment to reduce these emissions in the short term.

Electrification of the commercial buildings sector represents a key opportunity. Replacing fossil fuel use in buildings with efficient electric alternatives allows for buildings to be powered with low-emissions renewable electricity. Technological solutions such as heat pump systems offer a clear pathway, and can be combined with improvements to efficiency and 'smart' building energy management systems to both benefit from and assist in the broader transition to a renewables-dominated energy system. However, while the technology is maturing and increasingly available, electrification pathways and least-cost strategies for replacing complex centralised systems are not yet widely understood.

A key challenge for governments and industry is to deploy these technologies into existing building stock. With an average expected lifespan of around 60 years, most commercial buildings that exist today will still be in operation in 2050. Clear signalling and strategic policy intervention is required to overcome inertia and mitigate the risk of continued fossil fuel use beyond a critical time frame.

PURPOSE

This report summarises the research conducted in phase one of the *Commercial Buildings Electrification Roadmap* project, the purpose of which is ultimately to support Australian governments to unlock emissions abatement opportunities afforded by the electrification of commercial buildings. We know we must electrify to meet net zero targets; policy makers now face the practical and policy challenges of advancing the electrification agenda, including motivating building owners to undertake these works in the short term – as is needed in line with transition pathways.

The research objective in this phase of the project has been to review existing evidence and identify the gaps that will need to be filled to develop a policy roadmap for the electrification of Australia's commercial building stock. Alongside a review of existing evidence, the report provides an evidence based typology of commercial buildings to enable the future design of a policy roadmap.

SCOPE AND FOCUS

In this report we use the term '**commercial buildings**' to refer to non-residential buildings. These include a wide range of uses in the private and public sectors, including offices, retail, hotels, schools, hospitals, aged care, public buildings, entertainment, and industrial buildings.

Most data provided in this report or in broader analysis of the commercial buildings sector include the building operations of **industrial** buildings (such as lighting, HVAC, or domestic hot water), but do not include the energy used for industrial or manufacturing processes that occur within those buildings. In practice, gas usage for building operations in industrial buildings such as warehouses or factories is comparatively minor.[4]

3 Climate Change Authority (2024), *Sector Pathways Review.* Figures include Scope 1 emissions generated in buildings and Scope 2 emissions generated elsewhere for electricity consumed in buildings.

4 Gas intensity per square metre is modelled as relatively low for warehouses and other industrial buildings in the 2022 Commercial Buildings Baseline Study.

Apartments and other multi-unit residential dwellings are generally considered outside of the scope of commercial buildings analysis and are not included in data on commercial sector energy use. Nonetheless, there are important practical and technical similarities that exist in the electrification of many apartment buildings with comparable commercial buildings, such as the presence of centralised boilers or HVAC systems. Up to 60% of energy consumption in large apartment buildings comes from common areas and shared services. For this reason, we consider apartment buildings to be within the scope of commercial buildings electrification. Data sources cited in the research findings section do not consider apartments to be within the commercial building sector, unless otherwise indicated.

Further definitions can be found in the **Building Types** section of this report.

The core focus of this report is the electrification of existing commercial buildings through the replacement of gas with electric alternatives. Other fossil fuels such as LPG and diesel are a relatively minor presence in the commercial building sector however are also within the scope of electrification. Analysis and recommendations relating to new commercial buildings are also included where relevant.

RESEARCH METHODOLOGY

Research for this project was conducted from January – June 2025. The research methodology consisted of the following elements.

DESKTOP RESEARCH

A literature review was undertaken of existing research and analysis of issues relating to the electrification of commercial building stock in Australia. Documents were primarily grey literature such as industry and government reports.

A primary focus was directed towards research or analysis on commercial buildings within Australia, although international research was reviewed for additional context.

A summary of documents considered is available in Appendix 1 and a full list of sources is available as references to this document.

INDUSTRY REFERENCE GROUP

An Industry Reference Group (IRG) has played an advisory role on the development and findings of the project. The IRG was convened jointly by the EEC and PCA in early 2025. Membership of the IRG has been by invitation and has included representatives from industry associations, businesses, academia, and NGOs, with participation of government representatives in observational capacity.

40 organisations or independent members have participated in the IRG. A full list of participating organisations is provided in Appendix 2. The IRG has met three times and provided input on the following issues:

- February 2025: Introduction and consultation on challenges, opportunities, existing research, and knowledge gaps
- March 2025: development of commercial building typology
- May 2025: review of project research and initial considerations for no-regrets policy recommendations

Alongside formal meetings, additional comments and input have been sought where relevant from IRG members.

EXPERT INTERVIEWS

To supplement the outputs of the Industry Reference Group, targeted interviews with selected expert stakeholders were undertaken. 12 interviews were conducted with stakeholders including industry practitioners, property owners undertaking electrification, government, industry associations, and external researchers. Interviews were semi-structured, allowing for broad input on issues including the drivers of electrification, barriers to electrification, existing research and data, technical considerations, industry experiences, and policy opportunities.

RESEARCH FINDINGS

GAS IN AUSTRALIA'S COMMERCIAL BUILDINGS

This section presents findings of a data review on gas consumption in the commercial buildings sector, including breakdowns by subsector and end use; gas and energy intensity; and trends and opportunities in electrification and energy efficiency. Analysis of existing data finds significant variation in the intensity and total gas consumption in commercial buildings according to jurisdiction and building type. This data review offers policy makers an indication of the scale and relative size of electrification opportunities that may inform consideration of policy interventions. While this review presents findings drawn from existing resources, significant uncertainty and data limitations remain on gas consumption in Australia's commercial buildings.

Australia's commercial sector accounts for 7.8% of Australia's total domestic energy consumption and 9.3% of Australia's total domestic consumption of natural gas.[5] Excluding exports, the sector is the fourth largest domestic consumer of gas following manufacturing (51% of total domestic consumption), residential (25.9%), and mining (12.2%).

Domestic gas end consumption by sector (Petajoules, 2023-2024)

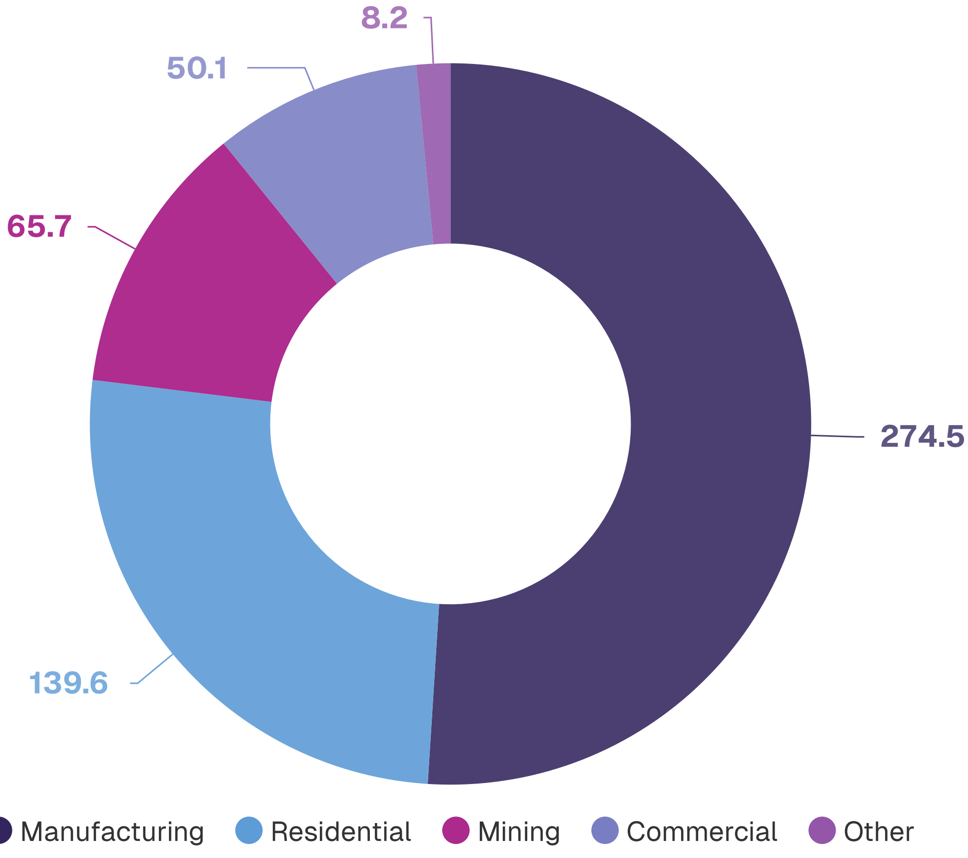

Figure 1: Domestic gas end consumption by sector. Source: Australian Energy Statistics 2025.

5 Australian Energy Statistics (2025), table H. Figures for end consumption, excluding gas used for electricity generation and gas exports.

A significant majority of the total gas and electricity consumption of the commercial sector occurs within buildings. Total gas consumption in commercial buildings across Australia was **45.8 PJ** in FY 2024.[6] **Victoria** has the highest gas consumption in commercial buildings of any jurisdiction at 20.6 PJ per year, followed by NSW at 13.5 PJ. Gas makes up a higher proportion of energy use in Victoria than other large jurisdictions.

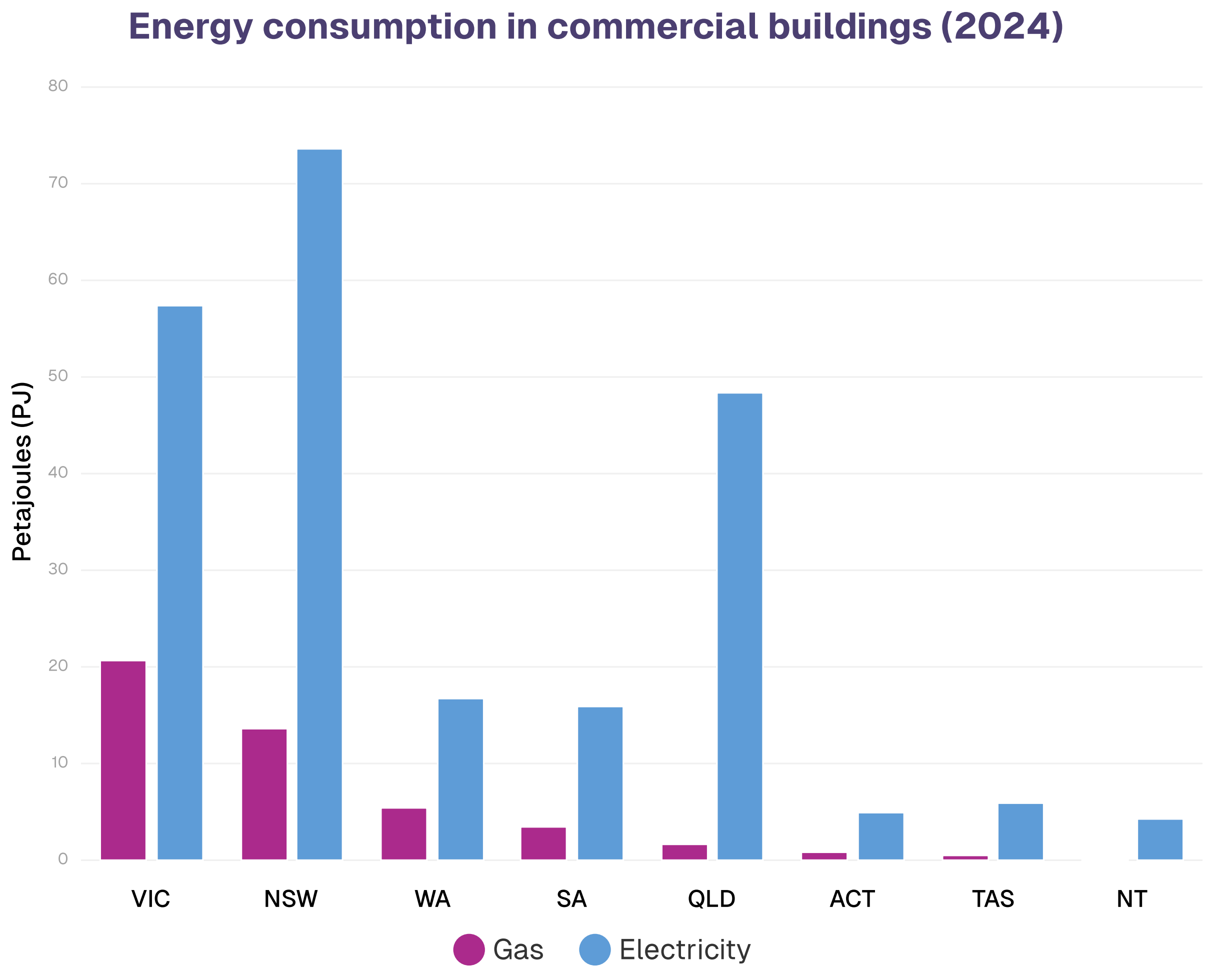

Figure 2: Total gas and electricity consumption in commercial buildings by jurisdiction.
Source: Commercial Buildings Baseline Study 2024.

When considered by building type, offices make up the largest share of commercial sector gas consumption, followed by retail, short-term accommodation, and entertainment. Between them, these building types consume over 70% of commercial buildings' gas consumption nationally. This reflects that these types of buildings make up a large share of the total building count and floor space in Australia's commercial building sector. Levels of consumption by building type are subject to uncertainty and limited data sources.

Figures presented here on building sub-type consumption and energy intensity are drawn from the 2022 Commercial Buildings Baseline Study; methodological changes in the 2024 update led to new estimates of the relative consumption across different building sub-types. For example, the 2024 update sees higher consumption in building types including transport buildings and warehouses and lower overall consumption in short-term accommodation buildings.

6 Strategy. Policy. Research. (2025a). *Commercial Buildings Baseline Study 2024 update – revised February 2025.*

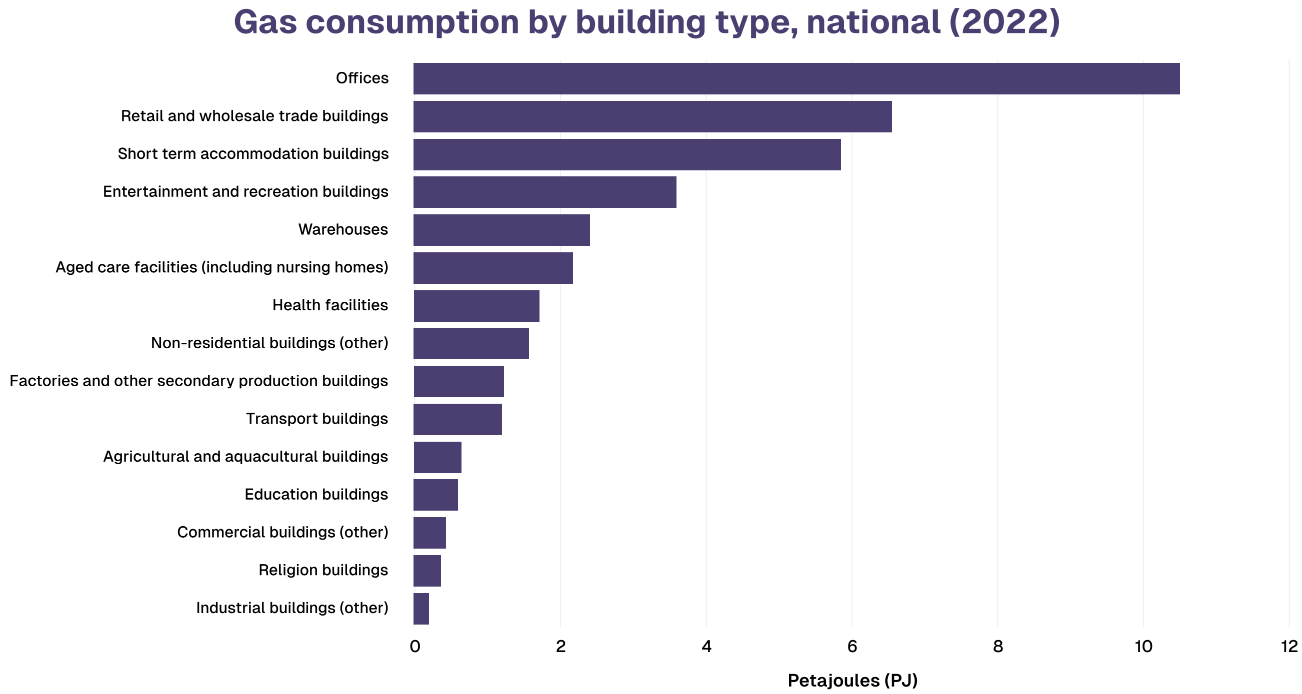

Figure 3: Total national gas consumption by building type. Source: Commercial Buildings Baseline Study 2022.

When assessed on the intensity of gas consumption in terms of gas consumed per metre squared of floor space, the building types with highest consumption are (in descending order) health, aged care facilities, accommodation, retail, and offices. Gas intensity partly reflects the prevalence of different end uses, including space heating but also specialist uses such as high-temperature boilers in hospitals and other specialist settings. Due to a combination of greater heating requirements and the historical development of gas distribution infrastructure, buildings in Victoria use gas much more intensively than in other major jurisdictions.

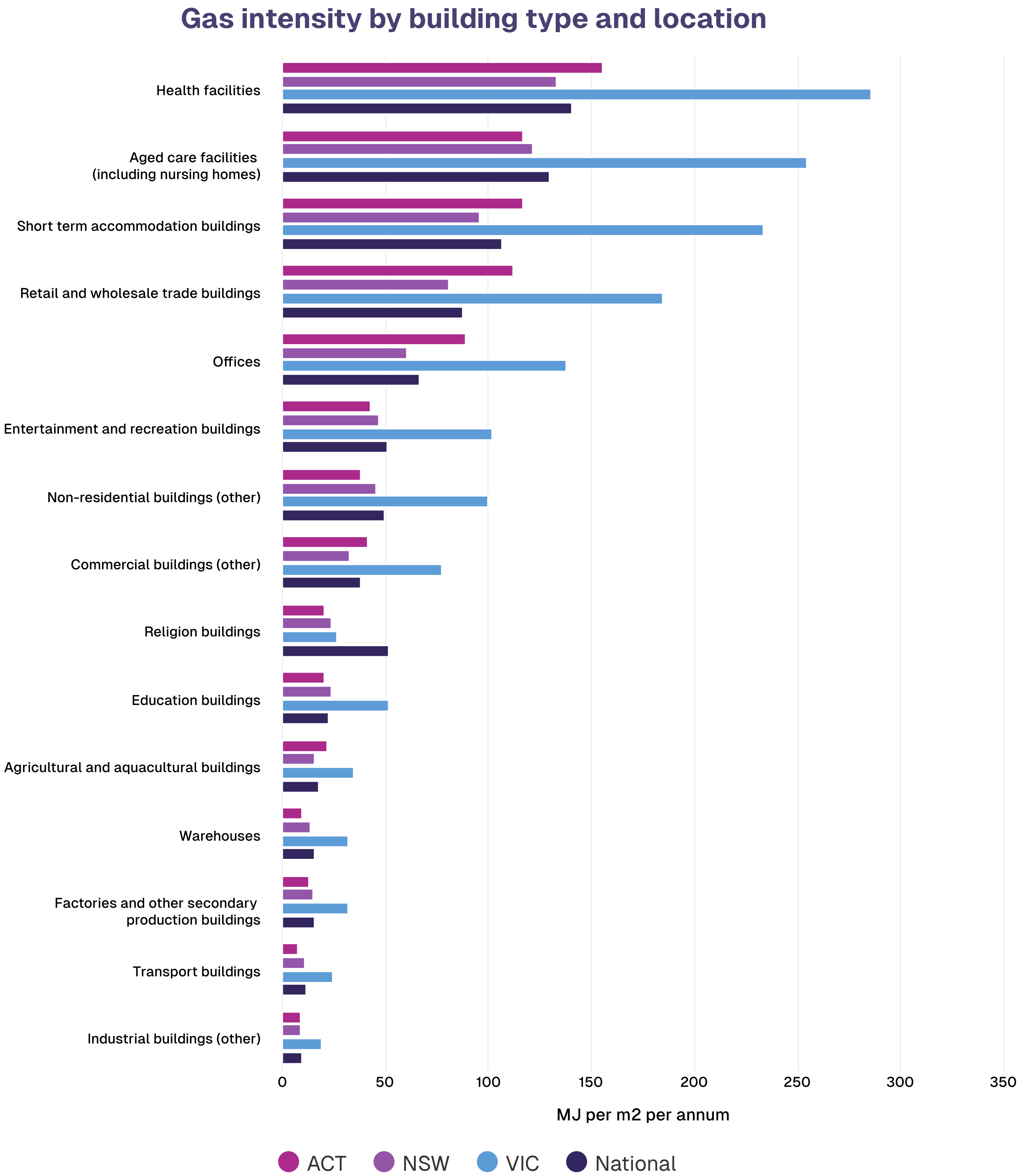

Figure 4: Intensity of gas consumption by building type and location.
Source: Commercial Buildings Baseline Study 2022.

The overall intensity of gas consumption per unit of floor space varies across states and territories. While the 2022 Commercial Baseline Study found a national average of 53 MJ of gas consumption by per square metre of commercial floorspace per year, Victoria (108 MJ/sqm/a) and SA (70 MJ/sqm/a) had significantly higher levels of gas intensity. In contrast, Tasmania, NT and Queensland had very low gas intensity of 6 MJ/sqm/a or less. Electricity intensity likewise varies across states and does not correlate with gas intensity; while the use of gas in place of electricity is a factor in the electricity intensity of commercial buildings across states and territories, other factors include building design, functions, and climate.

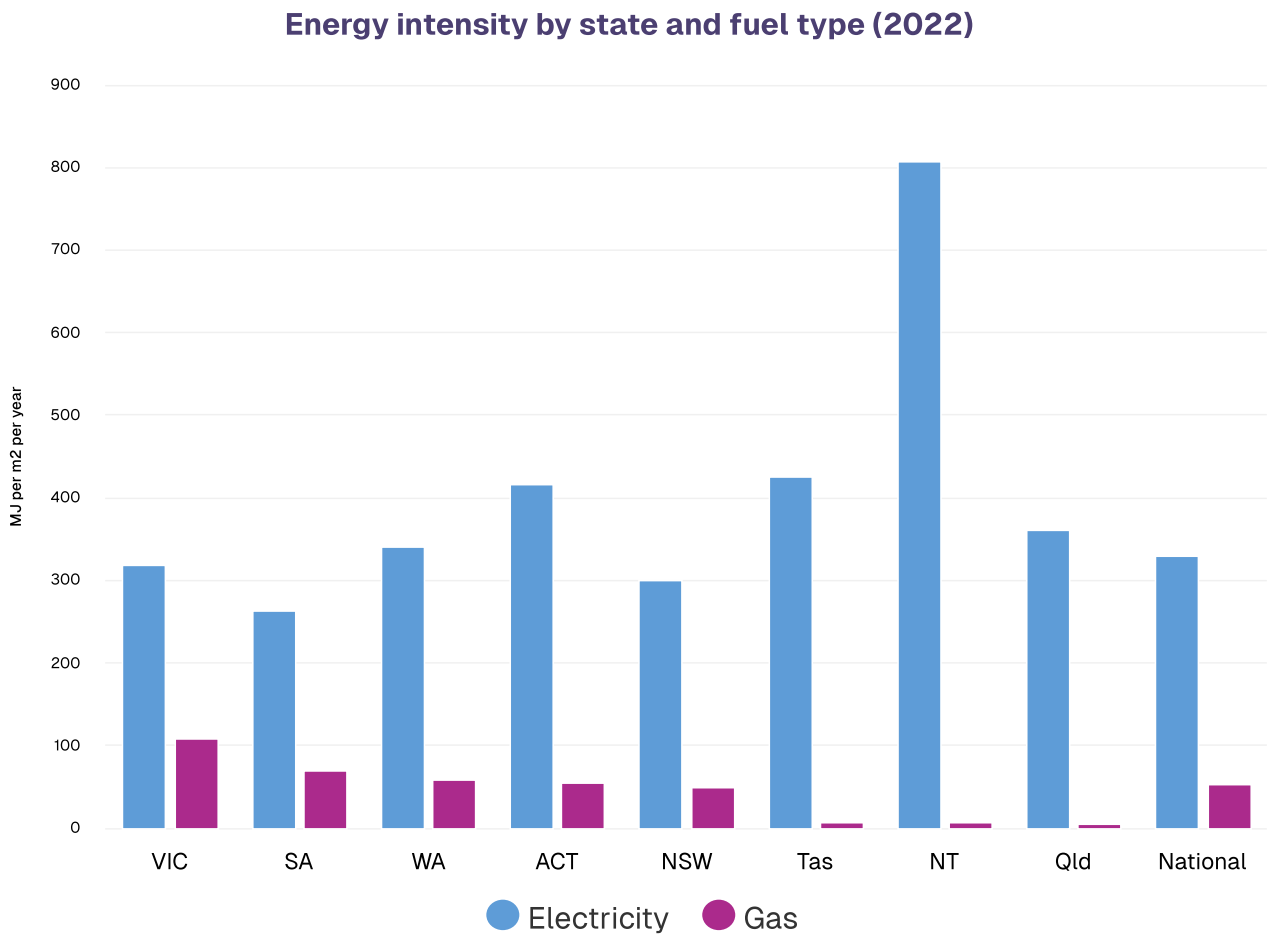

Figure 5: Energy intensity by state and fuel type. Source: Commercial Buildings Baseline Study 2022.

Analysis of data from buildings rated for the NABERS Renewable Energy Indicator finds that hotels and residential aged care facilities had the highest use of gas as a proportion of total building energy use, at 36.7% and 34.8% respectively. Other major building types such as offices, apartments (base building) and shopping centres had a lower overall proportion of gas use when compared to the total energy used in those buildings. While these datasets provide an indication of differences in gas use across building types, the sample size of buildings rated for the Renewable Energy Indicator varies with limited data available for some building types or jurisdictions. Larger datasets are available for sectors with high uptake of NABERS ratings (primarily offices, shopping centres and hotels), whereas datasets for building types with lower ratings penetration may be more likely to include high-performing buildings and therefore not be fully representative of the broader building stock.

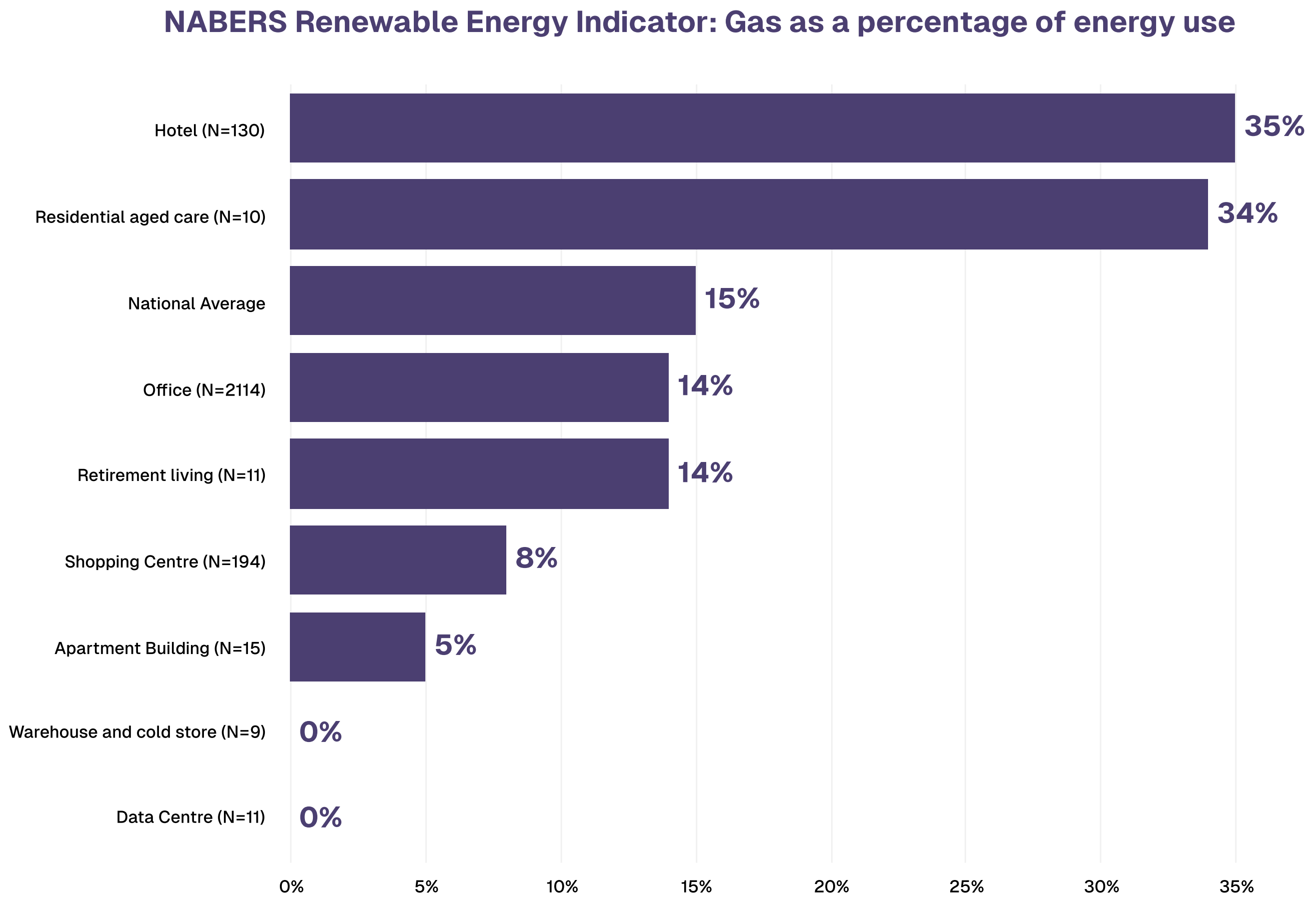

Figure 6: Gas as a percentage of total building energy use by building type. Source: NABERS REI data.

Estimates of gas consumption across the commercial building sector are subject to uncertainty and data limitations and most analysis is undertaken with modelling drawing on broader data. NABERS rating data provides valuable information at the building level, however availability of information is limited to those buildings that have undergone a rating.[7] Further data and evidence are held within the private sector but is not accessible for public research purposes.

How is gas used in commercial buildings?

Gas consumption includes a range of end uses in commercial buildings.

Space Heating

Space heating is the single largest user of gas within commercial buildings.

Gas heating can be direct furnace forced air heating or hydronic heating using a gas boiler. Most gas heating systems in larger buildings are hydronic, in which gas boilers heat water and the heated water or steam is pumped through pipes to provide space heating. Gas furnaces or ducted heating are relatively common in small buildings that can use domestic-scale appliances.

7 As at 1/10/25, 2,304 buildings had current public NABERS Energy ratings. This figure does not include private non-disclosed ratings or past ratings that are no longer current. As some buildings include multiple ratings accounting for base buildings, tenancies or other categories, the data set for analysis was 2,502 NABERS Energy ratings with Renewable Energy Indicator findings.

Gas heating can be replaced with air-, ground- or water-sourced heat pumps with significant efficiency gains. The most efficient condensing gas boilers have a Coefficient of Performance (COP) of around 0.95; older boilers often have a COP of around 0.8. These compare poorly to more efficient heat pumps with a COP of 3 or more. Site-specific issues such as space availability, acoustics and access to heat source can determine the level of ease for replacement of a gas boiler.

Temperature changes also offer opportunities for efficient electrification. Most gas boilers heat water to 80 degrees Celsius, however a lower temperature is suitable for many buildings and allows for greater efficiency, viability and cost effectiveness of heat pumps. Reductions in temperature improve heat pump performance by approximately 2-3% for every 1 degree Celsius, while a heat pump heating to 60 degrees Celsius requires lower capital costs through a wider range of products available and the avoided need for dual stage compression.[8] Industry analysis suggests that assessments for building electrification do not always consider opportunities for lowered hot water temperature for heating but rather seek a like-for-like replacement of a gas boiler, leading to unnecessarily high costs and technical challenges.

Gas space heating is most prevalent in Victoria but can also be found in other jurisdictions. Within regions with widespread gas use in commercial buildings, gas space heating is found across all building types with relatively minor distinctions between building types. In buildings with gas connections, gas space heating is typically the largest gas consumer. Levels of gas consumption are influenced by climate zone and the performance of a building's thermal envelope. Space conditioning more broadly (including cooling and ventilation) are significant users of electricity across all climates; in large buildings using gas for space heating, additional electrical equipment for cooling and ventilation are typically present.

Hot water

Alongside hot water for space heating purposes, gas equipment is used in some buildings for domestic hot water. Hot water can be sourced from centralised gas boilers used for heating (more typical in larger buildings) or from standalone domestic hot water systems, which may be based on instantaneous heating or tank storage. Heat pumps provide an alternative to gas boilers or standalone gas hot water systems and offer greater energy efficiency. As with gas boilers for space heating purposes, appropriate temperature setting can deliver efficiency gains; considerations include maintaining temperatures of at least 60 degrees Celsius to avoid Legionella risk. Other electric alternatives such as resistive instantaneous heating are a lower efficiency option that may be viable as standalone systems in buildings with lower requirements for domestic hot water. Hybrid heat pump/resistive water heaters may also be appropriate in certain commercial building settings. Demand within building types for domestic hot water facilities varies and data on end use is limited; hotels and hospitals are understood to have relatively high requirements for hot water usage.

Cooking

Cooking is a relatively small user of gas by volume within commercial buildings: available data from the 2022 Commercial Building Baseline Study finds cooking or catering makes up 0.5% of gas use in offices to 14.9% of gas use in hotels.[9] Uses of gas in commercial kitchens are primarily stovetops, ovens and grilling. Cooking facilities can be a key requirement for certain business types such as restaurants or some retail. Mixed use buildings with restaurants alongside other uses (such as offices or apartments) may face barriers to full electrification where restaurants demand gas supply. Electrification technologies

8 See for further details Leak, J, Vos, B, Snow, M. (2024). *Retrofitting commercial buildings with heat pumps: a how to guide;* and A2EP industry workshops on heat pump temperature setting.

9 Strategy. Policy. Research. (2022). *Commercial Buildings Baseline Study 2022.*

for cooking are mature and include induction cooktops and electric ovens and grills. Community perceptions of the suitability of these alternatives across cuisine types vary and are an important consideration for businesses and building owners.

Laundry

In-house laundries are a significant user of energy in hotels and some other commercial building types such as health facilities or aged care. Gas or LPG is used to heat water and generate steam for drying. Heat pumps offer a viable technological option for electrification, however interviews in this project have suggested that facility owners face challenges in accessing suitable alternatives to existing gas systems.

Swimming pools

Most aquatic centres rely on gas boilers to control indoor air and pool water temperature, with a high energy intensity. Pool water and the surrounding air are heated, the pool water evaporates, and ventilation fans remove the resulting hot, steamy air. This removal of heat necessitates the ongoing heating of air and water. In cooler climate zones, this process consumes very large volumes of gas. While there are under 2000 aquatic centres nationally, alongside public aquatic centres, some pools heated using gas may be found in other types of commercial buildings, primarily hotels.[10] Heat pumps that can capture and recycle waste heat offer an efficient, all-electric alternative that can reduce energy consumption and operational costs.

Generators

Hospitals and healthcare facilities use generators to provide backup power in case of outages, generally powered by gas or diesel. In the long term technologies such as battery storage may provide an alternative to generators to ensure continuity of energy supply. Replacement of diesel with low carbon liquid fuels (such as biofuels or renewable diesel) may also be viable.

Specialist uses

Additional specialist uses for gas make up a relatively small percentage of overall gas consumption within commercial buildings, however may result in specific challenges to electrification. Examples include high-heat steam sterilisation processes used within hospitals and aged care facilities, or laboratory uses. Some functions may be considered hard to abate processes rather than typical building uses.

Industrial processes

Heavy industrial or manufacturing processes are here considered outside of the scope of commercial buildings.

Gas consumption by end use

Limited public data are available on how much gas is used for different functions within buildings. Estimates of gas use by different end uses within buildings vary across building types and analyses. While NABERS Energy ratings provide information on total consumption levels of gas and electricity, data from ratings are not available by end use. Sub-metering to track end uses of electricity is relatively rare and concentrated in newer or higher-grade buildings; sub metering of gas equipment to identify end uses is understood to be very rare and data have has not been found during this research project. More detailed data collection has been undertaken by private companies however this information is not readily available due to commercial restrictions. Proportions of gas consumption by end use are likely to vary across buildings and building types and locations.

10 Energy Efficiency Council (2023b). *Harnessing heat pumps for net zero: the role of heat pumps in saving energy and cutting emissions*, p83

DeltaQ estimates[11] that gas end use within commercial buildings is made up of:

- Space heating: 80%
- Domestic hot water: 12%
- Kitchen equipment: 4%
- Other: 4%

The 2022 Commercial Buildings Baseline Study presents findings from limited commercial data sets provided by Buildings Alive and Energy Action.[12] Collated findings of the gas end use breakdown from Energy Action data are provided below in Figure 7. Data presented was gathered from 2004-2017 and includes 4 hospitals, 26 hotels and 27 offices; the location or specificity of included buildings may impact on proportional end use findings.

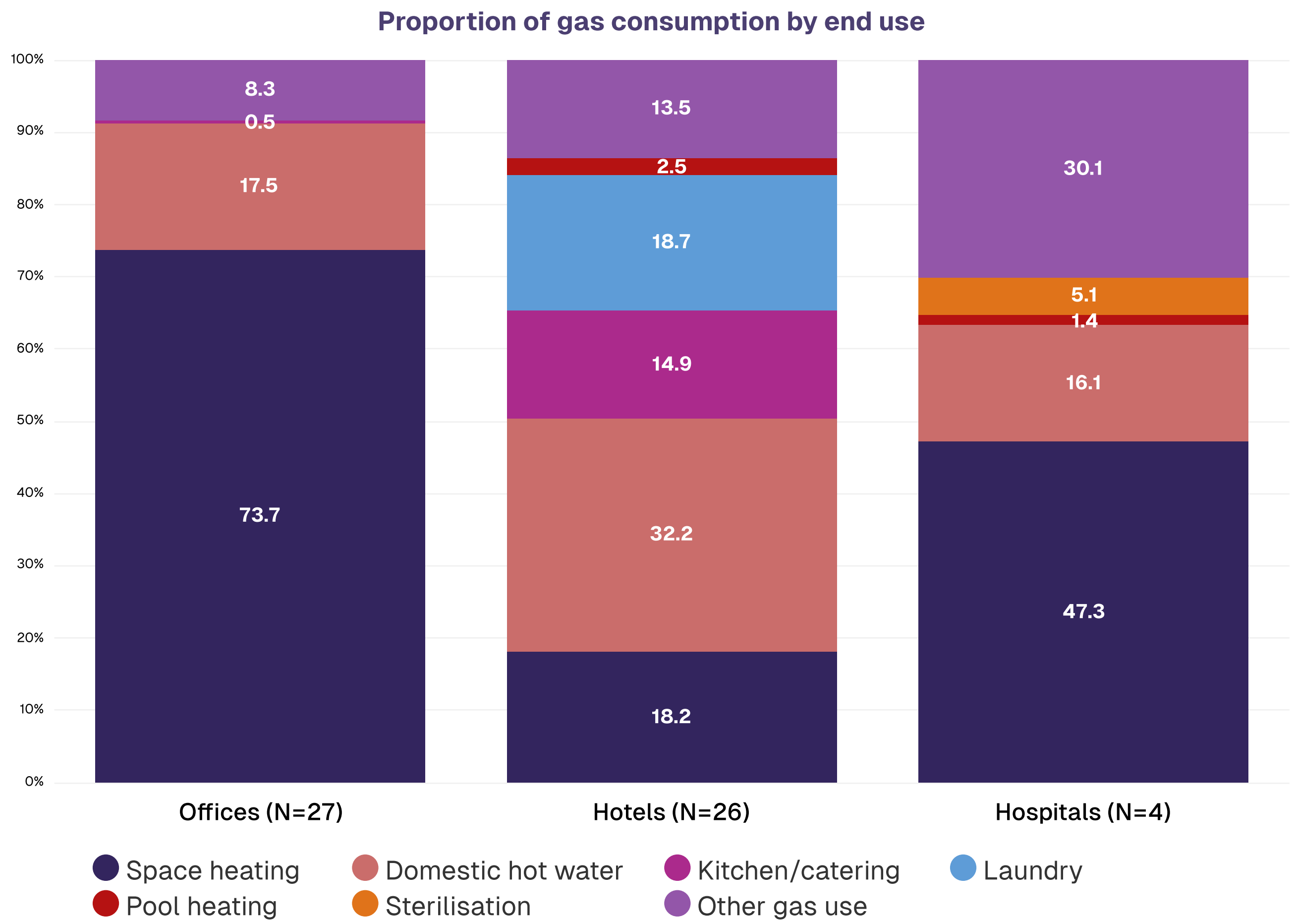

Figure 7: Proportion of gas consumption by end use. Source: Commercial Buildings Baseline Study 2022.

A further indicative estimate of proportionate gas use by end use across different building types is provided as follows, drawing on the Climateworks Centre AusTIMES database as analysed by EEC. Data categories are designed for broad-scale analysis of decarbonisation pathways in commercial buildings and other sectors, rather than detailed building-level analysis. Indicative breakdowns of end use in the database are modelled rather than observed and are drawn from research including the 2012 Commercial Buildings Baseline Study. As such, modelled

11 DeltaQ (2022). *Rapid and least cost pathways for decarbonising buildings operations: building level technical report.*
12 Strategy. Policy. Research. (2022), pp 110-122

results may provide indicative guidance for policymakers but should be considered as having limited certainty. Data are presented here with original AusTIMES categories for buildings and end uses; the category "appliances" primarily refers to cooking and catering, while "other" refers to uses including specialist uses, generators, laundry, or swimming pools.

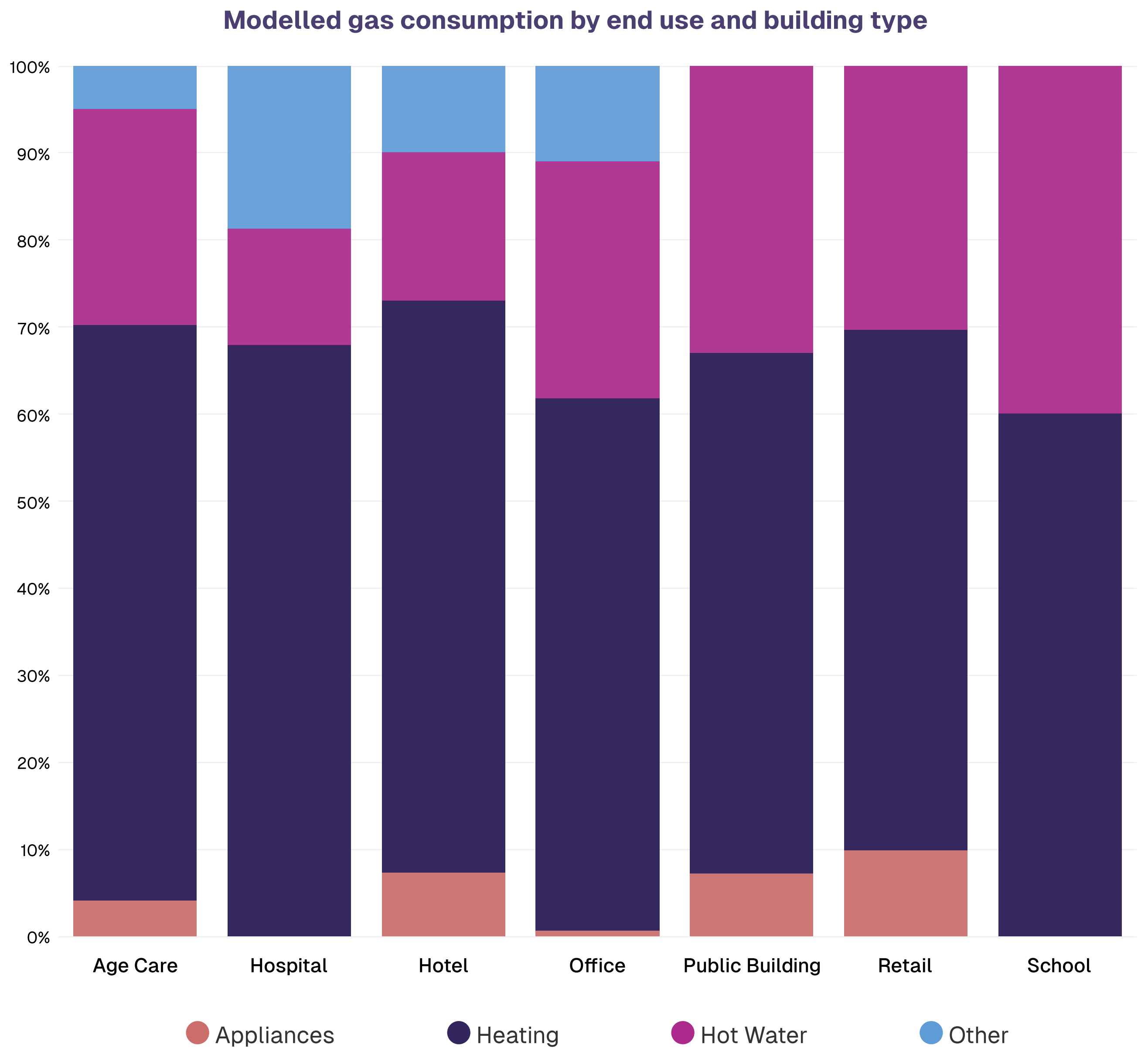

Figure 8: Indicative breakdown of gas consumption by end use in selected commercial building types. Source: Climateworks Centre / EEC.

The modelling finds a relatively consistent proportional breakdown of end use across states and territories, with minor exceptions such as a somewhat proportionately higher consumption of gas for space heating in ACT. While evidence is limited, is possible that proportionate uses may vary more greatly across locations than those indicated in the modelling – for example, we hypothesise that gas energy use for space heating relative to other uses such as hot water is likely significantly higher in Victoria than other states. Overall modelled consumption figures by state vary to a limited extent from other data sources.

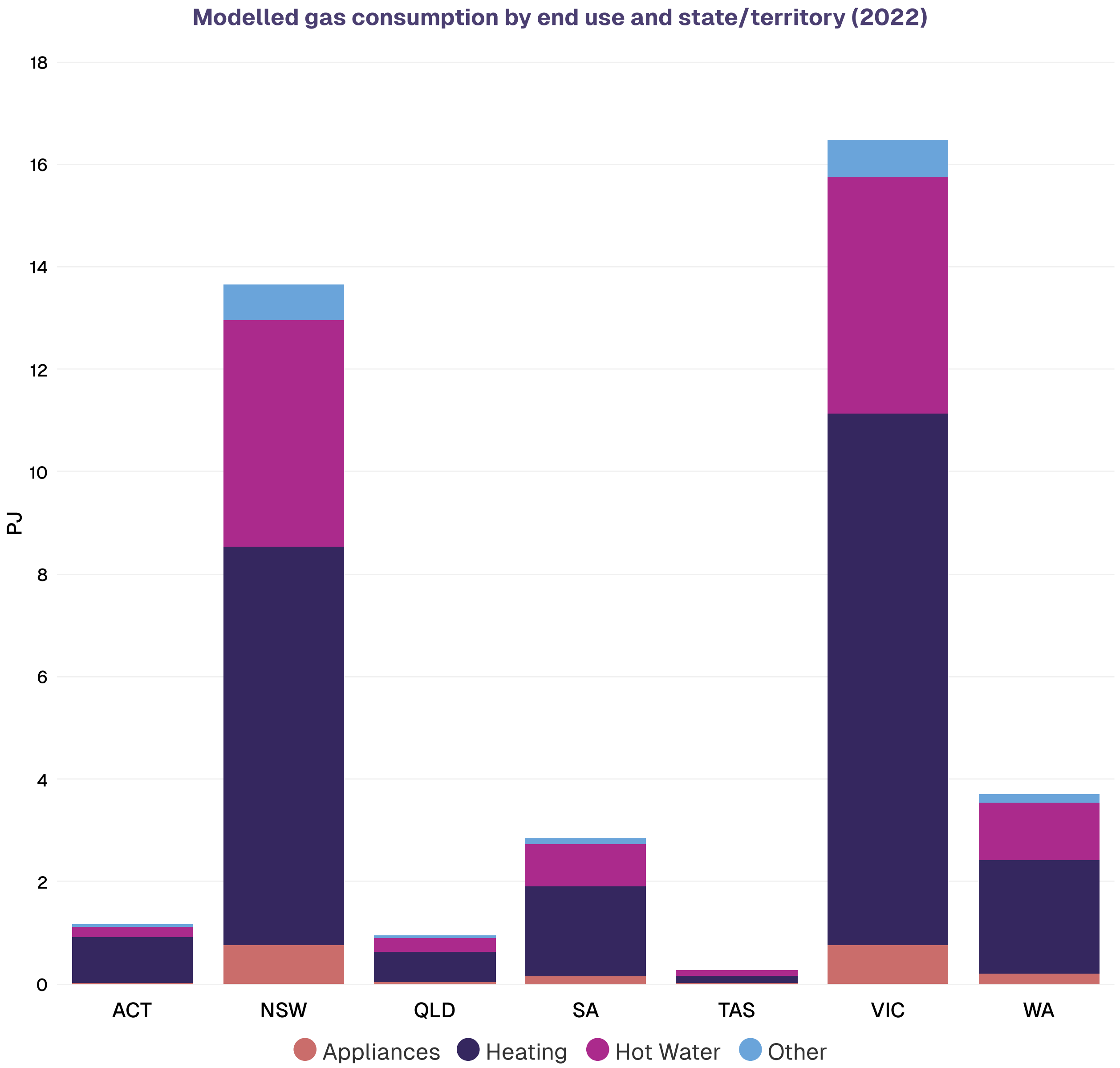

Figure 9: Modelled gas consumption in commercial buildings by end use and state/territory. Source: Climateworks Centre / EEC.

Electrification and decarbonisation

Stationary combustion[13] in commercial buildings accounts for 6 Mt CO_2-e per year, or 5% of total Scope 1 and Scope 2 emissions from the built environment sector.[14] These emissions are currently less than those produced by electricity use in commercial buildings (35 Mt CO_2-e per year).

13 "Stationary combustion" is the direct combustion of fuels within buildings. While natural gas accounts for the largest share of fossil fuel use in commercial buildings, other fuels such as diesel and LPG are also included.
14 Climate Change Authority (2024)

Emissions from built environment sector, 2024 (Mt CO_2-e)

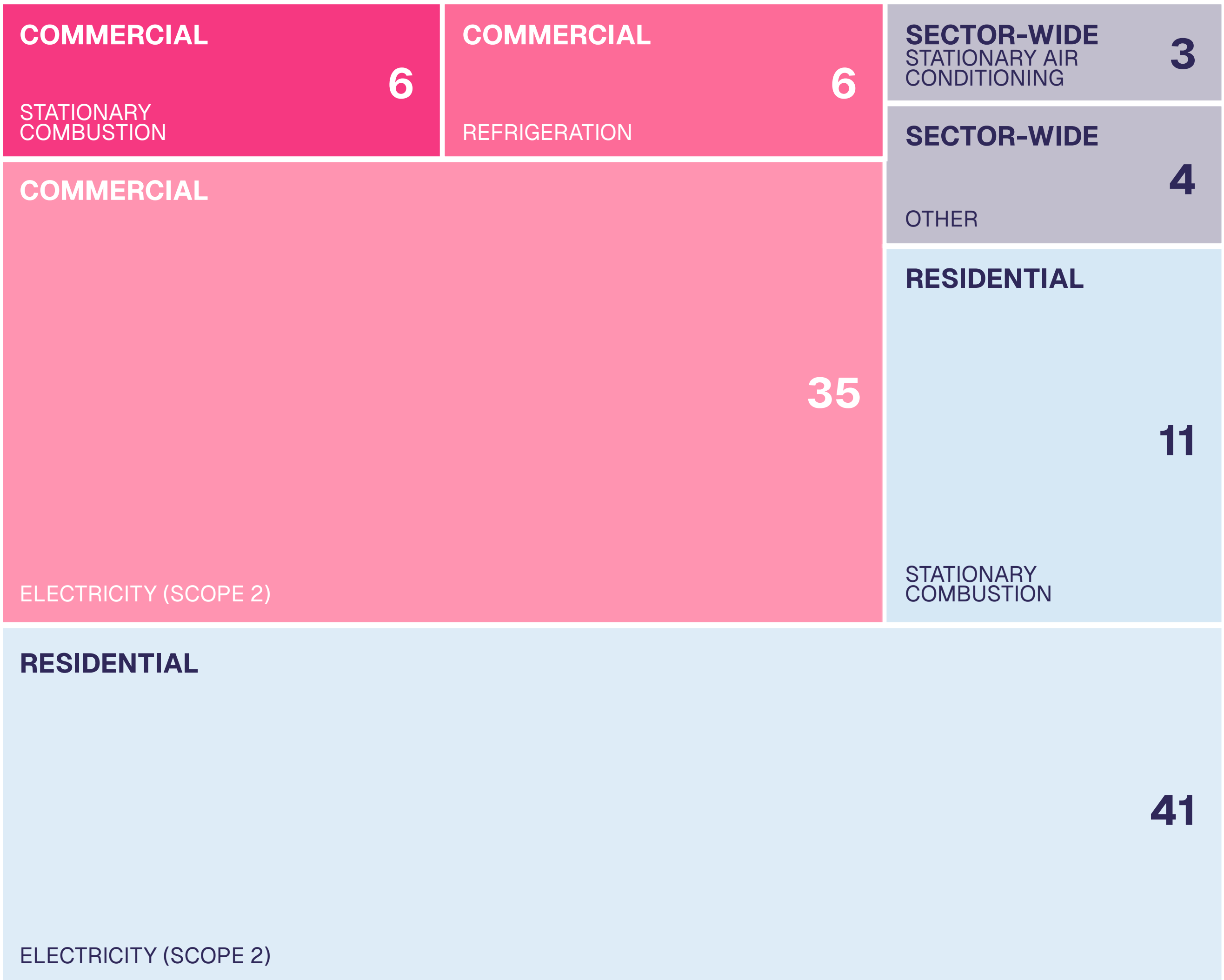

Figure 10: Built environment sector emissions 2024.
Source: Climate Change Authority Sector Pathways Review, 2024

The decarbonisation of Australia's electricity grid due to the growth of renewables is expected to reduce Scope 2 emissions from electricity over the coming decade, whereas the intensity of emissions from the direct combustion of gas and other fossil fuels is expected to remain steady.

Applying historical and projected emissions intensity factors for electricity from the grid in Victoria to a case study of a large aged-care building[15], we find that Scope 2 emissions from use of electricity within the building are falling.

An efficient all-electric HVAC system already results in lower annual emissions than a dual fuel system; even a relatively less efficient electric system will come to produce lower emissions over the lifetime of the building. Over a 20-year period from 2025, the gas boiler system will produce significantly more emissions (5780 tonnes) than the basic heat recovery chiller system (2779 tonnes) or the highly efficient variable refrigerant volume system (1728 tonnes).[16]

15 Building scenarios and energy use sourced from Energy Efficiency Council (2023b) p84

16 Calculations include Scope 1 emissions from gas and Scope 2 emissions from electricity; figures do not include emissions from refrigerants. Electricity emissions intensity projections sourced from DCCEEW **Australia's Emissions Projections 2024**, Appendix D.

Operational emissions: HVAC system, Victoria (500kW cooling and 560kW heating capacity)

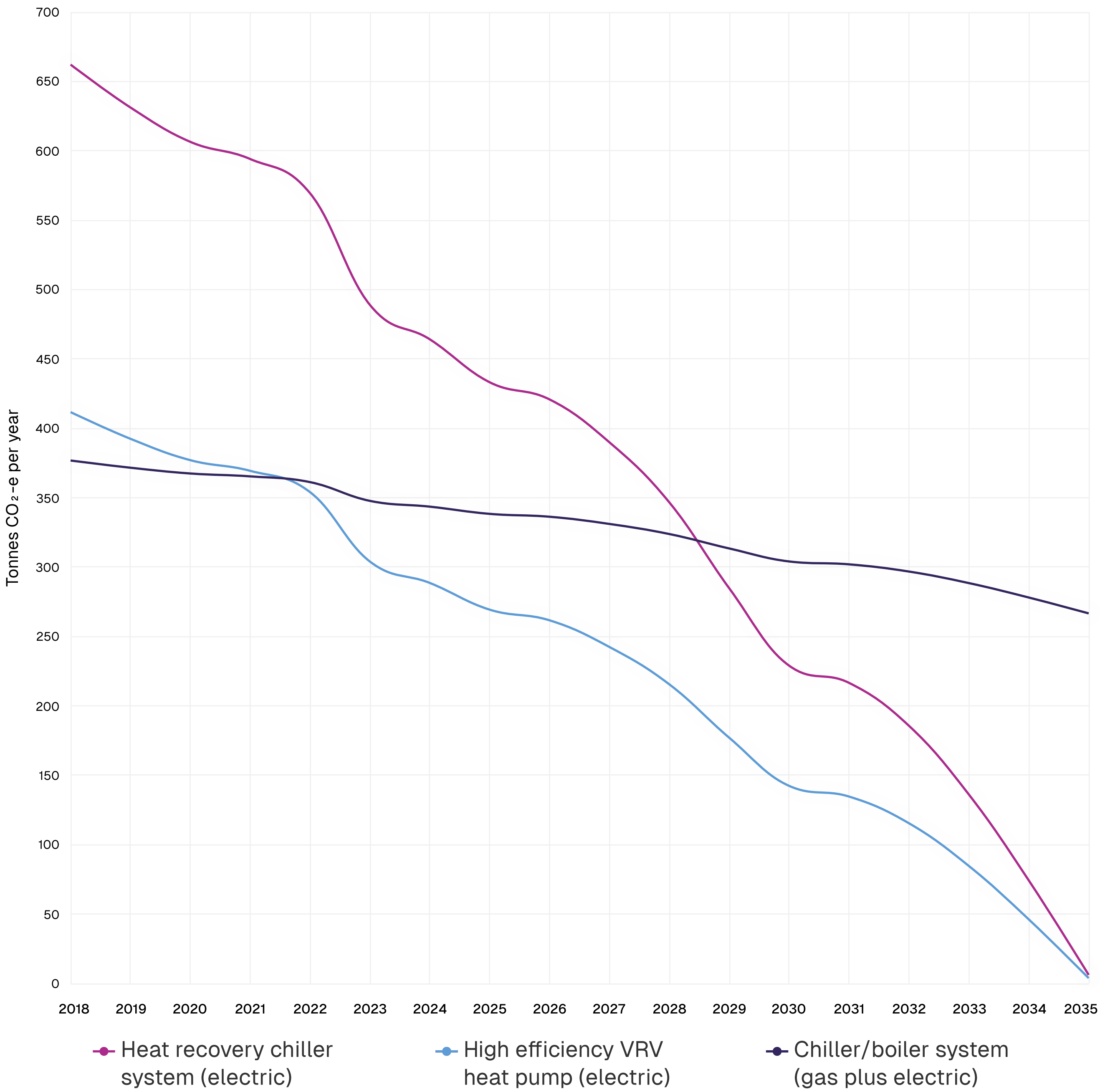

Figure 11: Operational emissions of sample building. Source: EEC analysis.

Scenarios for decarbonisation require a reduction in gas consumption within commercial buildings. Unlike harder-to-abate sectors of the economy, technologies are already available for deployment to reduce emissions in the built environment.

Climateworks Centre modelling[17] finds that in a scenario aligned with limiting global temperature rises to 1.5 degrees, commercial building gas consumption would fall below 5 PJ by 2040, declining to near zero by 2050.

17 EEC analysis of Climateworks Centre Austimes modelling; see Energy Efficiency Council and Climateworks Centre (2025). *Efficient Electrification for Australia's 2035 Target – Policy brief.*

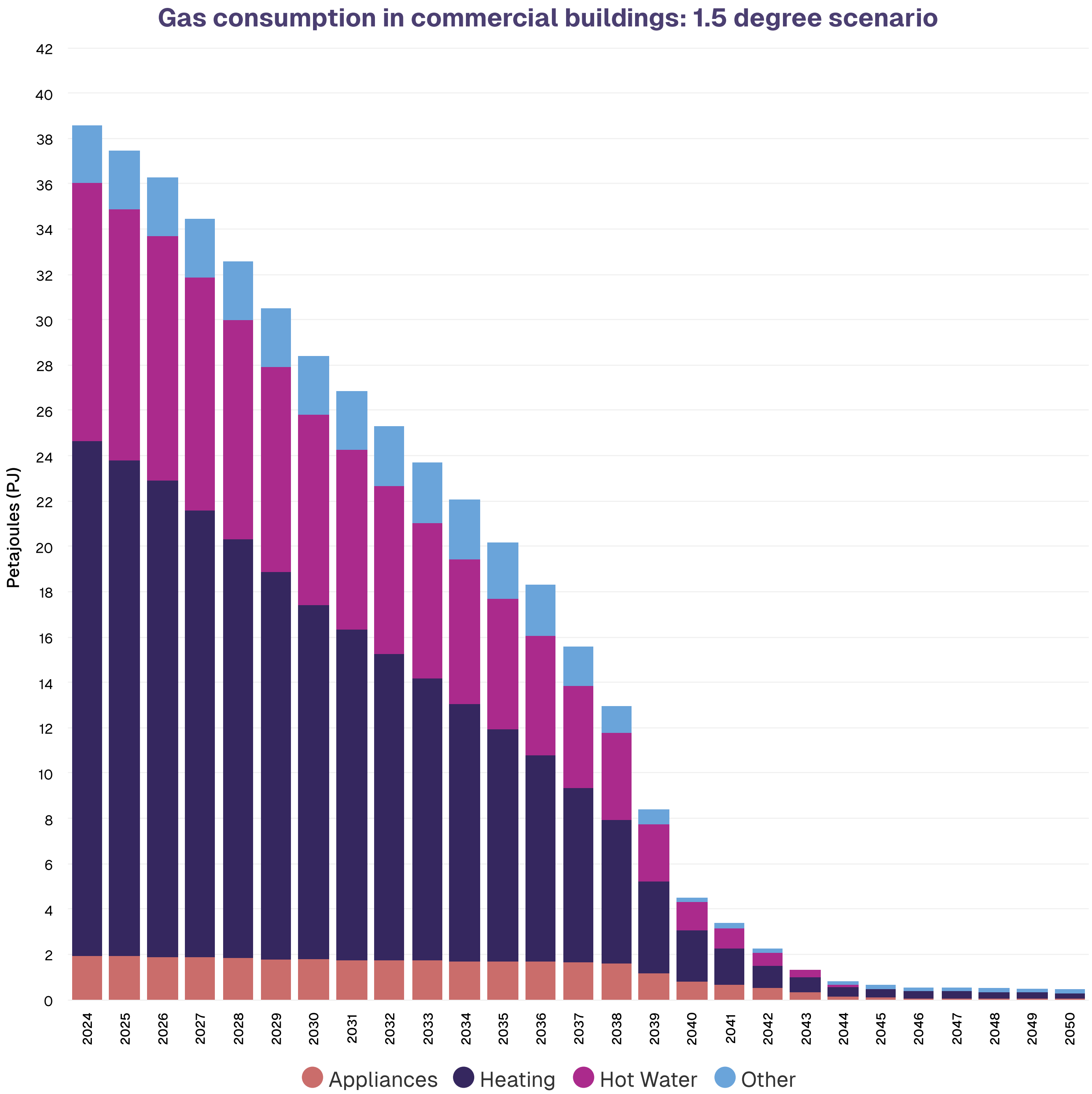

Figure 12: Gas consumption in commercial buildings in 1.5 degree warming scenario. Source: Climateworks Centre / EEC.

Other scenarios also project a decrease in gas consumption within commercial buildings. The Commercial Buildings Baseline Study 2024 projects that under the AEMO Step Change scenario, national gas consumption within commercial buildings will decline from 45.8 PJ in 2024 to 9.3 PJ in 2050. Under the same scenario, electrification and a growth in the overall building stock result in an increase in electricity consumption within commercial buildings from 226 PJ in 2024 to 370 PJ in 2050.

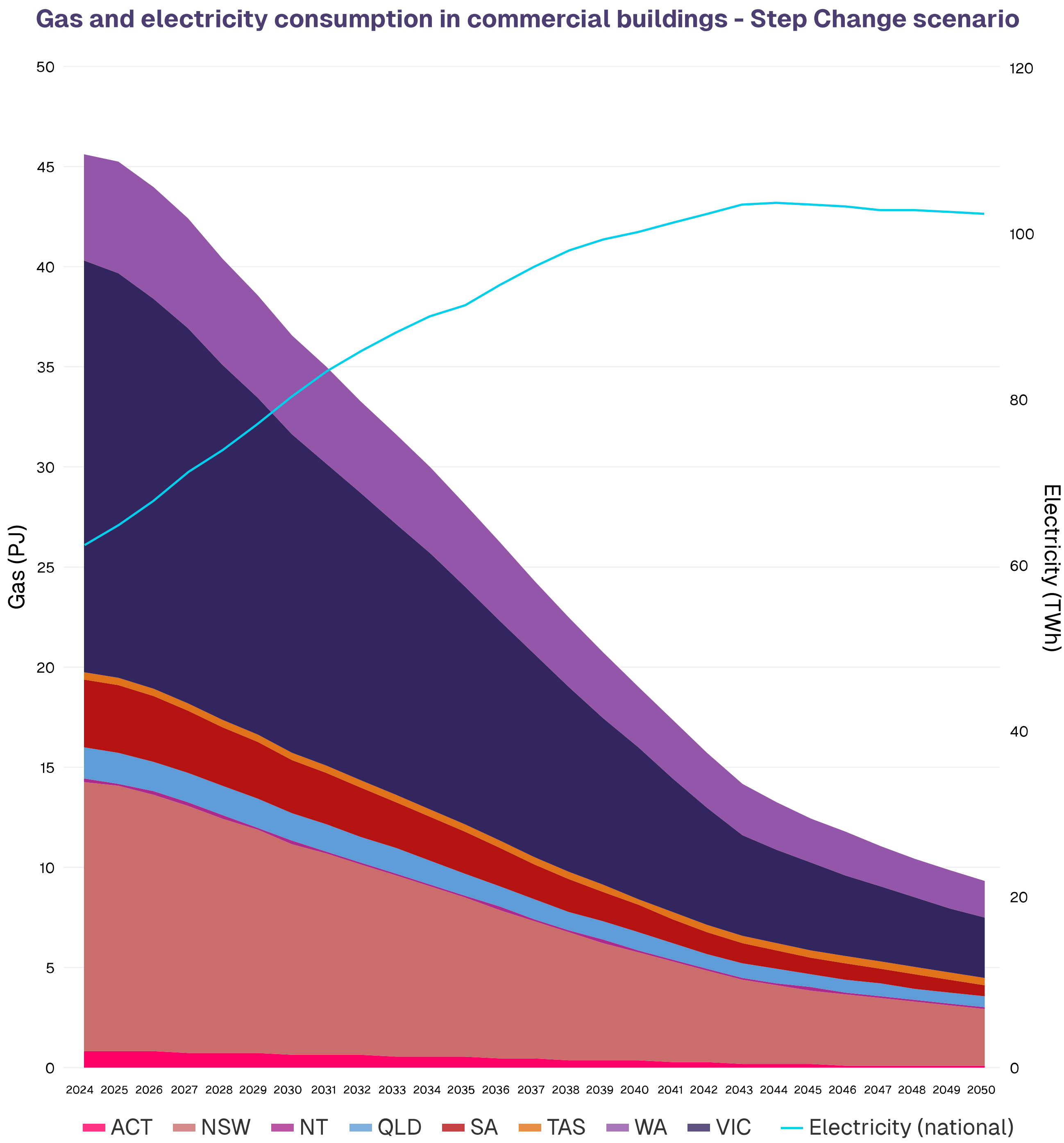

Figure 13: Gas consumption in commercial buildings under AEMO Step Change scenario. Source: Commercial Buildings Baseline Study 2024.

Opportunities from efficient electrification

Australia's commercial buildings are becoming more energy efficient. The average amount of electricity and gas required per square metre has fallen by around 18% and 16% respectively between 2012 and 2024; buildings with ratings under the NABERS program have improved efficiency by around 40% over the same period.[18]

18 See NABERS Annual Report 2023-24.

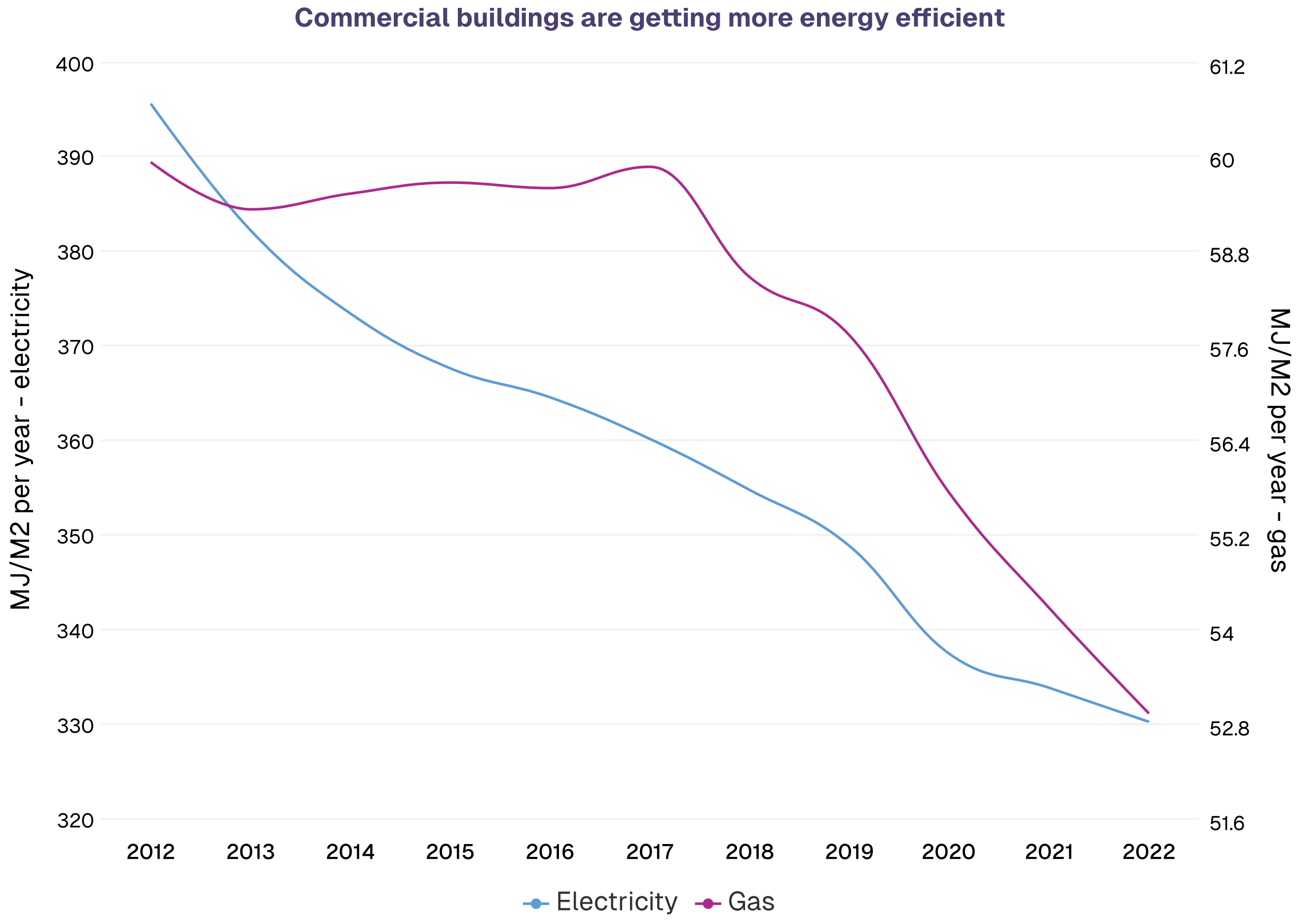

Figure 14: Electricity and gas intensity over time. Source: Commercial Buildings Baseline Study 2022.

Best practice electrification incorporates energy demand management principles including efficiency and optimisation of energy loads. Incorporating energy efficiency (such as thermal efficiency upgrades) into electrification retrofits can improve return on investment (ROI), limit impacts on energy grids and often reduce the operational costs of specific electrification technologies (for example, reducing energy loads for heat pumps replacing gas boilers). Electrification can also itself deliver efficiency gains through the higher energy efficiency of electric equipment such as heat pumps. Right-sizing and optimisation offer the potential to reduce the power capacity of heating appliances through options such as lower water temperature, tailored solutions for smaller parts of buildings with specific needs, or separating equipment for optimal outcomes.

Electrification of heating loads opens the potential for demand flexibility and management, particularly where thermal storage – like hot water tanks, refrigeration, or building thermal mass – is used. Thermal storage, coupled with renewable electricity, is an opportunity to provide heating and cooling at very low operating cost and emissions. In some instances, this provides the opportunity to run electric appliances to produce heat or cool when renewable energy production is high, avoiding the need for energy use times of peak demand (and high wholesale prices).

Overall impacts of demand-side measures in commercial buildings, including electrification, energy efficiency and flexible demand are able to contribute significant energy and emissions savings.

Analysis conducted by EEC and Climateworks Centre finds that electrification and energy efficiency can deliver average emissions reductions of over 3 Mt CO_2-e per year between 2026 and 2050.[19] The modelling underpinning this analysis assumes prioritising the deployment of available technologies to achieve an emissions target in line with a 1.5 degree Celsius climate change scenario at least cost. Energy efficiency gains make up a large proportion of early emissions savings in the 2026-2030 period as the electricity grid continues to decarbonise. Increasing commercial buildings' flexible demand – the impacts of which are not included in the modelling – would reduce emissions further still.[20]

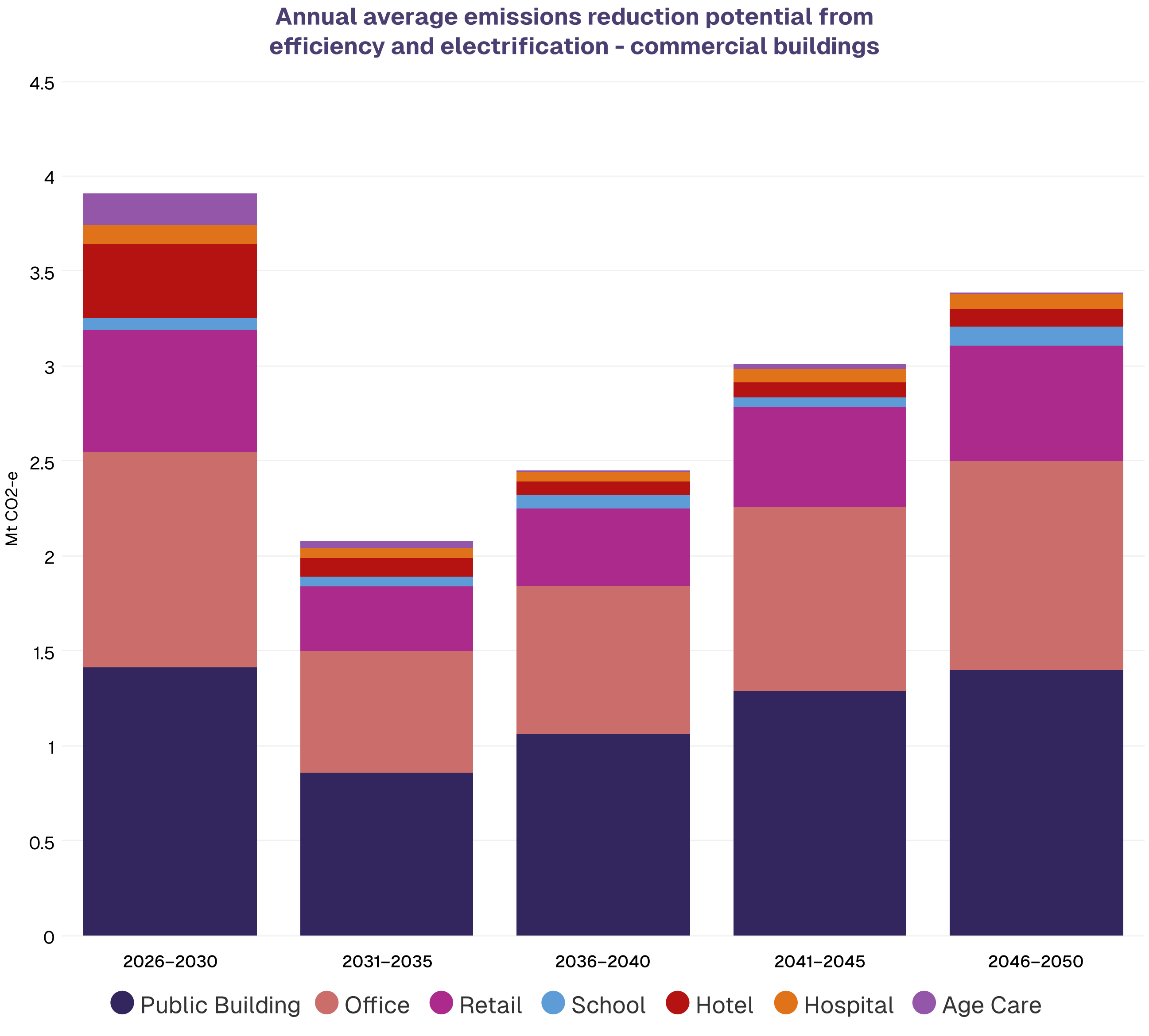

Figure 15: Average annual emissions reduction potential from energy efficiency and electrification in commercial buildings. Source: EEC and Climateworks Centre.

19 EEC and Climateworks Centre (2025)
20 For example, a report by the Green Building Council of Australia (GBCA) suggests that shifting one third of the load in buildings for three hours a day, five days a week would reduce Australia's annual GHG emissions by 0.6%. See Green Building Council of Australia (2023), From net zero to zero A discussion paper on grid-interactive efficient buildings.

DRIVERS AND BARRIERS TO ELECTRIFICATION IN COMMERCIAL BUILDINGS

Desktop research, industry engagement and stakeholder interviews helped to identify the key factors that are driving demand for commercial building electrification, or that are creating barriers to electrification. While enablers are identified individually, ultimately a combination of them will be required to deliver a comprehensive approach to decarbonisation in commercial buildings. Identified factors are described below.

Drivers	▪ Market demand for decarbonisation and sustainability ▪ New opportunities in energy transition ▪ Gas supply risks ▪ Reduced operational costs ▪ Incentives and finance ▪ Ratings, disclosure and consumer information ▪ Regulations and standards
Barriers	▪ Financial barriers ▪ Physical and practical constraints ▪ Information gaps in an emerging market ▪ Disruptions to tenancies and operations ▪ Electricity infrastructure and network capacity ▪ Ownership and tenancy structures ▪ Skills and workforce development ▪ Supply chains ▪ Owner / tenant knowledge and motivations on electrification ▪ Consultant, facility manager and technician knowledge and motivation ▪ Social motivations related to cooking ▪ Mixed use buildings ▪ Metering and monitoring ▪ Refrigerants ▪ Heritage considerations

Market drivers

Market demand for decarbonisation and sustainability

Tenant and owner commitments to decarbonisation and sustainability have been a driver of early movers in commercial building electrification.

In some cases, electrification has been planned or undertaken as a required measure of organisational net zero plans, decarbonisation targets of large commercial property sector companies, government operational decarbonisation commitments, or local government climate emergency declarations. For example, the Federal government's Net Zero in Government Operations Strategy requires any new building leases by departments to be all-electric from July 2026 and all government operations to shift to all-electric buildings by 2040. In other cases, a perception of tenants placing a premium on sustainability credentials has driven building owners to consider electrification to ensure tenant attraction or retention.

A feature of this dynamic has been that early movers have primarily been within the categories of public buildings or premium and A-grade office buildings. Mid-tier office buildings have experienced lower levels of market demand for energy performance upgrades, with refurbishment highly dependent on higher vacancy rates.[21]

Climate related financial disclosure and Commercial Building Disclosure may play a direct or indirect role in encouraging companies to occupy lower-emissions or electrified buildings, or for financial institutions to manage scope 1 emissions from gas within building portfolios.

New opportunities in energy transition

The broader energy transition from fossil fuels to renewable energy is facilitating changing energy use patterns and opportunities for participating more directly in energy markets. Key emerging trends for the commercial buildings sector include the spread of distributed energy resources such as solar and battery storage; electric vehicle charging; and time-of-use (including wholesale) energy pricing. Combined, these trends may help promote commercial buildings to more directly participate in and benefit from the electricity market by providing their distributed generation, storage and loads as resources that can deliver valuable energy market services. While some uptake of these opportunities is possible in buildings that consume gas, electrification is highly consistent with increased benefits and cost effectiveness.

Gas supply risks

An additional factor related to the broader energy transition is the emerging risk of gas supply shortfalls, primarily in southern regions. Electrification and energy efficiency are key responses to mitigate risks of supply shortfalls and measures to reduce demand have extended the projected timeframe before shortfalls.[22] While there is limited attitudinal evidence available to suggest that commercial building electrification decisions have been driven directly by the risk of shortfalls, supply risks are likely to increase gas consumption costs, increase uncertainty, and drive policy decisions to reduce gas demand.

Reduced operational costs

The greater energy efficiency of electric appliances such as heat pumps typically results in lower operating costs for occupants. Uncertainty over medium-term gas prices and an expected long-term increase in gas prices may also encourage electrification in the commercial sector. The upfront cost and lifetime value of upgrades varies significantly across the building stock.

Incentives and finance

Retailer energy efficiency obligation schemes such as the Victorian Energy Upgrades (VEU) program in Victoria and Energy Security Safeguard in NSW[23] provide financial incentives for energy upgrades, including in the commercial buildings sector. Scheme participants have historically targeted low-cost energy efficiency upgrades in commercial buildings, with commercial lighting upgrades making up the majority of uptake under the VEU and ESS. However, jurisdictions have consulted on or implemented changes to incentivise higher-cost electrification upgrades, such as heat pump installation in commercial premises. These changes include revising emissions or energy savings factors to ensure greater rewards for gas appliance and equipment replacements, changes to project-based measurement and verification methodologies to encourage greater uptake, and the introduction of new activities for commercial and industrial facilities.

Finance, both public and private, is also playing an increasing role in encouraging building owners to electrify, linked to government and finance sector net zero commitments. Major banks,

21 Sustainability Victoria (2018). *Mid-tier offices investment performance study.*
22 Northmore Gordon (2020). *Victorian Gas Market – Demand Side Measures to Avoid Forecast Supply Shortfall.*
23 The Energy Security Safeguard (the Safeguard) in NSW provides financial incentives for energy and peak demand savings, through the Energy Savings Scheme (ESS) and Peak Demand Reduction Scheme (PDRS).

facing scrutiny of their commercial portfolios with the introduction of climate related financial disclosure, are growing their portfolios of 'green loan' products. While as of 2022 green loans were only around $10 billion (3%) of commercial real estate debt, strong growth has been projected, with some estimating the 'big four' banks have committed $200 billion of green finance commitments.[24] Sustainable finance has been supported by the development of the Australian Sustainable Finance Taxonomy, including benchmarks for emissions intensity in a range of commercial building types to 2050.[25]

Similarly, governments have established lending mechanisms to support upgrades to their own assets. An example is the Greener Government Buildings program in Victoria, which has supported over $300 million in upgrades to Government-owned buildings since 2009.

The CEFC also has a lifetime commitment of $3.5 billion[26], split between a variety of investment products, towards projects that decarbonise the property sector.

Ratings, disclosure and consumer information

Buildings obtaining NABERS energy ratings have demonstrated significant improvements in energy performance over the lifetime of the program. The availability of the Renewable Energy Indicator provides an insight to building owners on fossil fuel use including onsite gas use. A proposed update to NABERS Energy ratings is expected to further incentivise electrification by shifting the basis of ratings calculations away from emissions factors, in line with the context of the broader decarbonisation of the electricity grid due to increased renewable energy generation.

Buildings certified under the voluntary Green Star program also require all-electric status to achieve the highest ratings, acting as an incentive for electrification in market-leading buildings. The Australian Sustainable Finance Taxonomy enables financial mechanisms for upgrades and green investment through projected benchmarks on building energy use and emissions intensity and requires buildings to have no on-site fossil fuels to comply with green technical screening criteria.

24 CBRE (2022). *Green Finance: Local Response Australia.*
25 Australian Sustainable Finance Institute (2025). *Australian Sustainable Finance Taxonomy.*
26 CEFC analysis, accurate as at March 2025.

The expansion of Commercial Building Disclosure to incorporate new building types offers an opportunity to expand the reach of ratings and information which may be leveraged with appropriate information on electrification. The Commercial Building Disclosure program requires the mandatory disclosure of NABERS ratings for selected building types and has demonstrated success in driving improved energy performance. The CBD Expansion Roadmap includes disclosure of the Renewable Energy Indicator as a high-priority action for non-regulatory activities.

Regulations and standards

Regulations are in place in the ACT and Victoria[27] to require all-electric new commercial buildings. Additional residential regulations introduced in Victoria include the phaseout of gas appliances including hot water systems in existing apartment buildings, with a range of exemptions such as where the cost of replacement is unreasonable. While these regulations do not directly address most existing commercial buildings, they do contribute to growing industry capacity for electrification and send a market signal in line with broader strategies on gas substitution.

The National Construction Code 2025 (NCC 2025) consultation draft has proposed to set requirements for "electrification-ready" buildings to facilitate future electrification at lower cost, including space requirements, electrical capacity, and features relevant to lower temperature heat pumps such as increased water flow capacity. Implementation would reduce eventual costs for future works to new buildings and may have indirect impacts on existing building stock and industry capacity. The October 2025 Building Ministers' Meeting announced that NCC 2025 will be published by 1 February 2026.

Minimum Energy Performance Standards (MEPS) for air conditioners over 65kW have been introduced. The direct influence of MEPS for key equipment on market willingness to electrify is unclear but may be a factor in building market confidence alongside providing direct benefits for building owners and occupants.

27 Commencing on 1 January 2027 in Victoria; the regulations will apply to all new commercial buildings excluding industrial and agricultural buildings.

BARRIERS TO ELECTRIFICATION

Financial barriers

The direct business case for commercial buildings electrification is difficult to generalise due to the variety in the commercial building stock.

Electrification with the installation of efficient equipment typically leads to lower operating costs through reduced energy use. However, the upfront cost incurred can be a barrier and means that operating cost reductions do not lead to a positive return on investment (ROI) in all cases.

Limited public data is available on the average costs and ROIs for electrification of commercial buildings. Typically, data or records on costs and benefits are held by private companies and commercial-in-confidence considerations limit information sharing. While understandable, a lack of clear information on comparative costs and savings is likely to limit public awareness and motivation for electrification in the commercial sector.

Modelling undertaken by DeltaQ and SPR for ASBEC[28] finds positive benefit cost ratios for replacements of gas cooking with induction. Electrification of existing gas hot water systems was found to have varying private cost effectiveness, ranging from a positive benefit cost ratio of 1.8 for direct electric storage in large office buildings with modest hot water usage, to negative benefit cost ratios of 0.2-0.5 for heat pump systems. Retrofits of electric space heating (variable refrigerant flow with heat recovery for small buildings, and low temperature air-sourced heat pumps for large buildings) were found to have low benefit cost ratios of 0.1 or less. Operating costs for all-electric buildings were lower than buildings remaining connected to gas.

Critically, the above analysis finds that while benefit cost ratios were low for many measures on a private cost basis, the costs of an electrification approach are nonetheless lower than alternative pathways in the commercial building sector to achieve net zero emissions by 2050 (featuring carbon offsets, fuel blending and green hydrogen). These findings suggest that government policy intervention to encourage electrification is required, rather than dependence on commercial decisions alone.

The impacts of upfront electrification costs and the benefits of savings are likely to be differentially distributed, with small businesses or owners of lower-grade buildings disproportionately unwilling or unable to meet the costs of upgrades. Industry analysis suggests costs quoted in electrification assessments do not always account for possible savings, particularly by offering unsuitable like-for-like replacement of gas equipment. Opportunities may exist for mitigation of upfront costs in many buildings under current deployment conditions, including through prioritisation of least cost solutions through right-sizing, efficiency and load optimisation.

Physical and practical constraints

Commercial buildings are highly diverse and the practical requirements for retrofits are site-specific.

Possible constraints that can make a retrofit challenging or increase costs include the physical space available in plantrooms, which can be a barrier to deploying heat pump systems as they require more space than gas boilers. Factors determining the suitability of heat pump systems or alternative space conditioning systems include plant room size, whether a space is or can be ventilated with external access, access to water heat sources, the presence of existing centralised heating coils, or the need for additional structural changes. Industry is building capacity for right-sizing equipment to reduce physical constraints and ensure efficient energy use, for example through the consideration of required water temperatures to allow for smaller heat pump

28 See modelling of least cost decarbonisation report from Australian Sustainable Built Environment Council (2022). *Unlocking the pathway: Why electrification is the key to net zero buildings.*

systems.[29] The capacity and temperature settings of heat pump systems may also determine the need for additional works to buildings: for example, a heat pump heating water to a lower temperature may improve energy efficiency in suitable spaces but also require new water pipes to allow for larger water flow capacity for space heating.

Practical challenges of installation such as access to plant rooms are being addressed by installers, but may increase costs: an example cited in a project interview was dismantling a heat pump into multiple pieces to be delivered through a roof for reassembly inside due to small gaps in walls.

Other challenges requiring modification to buildings when installing electric heat pump systems include access to ventilation for air source heat pumps, upgrades to electrical infrastructure and building energy management systems, or new piping to deliver refrigerant around a building.

Information gaps in an emerging market

The electrification of existing commercial buildings with gas connections is a new and emerging focus, with a relatively small handful of buildings in Australia having been successfully completed. Accumulated experience and industry know-how are required to move beyond the early adoption phase. A lack of clear examples or demonstrations to follow represents a barrier for the expansion of commercial building electrification, in particular for building types where fewer or no case studies are available. Information sharing on existing case studies or demonstrations is not widely available within the industry or among building managers and owners. According to interviewees, the lack of case studies is particularly evident in buildings with specialist uses of gas, such as hotel laundry facilities or laboratory gas.

Research gaps remain on gas consumption in the commercial building sector. Significant insights are available from published modelling such as the Commercial Buildings Baseline Study, localised studies, or data from NABERS ratings. However, remaining gaps place limitations on industry, consumers and policy makers. Areas with limited research or data include:

- End uses of gas within buildings
- Representative costs and savings from retrofits and all-electric new builds
- Workforce, skills and supply chain mapping
- Open access information on practical solutions and demonstration projects
- Impacts of electrification on energy grids, including at the local level
- Opportunities for energy efficiency, flexible demand, load shifting and other demand management
- Technical guidance and specifications for electrification and HVAC design
- Impacts of urban heat island effect and climate change on building resilience and electricity loads

Disruptions to tenancies and operations

As with any significant maintenance or upgrade project, electrification retrofits can be disruptive. The scale and impact of disruptions can vary according to project scope and tenancy arrangements. Managing this impact may require forward planning for electrification works or tenancy contracts. As with other major building works, undertaking works during quiet periods such as holiday periods can mitigate the issue under some circumstances. As end-of-life equipment replacements are unavoidable, upgrades at end-of-life are likely to offer the lowest level of additional disruptions from electrification, suggesting that building owners should be assisted to plan ahead for electric replacements at this time.

29 See A2EP project on lowering water temperatures: https://www.a2ep.org.au/post/workshop-a2ep-workshop-lowering-heating-hot-water-temperatures-in-commercial-buildings-melbourn

Electricity infrastructure and network capacity

While electrification tends to lead to increased efficiency and reduced overall energy consumption, shifting energy use from gas to electricity results in increased demand for electricity and potential impacts on electricity networks.

Geographical concentration of commercial buildings in areas such as capital city centres is expected to lead to specific capacity constraints in the event of large-scale electrification. Where the electricity supply to an area may be limited, infrastructure upgrades could be needed, requiring engagement with more stakeholders and the local community.

Analysis supporting the development of proposed NCC 2025 rules factored in substation infrastructure costs when assessing the cost-effectiveness of all-electric new buildings. The analysis found that these costs had a significant impact and, in some scenarios, made the difference to whether a fully electric new building or an electrification-ready building with minor future retrofits enjoy the lowest overall lifetime costs.[30]

At the building level, the upfront cost of electrification may include electrical infrastructure upgrades such as increasing the building's main switchboard capacity, subject to existing infrastructure and the specific requirements of the retrofit.

Commercial building electrification takes place in the broader context of the transition to renewables and growth in electricity demand for existing and new uses such as electric vehicle charging. Managing peak demand in the context of electrification is likely to include a focus on simultaneously increasing energy efficiency, flexible demand and load shifting.[31]

Ownership and tenancy structures

Decision-making structures can add complexity or influence motivations for building electrification.

Tenant motivations are an important driver of decisions to electrify. Early movers in electrification have been disproportionately A-grade or premium buildings in which sustainability has been a key feature for tenant retention or attraction. However, pressure from tenants to upgrade is not present across the building stock and tenant sensitivity to cost or disruptions may reduce incentives for building managers or owners.

A split incentive can exist between building owners who are responsible for the upfront cost and management of retrofits, and commercial tenants who may benefit from electrification or efficiency retrofits through reduced operating costs or improved amenity. Investors or owners have a range of profiles, willingness to electrify, or engagement with the operations of buildings.

Apartment buildings or other strata arrangements (including mixed use buildings) face complex decision-making processes to proceed with base building electrification. Collective decision-making through strata has been identified by interviewees as a barrier to electrification; decisions to upgrade can be hindered by lack of engagement or high barriers to approval such as requirements for special resolutions under strata law in some jurisdictions such as Victoria. Lack of knowledge or engagement with electrification opportunities is also identified as an issue in the apartment sector, where decisionmakers are apartment owners rather than corporate actors.

Skills and workforce development

The emergent nature of the commercial electrification market means that existing services including consulting, planning, and installations are conducted by relatively early industry adopters. Broader issues in the

30 DeltaQ (2023). *NCC 2025 Energy Efficiency – Advice on the technical basis. Initial Measures Development: Electrification Report.*
31 See Strategy. Policy. Research. (2025b). *2025 Energy Efficiency Forecasts final report*; Buildings Alive, The Australia Institute (2024). *Buildings as batteries: How buildings can support the clean energy transition*; Energy Efficiency Council (2023c). *Clean Energy Clean Demand.*

construction sector and related trades indicate a risk of low workforce capability and capacity.

2023 EEC analysis of the commercial buildings energy upgrades workforce[32] found significant barriers to creating and sustaining an appropriately skilled and sized workforce. Findings included that training for individuals for activities related to electrification and energy efficiency upgrades was generally relegated to on-the-job training, and that professional development gaps existed in a range of key roles. While further industry training and certification has been developed in response to these findings, skills and workforce capacity are likely to remain an important factor for the speed and scale of commercial building electrification.

A lack of experience with retrofitting heat pumps – one of the key electrification technologies – among the trades and professions that design, sell, install and maintain heating systems is a barrier to adoption. Capacity constraints are also an issue for heat pumps, noting the diverse roles required for their design installation and maintenance, including building designers, engineers and certifiers, facilities managers, plumbers, electricians, and refrigeration mechanics. Building a heat pump workforce with high levels of skills and experience will be important for accelerating heat pump deployment while also delivering high quality and safety outcomes.

Supply chains

Scaling up commercial building electrification will require supply chains to meet demand for equipment such as heat pumps and related systems. While products are available, variable building stock can require bespoke or specific products and industry faces capacity challenges to meet any potential demand growth, particularly as other countries attempt to scale up electrification at the same time as Australia. Interviewees indicated challenges for projects to access products, including long lead times for imported heat pump products that can be compounded in the event of faults or errors.

Owner / tenant knowledge and motivations on electrification

Engagement with electrification is growing but remains low, with gaps in community and stakeholder understanding of the role of electrification in Australia's buildings. Interview subjects suggest a knowledge gap among building owners: while larger institutional owners may have resources or motivation to plan for electrification or improve energy performance, smaller building owners or small business tenants may not have capacity to learn about the best options for their building or awareness of available funding or resources. This can lead to a lack of confidence, preventing them from starting the electrification process. This perception is broadly consistent with the observed pattern of electrification being led by premium or A-grade buildings. Resources, feasibility assessments and engagement with owners in the commercial sector have been deployed through programs such as the Victorian *Large Energy User Electrification Support Program and the NSW Heat Pump Feasibility* Grant. Opportunities remain for expanded deployment of general information, advice, feasibility assessments, or referral services including 'one stop shops' addressing specific needs of cohorts including small businesses, apartment and strata owners, or owners of complex-to-electrify buildings.

Consultant, facility manager and technician knowledge and motivation

Consultants, facility managers and technicians are important agents in maintenance and upgrade processes. The technical and domain-specific nature of building operations ensures that key technical actors strongly influence measures relating to electrification or other upgrades. Technical professionals may favour gas equipment or like-for-like replacements due to professional experience developed prior

32 Energy Efficiency Council (2023a). *Commercial building energy upgrades workforce mapping: Clarifying the professional development pathways for trades and professions for decarbonising Australia's commercial buildings.*

to the emergence of electrification, or limited information, examples and training on the possibilities for building electrification. Industry interviews indicate that technical advice on electrification varies significantly, including recommendations on upgrade pathways, the viability of electrification, or costs.

Social motivations and preferences related to cooking

Social preferences for gas cooking remain a potential barrier for electrification at the building scale, particularly in apartment, mixed use, or retail and hospitality venues. Electric alternatives to gas cooking including induction cooktops have increasingly demonstrated high performance, however perceptions of the suitability of induction for all cuisine types and uses are a limiting factor for social acceptance.

Mixed use buildings

Mixed use buildings present a unique set of challenges including multiple decision makers and energy demand profiles. For example, mixed use buildings where a majority of floor space is occupied by apartments or offices with low gas demand have in some cases remained connected to gas networks to meet the needs of hospitality or retail venues within the building. More data on mixed use buildings and their primary function should be collected to understand the options for electrification, with potential options for research including survey data or case studies.

Metering and monitoring

Unlike electricity use, gas is typically metered by total consumption only and information on the time of use is rarely available to building owners. This was understood by project interviewees to limit the opportunities for tuning or efficiency gains in buildings using gas. Estimated benefits and impacts of electrification or efficiency retrofits are also constrained by a lack of time-of-use data on gas consumption.

Alongside limited data on gas consumption, research conducted for NABERS finds that many building owners or occupants often have limited baseline data on energy consumption patterns including electricity due to a lack of smart meters, monitoring, or building energy management systems; this is a factor in the broader issue of knowledge on and motivation for electrification (see above).

Refrigerants

Heat pump-based HVAC systems and water heaters require the use of refrigerants, which, if leaking, are potent greenhouse gases. Additional intersecting issues alongside global warming potential (GWP) include safety, weight, flammability, PFAS (perfluoroalkyl and polyfluoroalkyl substances) and other technical considerations. Electrification with heat pumps (including efficient Variable Refrigerant Flow systems) may increase refrigerant use, requiring consideration of safety issues and the role of low global warming potential refrigerants. While knowledge, skills and licensing to design, install and maintain refrigerant-based systems has not been identified in our research as a direct barrier to electrification, a clear policy approach to the issue is likely to reduce industry uncertainty.

Heritage considerations

Interviewees nominated heritage protections as a challenge for electrification under some circumstances. For example, some heritage-protected buildings may prohibit the installation of electric systems that compromise the aesthetics of building facades. Further data on this issue is not available and is likely to be site-specific.


Intensive Care Unit (ICU)
Surgery Waiting
Elevator
General Ward

A TYPOLOGY FOR COMMERCIAL BUILDINGS ELECTRIFICATION

APPROACH TO TYPOLOGY DEVELOPMENT

This project is based on the working hypothesis that while commercial buildings vary widely in size, design, and ownership, the differences that matter most for electrification are limited. Many buildings share core characteristics that influence how electrification can be approached.

Analysis in the research findings of this report indicates that shared characteristics relevant to electrification – particularly common patterns in energy use – are largely based on the **social or functional use** of buildings. For example, commercial offices tend to use gas mainly for heating during business hours, hotels and hospitals are likely rely on gas appliances to feed continuous demand for hot water or other specialist uses.

Additionally, feedback from industry experts and technical professionals during consultation highlighted that many of the barriers to electrification recur within particular use categories. For instance, it is likely that hospitality businesses face common hurdles with electrifying kitchens and smaller retail tenancies may have limited control over centralised gas systems and experience similar landlord-tenant split incentive issues.

CONSIDERATIONS IN DEVELOPMENT OF COMMERCIAL BUILDINGS ELECTRIFICATION TYPOLOGY

The commercial buildings stock is diverse, with a complex variety of building uses and specificity. Several factors were considered in developing an approach to classifying buildings.

Existing classifications

Commercial buildings are classified within existing policy processes, analysis and data sets. These classifications are in general use within industry and in some cases determine regulatory compliance. We consider that alignment with such categories where possible reduces complexity or duplication.

Key categorisations include:

National Construction Code: commercial buildings are grouped into a range of classes for the purposes of compliance with construction standards for new buildings. These classes include: accommodation and hotels (Class 3); offices (Class 5); retail and hospitality (Class 6); carparks (Class 7a); warehouses (Class 7b); factories (Class 8); health and hospitals (Class 9a); assembly and public buildings (Class 9b); and residential care buildings (Class 9c). Additionally, some Class 2 apartment or multi-residential buildings include shared services with commonalities to a range of commercial buildings.

NABERS ratings: NABERS ratings are offered across a range of spaces. Categories used by NABERS determine rating processes, benchmarks and data collection, and are the basis for the Commercial Building Disclosure program. Categories include: apartment buildings; co-located; data centre; hotel; office; residential aged care; retirement living; school; shopping centre; retail stores; public hospitals; and warehouse and cold store.

Australian Bureau of Statistics / Commercial Buildings Baseline Study: the Australian Bureau of Statistics (ABS) uses a Functional Classification of Buildings for construction and other statistics. This classification is used in the Commercial Buildings Baseline Study and a range of other analyses. Some industrial buildings are included in these classifications. Commercial building categories are: retail and wholesale trade buildings; transport buildings; offices; factories and other secondary production buildings;

warehouses; agricultural and aquacultural buildings; education buildings; religion buildings; aged care facilities (including nursing homes); health facilities; entertainment and recreation buildings; short term accommodation buildings; commercial buildings not elsewhere categorised (nec); other industrial buildings nec; non-residential buildings nec.

AusTIMES: the CSIRO / Climateworks Centre database underpins a range of analysis on decarbonisation and emissions from commercial buildings. Categories used are: aged care; hospital; hotel; office; public building; retail; school.

Property Council of Australia office building quality: a voluntary classification system for office buildings with grades of Premium, A Grade, B Grade, C Grade, and Other. Criteria for determining grades include a range of features, quality, location, comfort including air quality, and environmental credentials. This classification applies only to office buildings.

Australian and New Zealand Standard Industrial Classification (ANZSIC): a standard classification developed by the Australian Bureau of Statistics (ABS) for the analysis of industry statistics. Categories do not relate primarily to building types but rather economic activities, however these categories may form a basis for classification and in practice many categories may be grouped together into certain building types. The commercial and services sector in the Australian Energy Statistics uses ANZSIC Divisions F (wholesale trade), G (retail trade), H (accommodation and food services), J (information media and telecommunications), K (financial and insurance services), L (rental, hiring and real estate services), M (professional, scientific and technical services), N (administrative and support services), O (public administration and safety), P (education and training), Q (health care and social assistance), R (arts and recreation services), and S (other services).

Energy use characteristics

Key energy use characteristics of building types that were considered focused on gas use and potential for electrification.

Gas end uses and the prevalence of specific gas equipment was a key consideration. We mapped the presence of identified gas end uses across building types (space heating or conditioning, hot water, cooking, laundry, pool heating, specialist uses, generators). Building types with similar requirements (such as space conditioning only) may be usefully grouped together for technical guidance, whereas other buildings with a higher usage of additional features (such as cooking or specialist uses) may experience a different electrification process. A challenge in categorising buildings on end use alone is the variation that exists across the building stock and within each sector.

Other factors considered include additional energy needs such as electric vehicle charging; the time of energy use, which influences future opportunities for the integration of onsite solar and batteries with the grid; load shifting and flexible demand; opportunities for thermal efficiency or other energy efficiency gains; and the availability of NABERS ratings and data.

Barriers and drivers

We considered the impacts of the barriers and drivers outlined in the section above on the possible electrification pathways of different building types.

Technical barriers and drivers include space constraints, the relative ease or difficulty of retrofits, and the availability of technical solutions. Key distinctions can be made where harder-to-replace features are present (such as specialist gas uses). Further technical distinctions can be made around issues like building height, size of plant room, access to water heat sources or ventilation, and the presence of centralised heat coils.[33] Smaller buildings with domestic-scale appliances only are more likely to offer easier and

33 Issues identified through IRG process and from stakeholder input.

cost-effective replacement options comparable to the residential sector. However, differing technical approaches to these constraints do not map easily onto other forms of categorisation such as building uses, ratings or datasets. In order to achieve a typology that informs a wide range of stakeholders rather than solely a technical guide, our approach has been to consider major technical distinctions only.

Social barriers and drivers include incentives specific to building types, decision making structures, ownership models, occupant behaviour, and the motivations and drivers of actors. The availability of ratings and regulatory inclusion in the Commercial Building Disclosure program offer a meaningful driver. Buildings where split incentives between owners and tenants are more likely to exist (offices and retail) or where shared decision making through strata arrangements (apartments) were more likely to occur in certain building types. Conversely, buildings with greater degrees of public ownership (such as public buildings and hospitals) or sole ownership (hotels, health, education) are well positioned and likely face a different pathway to electrification. Public-owned buildings in particular offer unique opportunities for leadership. Nonetheless, as with other considerations, the variety of buildings and complexity of the sector pose a challenge to classification without significant exceptions.

Barriers to the construction of new buildings as all-electric are qualitatively different and in general significantly lower than the electrification of existing buildings. While it is appropriate for policymakers and industry to consider new and existing buildings as distinct categories, the proposed typology does not focus on this distinction. Recommendations outlined in this report include policy options pertaining to new buildings across the proposed categories; with limited exceptions, a policy requirement for all-electric new building standards would apply across building types.

Stakeholders

Key stakeholder groups identified as important actors in building electrification decisions include:

- Building owners and investors
- Tenants or occupants
    - Executive / C-suite
    - Building and facilities managers
    - Sustainability / ESG advisors
    - Strata (apartments)
- Finance institutions and banks
- Consultants and technical advisors
- Equipment and appliance suppliers
- Construction / retrofit providers
    - Management
    - Key roles including electricians, plumbers, technicians
- Government, regulatory and planning (including local and state/territory)

We have considered the ways in which stakeholder roles may influence or define a typology of buildings. The presence, absence or characteristics of certain stakeholders can mark a material difference in electrification pathways. For example, small businesses may be less likely to have key internal decision makers such as ESG advisors or building managers; finance may vary across economic sectors or between public and private sectors; ownership and tenancy structures such as whether a building has multiple tenants or a sole occupant; or the presence of residential strata.

Size

Small buildings are likely to have lower barrier interventions available to electrify, such as replacement of domestic-scale appliances. A major distinction point is the requirements of larger buildings for large or complex centralised services. While small buildings serve a diverse range of social and commercial purposes, important commonalities in electrification pathways exist where domestic-scale or decentralised appliances are required. Some exceptions to this shared pathway are likely to exist, for example where specialist gas use is present or in the event of specific practical challenges.

Smaller buildings across various building types rated under NABERS are understood to have a lower prevalence of gas connections than larger buildings, and a lower level of gas consumption.[34] Limited information was found in our analysis on the size distribution of commercial buildings (such as the proportion of total floor space made up of large buildings).

Additional factors

Alongside the factors described above, additional factors mapped across building types were:

- Gas intensity
- Gas consumption as a proportion of total energy consumption
- Occupant behaviour and time of use
- Electrical capacity issues
- Suitability for energy management systems
- Load shifting potential
- Thermal efficiency potential
- Grid impacts of electrification
- Availability of NABERS rating data
- Potential differential impacts of refrigerant use
- Cost of electrification

We found limited scope to classify buildings based on an analysis of the above factors. These factors were present across a range of building types. In select circumstances these factors may be relevant to certain classes of buildings (for example, extensive availability of NABERS rating data in the office sector); where this is the case we have included these factors in our analysis of relevant building types. However, further systematic distinctions made based on these factors led to additional complexity that makes broader analysis or deployment challenging. For some categories, data or evidence was challenging to gather. Particular consideration was given to the cost of electrification. Public data on average expected costs of electrification for commercial buildings is not available, and further insights were challenging to gather from other sources. Insights on average costs for retrofits would offer a useful tool for analysis and guide for industry and building owners and may be an appropriate area for future research.

Confirmation of a use-based approach

Based on the full list of considerations outlined above, most commonly-used frameworks already organise commercial buildings by function. By aligning with these systems, the typology will integrate more easily with existing datasets and regulatory tools, and will make sense to the stakeholders who use and operate these buildings every day. Additionally, qualitative information collected from industry experts communicated broadly consistent barriers and opportunities with reference to use-profiles and size.

The typology proposed here focuses on grouping buildings by their primary use as a practical way to inform electrification policy and program design. From a technical perspective, best available evidence suggests that grouping buildings by their use, with regard to their size and complexity, is the preferred model to identify typical electrification pathways, reflecting commercial and technical constraints.

Core elements of building energy use characteristics furthermore align broadly with function: for example, gas use in office buildings typically centres on space conditioning and hot water, whereas gas use in hotels and accommodation is more likely to include additional uses such as laundry and cooking. These distinctions trend towards certain building use categories presenting broadly more challenging or complex electrification scenarios than others.

34 See analysis of NABERS data in DeltaQ (2022), p21

Nonetheless, in developing technical information related to building typologies it should be noted that highly complex buildings with additional gas consumption characteristics may be present across all building types.

Consistent with the research findings, prima facie, a use-based approach is likely to offer a clear and practical foundation for developing targeted electrification policy. Adopting a use-based typology is likely to enable coordinated responses to shared challenges in language that can readily be mapped to existing policy structures.

BUILDING TYPES

Building type	Description
Small buildings	Smaller buildings with domestic-level only appliances, leading to similar electrification measures. Occurs across range of sectors, including offices, retail, accommodation.
Office	Medium and large offices, defined as 1,000m^2 floor space or greater. Primary gas use space conditioning.
Retail and hospitality	Shopping malls, retail, supermarkets, and restaurants and hospitality. Primary gas use profiles including space conditioning and cooking.
Hotels	Hotels and other short-term accommodation with central services. Gas uses include space conditioning, cooking, hot water, and laundry.
Apartments	Apartment buildings with central services including hot water or space conditioning.
Health and specialist	Hospitals, health care facilities, aged care, and research facilities. Characterised by specialist requirements for gas processes.
Public buildings	Diverse range of buildings including entertainment, assembly, public facilities, schools, sports facilities and aquatic centres. Space conditioning a primary gas use, with additional specialist uses such as swimming pools.
Mixed use	Mixed use buildings incorporate multiple categories, resulting in additional complexity in electrification.
Industrial	Industrial processes within buildings are considered outside scope.

Small Buildings

Key features:

- Gas end uses: small or decentralised appliances including space heating, hot water and cooking
- Time of use: variable
- Key barriers: information, cost and motivation; limited technical barriers

Smaller buildings have been classified together as low-rise buildings requiring only domestic-scale appliances, usually decentralised or standalone units rather than centralised heating and hot water systems. In general, these appliances are relatively easy to install and comparable to the requirements of the residential sector. This category extends across a range of building use types, including offices, retail, hospitality, accommodation, and others. While ongoing operating cost savings are likely to be beneficial to occupants, upfront costs and potential split incentives in tenanted buildings remain a barrier. Unlike high density buildings, many smaller buildings may also be able to clearly benefit from onsite solar or battery storage alongside electrification.

Offices

Key features:

- Gas end uses: primarily central space conditioning; some domestic hot water
- Time of use: primarily business hours
- Key barriers: cost; practicality for retrofits

Offices make up the largest overall group of commercial buildings by floor space and energy use and offer a significant opportunity for electrification at scale. The Commercial Building Disclosure program applies to large office buildings over 1,000m2; the CBD Expansion Roadmap signals that the floor space threshold for inclusion in the program is expected to be reduced to 500-1000m2 in the future. NABERS ratings are available for large offices, allowing for analysis based on real data. Significant improvements have been achieved over the past decade on the energy performance of offices assessed with NABERS ratings.

Hotels

Key features:

- Gas end uses: space conditioning, hot water, cooking, laundry
- Time of use: 24 hours, evening peak
- Key barriers: cost, end uses with technical and social barriers to electrification including laundry and cooking

Hotels are a relatively gas-intensive sector with few known case studies of full electrification. Whereas some gas uses such as space conditioning and hot water are common to other building types including residential apartments, hotels are relatively likely to have more challenging to electrify facilities such as commercial laundries and kitchens.

Apartments

Key features:

- Gas end uses: space conditioning, hot water, cooking (shared services and within dwellings)
- Time of use: 24 hours, evening peak
- Key barriers: cost, decision-making processes, split incentives, perception issues on cooking

Apartment buildings are residential and not generally considered within the commercial building sector. However, apartment buildings with shared services (primarily space conditioning and hot water) share key physical and technical characteristics with a range of commercial buildings for electrification and require electrification pathways unlike those of detached housing or small multi-unit dwellings without shared services. Apartment buildings with shared services require strata decision-making to implement upgrades and typically include both shared areas where energy costs correspond to the body corporate in addition to dwellings. Additional features present in some buildings include embedded networks and gas cooking within dwellings.

Retail and hospitality

Key features:

- Gas end use: space conditioning, cooking, hot water
- Time of use: business hours and evening
- Key barriers: cost, perception issues on cooking

The retail and hospitality sectors make up a significant proportion of gas consumption across Australia's commercial buildings. While the sector does share key features in terms of social use and drivers for electrification, technical variation on the basis of size and building use are significant. Hospitality venues are more likely to include gas connections for cooking. Shopping centres with large floor space are major consumers of gas for space conditioning. Specific issues identified in stakeholder interviews included opportunities to improve energy efficiency when electrifying supermarkets due to location and design of refrigeration. Nonetheless, no major technological barriers to electrification were identified for this sector. Opportunities for energy management and onsite renewables integrated with electrification are likely to exist across the sector, including in larger shopping centres.

Health and specialist

Key features:

- Gas end use: spaces conditioning, high heat steam and sterilisation processes, hot water, cooking, laundry, generators, other specialist processes
- Time of use: 24 hours
- Key barriers: cost, specialist uses, technical barriers, disruptions to services

Health and specialist buildings have the widest range of gas end uses considered here, including uses for which industry currently has relatively limited understanding of electrification pathways. Possible disruption to services and operations has also been identified as a key issue. Aged care has been included in this category due to the presence of specialist requirements. However, we note that a significant majority of gas consumption for residential aged care is space heating with a similar profile to accommodation.

The public ownership of many hospitals means that decision making can be relatively straightforward and possibly offers a pathway for electrification projects in line with broader public strategy.

Public buildings

Key features:

- Gas end uses: space conditioning, hot water, pool heating
- Time of use: variable
- Key barriers: diversity of building stock

Public buildings are a broad category that incorporates entertainment, assembly, public facilities, schools, sports facilities and aquatic centres. These buildings have been classified together due to broad similarities in electrification needs (primarily space conditioning) as well as similar social uses and decision-making structures. Nonetheless, varied strategies for electrification may apply.

Aquatic centres and other swimming pools are a specific subset of public buildings with heavy gas use and a clear electrification pathway.

While public buildings are owned by both the public and private sector, government ownership of a significant proportion of public buildings may facilitate an electrification strategy or delivery of demonstration projects utilising public buildings.

Mixed use buildings

Key features:

- Gas end uses: space conditioning, hot water, cooking, others
- Time of use: variable
- Key barriers: challenges of meeting needs of all building occupants and use types

Mixed use buildings incorporate two or more of the categories listed above. Typical profiles are a hospitality or retail venue below an office or apartment building; a preference for gas in hospitality venues within mixed use buildings have been identified as a barrier to electrification of buildings or a motivating factor in connecting new buildings to gas. Technical pathways to electrification are broadly similar to other categories, however specific strategies may be required to manage decision-making processes across user types.

Industrial

Industrial or manufacturing processes within buildings are considered out of scope for this work. Gas consumption for building operations (independent of industrial processes) is understood to be relatively minor and has not been included in the above classification.

Other buildings

Further common building types with low levels of gas consumption have not been directly included within the building typology. These include car parks, storage, data centres, and agricultural buildings.

POLICY RECOMMENDATIONS

Drawing on the analysis of gas consumption in Australia's commercial building stock and drivers and barriers for electrification, we have identified opportunities for policy interventions that governments could make in the short term to accelerate electrification.

In line with scope of this project, the following recommendations are limited to those topics and issues identified in the development of the proposed typology and have been designed to leverage existing drivers or to overcome clear barriers. We note that this list of recommendations does not contemplate all the possible policy and regulatory interventions which might support an accelerated pathway to electrify existing commercial buildings. Instead, these recommendations are focused on low-risk actions which can be taken or initiated by governments in the short term, in advance of a detailed policy roadmap.

While industry consultation has also been used to inform the development of the typology and test assumptions, particularly where data gaps were identified – it was not within the scope of this project to test detailed policy recommendations with the Industry Reference Group.

Recommendations have been grouped into the following themes: regulation; strategy and targets; research and data; industry development; and information and incentives.

Recommendation	Detail
Regulation	
1. Disallow gas connections in new commercial buildings and apartment buildings	Every new building equipped with gas is one more building to retrofit at a significant cost in the future. State and Territory governments should regulate or legislate against new gas connections and this should be supported by a requirement that all new buildings be fully electric. The Victorian and ACT Governments have taken steps towards disallowing new gas connections within the state planning regime. This measure will unlock operational cost savings for building occupants and pre-empt the challenges associated with retrofitting for electrification at a future date.
2. Implement proposed improvements to energy efficiency requirements within NCC25	Nationally coordinated implementation of NCC2025 should take place alongside complementary jurisdictional measures to prohibit gas connections in new commercial buildings (see recommendation 1). New gas connections are inconsistent with the Trajectory for Low Energy Buildings goal of net zero-ready buildings. Recently proposed amendments to the National Construction Code provide a clear practical pathway that would support industry to design and construct all-electric new commercial buildings – noting the increase in energy efficiency stringency levels. While the National Construction Code does not in itself mandate that all commercial and apartment buildings are all-electric, the latest proposed amendments to the Code do provide industry with clarity about how this can be achieved on a performance basis and can play a role in equipping industry with practical pathways for the delivery of all-electric buildings.

Recommendation	Detail
3. Expand Commercial Building Disclosure Program to incorporate mandatory disclosure of energy performance in more building types and progression towards minimum energy performance standards (MEPS) and full electrification	Since 2011 the National Australian Built Environment Rating System (NABERS) has been used as the benchmarking tool for Australia's Commercial Building Disclosure Program. The commercial office sector has seen approximately 40 percent reduction in carbon intensity since 2011. Further expansion of the program will bring more commercial building types into contact with relevant information to support improved energy efficiency and electrification. To support electrification objectives, the Commercial Building Disclosure Program should expand to capture different building types, and importantly, require disclosure of both a NABERS Energy Rating and the NABERS Renewable Energy Indicator metric. Ratings and benchmarks should be aligned with the objective of electrification by ensuring that the benefits of electrification are fully accounted for. A clearly signposted progression towards the introduction of MEPS and expansion of building categories will provide a clear signal to industry and the commercial building sector, and allow planning certainty for building owners and managers. MEPS and ratings at the building level should be additional and complementary to MEPS for key electric equipment such as heat pumps (see recommendation 8). Alongside MEPS based on ratings aligned with the electrification objective, consideration should be given to the signalling of a timeframe for full electrification as a minimum requirement for existing commercial offices. As the leading sector in the CBD program, the largest overall consumer of gas in the commercial building sector, and as a commercial building type with relatively limited barriers to electrification, the sector offers a particular opportunity to leverage for a transition to full electrification requirements.
4. Expand and monitor Minimum Energy Performance Standards for key electric equipment	Minimum Energy Performance Standards (MEPS) accounting for a wide range of commercial heat pump products should be developed and implemented, including heat pump hot water systems and heat pump space conditioning systems not covered by existing MEPS for large air conditioners. A regulatory definition of a large volume commercial heat pump should be determined to allow for the development of MEPS and the development or implementation of existing assessment tools subject to measurement and verification. Testing and verification are required due to the bespoke nature of many commercial heat pumps, which has led to compliance challenges under existing standards. Technical standards covering design, installation, performance, control of auxiliary input energy and maintenance of key equipment should be subject to ongoing development and monitoring.

Recommendation	Detail
Strategy and targets	
5. Set and communicate targets and timelines for the electrification of the existing commercial building stock	Governments should set and communicate targets for commercial building electrification. Clear communication of a transition timeline will provide the market with the signals appropriate to ensure a smooth transition of the existing building stock to all-electric and the coordinated rollback of gas delivery systems and gas appliances. Timelines may include dates for completed building electrification or dates beyond which end-of-life replacement of gas equipment must use all-electric alternatives. End of life of equipment is a key trigger point for potential steps to electrify, however industry insights suggest that only a relatively small number of building owners are actively planning for electric replacements of equipment at end of life. Clear signposting of targets can increase incentives to assess electric alternatives and build capacity for electrification. Targets and timelines should take into consideration the range of drivers and barriers affecting different building types as outlined in this report and in coordination within a broader range of enabling policy measures. Careful design of limited exemptions due to practical barriers may be required. The measure should be supplemented with support for building owners through other enabling measures including information and resources to assist in planning for equipment end of life. State and Territory governments should work with the Federal government to develop a national plan to manage the reticulated gas network in line with electrification targets and declining demand from commercial buildings due to electrification.
6. Set ambitious electrification targets for government owned buildings	Decarbonisation scenarios project a need for electrification in the commercial building sector. Setting targets and establishing timeframes is an appropriate measure to ensure clear market signals and policy guidance. Governments at all levels should demonstrate leadership and commit to ensuring all new government buildings are all-electric and electrifying most existing government owned buildings. The Federal government's Net Zero in Government Operations Strategy commitment for new leases to be all-electric from 2026 and existing office leases to be all-electric no later than 2040 should be implemented in full and provides a model for all levels of government. Key opportunities exist at building end of life or at new tenancy negotiation. While government procurement policies do consider the use of gas in government owned and leased buildings, there is an opportunity to demonstrate strong ambition for electrification – particularly at the state level to ensure that public buildings are supported to undertake electrification works in the near term. To leverage the opportunity for demonstration projects (see recommendation 5), additional focus should be applied to electrification of strategic building types owned or operated by the public sector.

Recommendation	Detail
7. Align electrification agenda with strategy for refrigerant decarbonisation	Planning and strategy for commercial buildings electrification should be aligned with measures to reduce the use of refrigerants with high global warming potential (GWP) as well as other upstream and downstream environmental impacts.
Research and data	
8. Invest in demonstration projects	Limited industry knowledge and project experience in less complex and mixed-use buildings is a clear barrier to electrification. Strategic investment in leading-edge electrification projects in commercial buildings offers an opportunity to build industry capacity and reduce cost and knowledge barriers affecting the sector. Existing sources of funding or new funding should be leveraged to enable the rollout of demonstration projects. Priority should be given to projects addressing known challenges to the sector, such as the presence of specialist gas users or complex retrofit requirements; or to the building types with largest overall gas use (offices, retail, hotels, and apartments) to build industry capacity in areas of opportunity for electrification. Consideration should be given to prioritisation of community or economic assets delivering benefits for low socio-economic regions or communities. This would support rapid gathering of data and experience in early deployment, enabling electric services and applications in large commercial buildings to progress along the diffusion curve with results disseminated through outreach programs to building owners, designers, installers and facility managers. The public sector building stock (including hospitals, offices, and other public buildings) offers an opportunity for demonstration projects in electrification that would align with broader policy direction and building stock management needs.
9. Address research and data gaps on energy use in commercial buildings	Gaps in data and research on Australia's commercial buildings will impact on the development of an effective and cohesive national electrification strategy. The outputs of this project demonstrate there are gaps in empirical data relating to the end use of gas within buildings (i.e. specific shared-services technology and appliances); workforce mapping; retrofit costs and savings tracking; and impacts on electricity grids including capacity for demand management. Demonstration projects (see recommendation 4) should be leveraged for research and evaluation purposes. Policymakers should consider a mechanism to collect detailed information on gas appliances and infrastructure in use in commercial buildings, including anticipated lifecycle / end of life of relevant gas appliances and systems. While a major focus of research and data lies in informing policy makers and industry, information must be disseminated and available for decision makers at a building level (see also recommendation 15).

Recommendation	Detail
Industry development	
10. Enable electrification of commercial buildings by ensuring energy system capacity	Large-scale electrification of commercial buildings is likely to lead to increased electricity network demand in localised areas, alongside decreased demand for gas from the reticulated network. Increased electricity demand from commercial buildings should inform energy system planning. Substation or local network capacity constraints should be addressed to remove a likely potential barrier to commercial building electrification, with a particular focus on high density commercial areas such as CBDs. While distribution networks have primary responsibility for ensuring network capacity, the impacts of commercial building electrification should also inform government strategy and regulatory approaches. Commercial building electrification impacts on electricity network demand can be reduced or optimised through the integration of distributed energy resources and demand management, including distributed solar and battery storage, energy efficiency, flexible demand, load shifting, and building energy management systems. The Federal government's development of a Consumer Energy Resources (CER) Roadmap should be leveraged or complemented to address barriers to the connection of distributed generation, storage and flexible loads located in commercial buildings. Reforms should include a nationally consistent approach on how standards for connection are set, governed and applied. All levels of government should work together to implement recommendations from the CER Roadmap, in addition to recommendations issued in the Energy Efficiency Council's report, 'Clean Energy, Clean Demand' and the Property Council and Clean Energy Finance Corporation's earlier joint report, 'Distributed Energy in the Property Sector: Unlocking the Potential'. - These reports identify a range of barriers to distributed energy in property, and propose solutions to address them. State and territory governments should work with the Federal government to develop a plan for the management of reticulated gas networks in alignment with reduced gas demand from rapid building electrification.
11. Develop workforce with training and certification	Training and certification programs should be supported to build workforce capacity and upskill existing workers in key areas related to electrification and commercial building energy upgrades. Professional development gaps should be addressed for relevant roles including energy efficiency/sustainability engineers, energy management advisors, facilities managers, project managers, electricians and plumbers. Programs should include engagement campaigns and subsidised training. High-quality data should be collected on workforce numbers and roles where possible to enable governments to quantify both the existing workforce capacity, and to determine future needs. This information should be made publicly available to guide needs for workforce capacity development in industry.

Recommendation	Detail
12. Support supply chain development	Limited local supply chains for key equipment in electrification projects may limit industry capacity for electrification at scale. Further work is required to map supply chains for key equipment such as commercial heat pumps. Policy consideration should be directed to sovereign capacity in this strategic industry area and opportunities for leveraging existing programs such as Future Made In Australia. Consideration should include the potential role of local manufacturing or the role of local industry in international supply chains, installation, IP, and consumer products.
Information and incentives	
13. Align energy efficiency schemes with electrification objective	Retailer energy efficiency obligation schemes such as the Energy Security Safeguard, Victorian Energy Upgrades, or Retailer Energy Productivity Scheme are a successful model to support commercial energy upgrades and offer an opportunity to mitigate financial barriers to retrofits. Design of schemes should aim to incentivise higher-cost electrification activities and ensure the inclusion of commercial building electrification in a way that meets the needs of participants. Opportunities include ensuring that assessment methods provide certainty to participants on a baseline level of certificates to address the challenge of meeting upfront costs and reduce risk when undertaking project based activities; revision of emissions or energy savings factors to ensure greater rewards for gas appliance and equipment replacements; the introduction of new eligible activities where appropriate; and tailoring certain activities such as heat pump incentives according to building type to ensure suitability for a range of use cases. The objective of electrification may need to be balanced with alternative or complementary objectives including peak demand reduction.

Recommendation	Detail
14. Commit to the ongoing and adequate funding of NABERS to support continuous improvement and expanded availability of rating tools	Adequate resourcing for NABERS is critical to support continuous improvement and expanded rating tools, with a focus on supporting new sectors captured by expanded disclosure requirements and alignment of NABERS ratings with the electrification agenda. The Federal government announcement of approximately $10m for NABERS in the Built Environment Sector Plan is an important measure to maximise the effectiveness of building ratings disclosure. State and Territory Governments should support the expansion of NABERS to other building types and the regular review and growth of the CBD Program to cover more asset types. This would ensure the breadth of Australia's built environment can benefit from the ongoing measurement, verification and performance management of buildings the program provides. Nationally aligned programs can further leverage NABERS to drive emissions reductions in buildings. All states and territories should fund emissions reduction in buildings by establishing a comprehensive program that targets annual improvements in certified NABERS energy ratings. This should be modelled on the approach for calculating energy savings through the NABERS method of the NSW Energy Savings Scheme or other appropriate approaches to calculating savings. Work is currently underway to update NABERS Energy ratings to account for the decarbonising electricity grid by moving away from emissions factors in favour of energy factors. In practice, this is likely to prompt building owners with a NABERS energy rating to consider electrification (in order to maintain or improve their current rating). These changes should be resourced and leveraged to align with a broader government strategy for building stock electrification. Consideration may also be given to ongoing alignment of NABERS with market tools such as Green Star. NABERS stakeholders may be leveraged to source additional valuable information for building owners including information on gas end use; expected end of life timeframes for gas equipment to assist planning; and incorporation of additional demand management measures such as flexible demand capability. This information gathering should take place through a process independent of NABERS ratings and resourced by government, such as surveying of assessors and building owners that have undertaken ratings.

Recommendation	Detail
15. Provide information, resources, advice services and assessments for building owners and managers	Limited knowledge among building owners, managers, and other building-level decision makers is a barrier to large scale electrification. Resources and accessible advice available to the public can enable greater understanding and motivation. Resources may include guides, communications, or contact points offering referral or advice services. Grants programs such as the Victorian Large Energy User Electrification Support Program should be continued or expanded to support access to detailed assessments for large commercial buildings. Selected cohorts are likely to require tailored or specialist resources. In the context of small businesses, it is likely that extension of existing incentive programs that support appliance upgrades in residential buildings should be reviewed and optimised to support small businesses to access these schemes. For example, the Victorian Energy Upgrades program has been highly effective in reaching small businesses. In apartment buildings, navigating strata processes is likely to create a barrier to electrification work in shared spaces. We note that the NSW government, local government and community organisations[35] have created resources to support residents in strata buildings with information about the roles and responsibilities of the owner's corporation, owners and tenants on the installation of EV charging facilities in shared spaces. These resources also include fact sheets and a template request form. We recommend that State and Territory governments fund the development of resources to help owners and owners corporations initiate electrification work on a voluntary basis. Resources and initiatives should be aligned to a broader electrification strategy for strata-owned buildings.
16. Provide funding for improved usage of metering	A lack of baseline information for businesses on current energy usage patterns and potential savings due to limited usage of smart meters and sub-meters has been identified as a barrier to motivation for electrification. Government grants programs or assistance programs should incentivise or support businesses to install and use improved metering in order to establish a business case for electrification and other energy efficiency improvements. Funding or incentives should be aligned to complementary programs including ratings disclosure and grants for electrification feasibility assessments.

35 See: Let Me Be Frank (2025). *Working with apartment and strata communities: a handbook for local government.*

APPENDICES

APPENDIX 1: LITERATURE REVIEW

The literature review focus was a review of quantitative data sources on gas use in commercial buildings, in line with the project objective of identifying the scale of the opportunity for electrifying commercial buildings. Documents considered as part of the literature review include:

- Commercial Buildings Baseline Study (2022 and 2024 update)
- NCC 2025 **consultation documents**
- ASBEC, DeltaQ and SPR (2022): Rapid and Least Cost Pathways for Decarbonising Buildings – **Building Level Technical Report** and **Final report**
- Victoria **Buildings Electrification RIS**
- Energeia/Northmore Gordon (2021): Gas Infrastructure Advice – **Cost Benefit Analysis of Energy Efficiency Activities in the Gas Sector**
- City of Melbourne **Buildings Energy Use and Emissions Study**
- NABERS ratings registers and Activating NSW Buildings research
- GBCA: **Practical guide to electrifying buildings**
- ILO: Federal policy directions for commercial building retrofits
- Better Buildings Partnership **electrification resources**
- EEC: **Commercial building upgrades workforce mapping report**

The below is a summary of key elements of selected sources. Information provided below is limited to themes or brief findings relevant to the research focus of this project and is not intended to be a full summary or description of sources.

COMMERCIAL BUILDINGS BASELINE STUDY

- Recurring study from 2014 onwards. Detailed methodology update 2022, updated data and methodology in 2024 and minor update in February 2025.
- Uses range of data sources and modelling to provide gas and electricity use by building type and SA4 (region). Buildings categorised according to ABS categories.
- Limited data on energy end use by feature or appliances/equipment used.
- The CBBS includes projected figures on energy consumption and emissions intensity to 2050. The 2024 updated data aligns with AEMO ISP Step Change scenario.
- Variable inputs including local/state level reporting result in more comprehensive data for some regions and building types.
- Data can be analysed for total gas use by jurisdiction or building type and gas use intensity.
- Updates to methodology result in changes to the proportion of total gas used by various sub-sectors from 2022 to 2024. Analysis presented in this report primarily uses sub-sector data from 2022 report to ensure consistency within specific building categories, while using the 2024 edition for building stock-wide projections.

NABERS CERTIFICATE DATA

- A full register of buildings with current valid NABERS ratings is available, alongside program data provided by NABERS in annual reports and associated reports.
- Buildings rated for Renewable Energy Indicator provide data on total and proportional gas use.

- Data set limited to buildings that have undergone NABERS rating. Data availability ranges from near universal (large offices) to strong (offices, hotels, shopping centres) to limited in a range of other building types.

VICTORIAN BUILDING ELECTRIFICATION RIS

- Draws on CBBS 2022 for inputs on buildings, floor space, and gas use
- Applies Sustainability Victoria research on proportional gas use by end use to estimate gas use per square metre by building type and end use (heating, hot water, cooking)
- Estimates electricity use and intensity before and after retrofits

AUSTRALIAN ENERGY STATISTICS

- Provides large-scale overview of gas and electricity use by sector and state/territory
- Commercial and services sector use of 49.1 PJ gas in 2022-23 nationally, 21.6 PJ Victoria. These figures include sector use as a whole and are not limited to building operations. Statistics also include use of oil by sector.

DELTAQ / ASBEC: LEAST-COST PATHWAYS TO BUILDING DECARBONISATION

- 2022 paper reviews evidence on gas end use across sector
- Assesses constraints on technology deployment
- Models costs and benefits to electrification across range of building archetypes
- Key findings on analysis of sector-wide gas end use include:
    - Space heating represents 80% of end use
    - Hot water services represent 12% of end use
    - Kitchens 4% and other 4%
    - Over 60% of total commercial building gas use in Victoria
    - Largest sub-sectors for gas use are offices (40%), retail (22%), hotels (19%)
- End use analysis subject to data limitations
- Notes reported 15-60% of gas use for space heating made up of losses, and 25-50% of gas use for hot water made up of losses; indicates important role for efficiency
- Recommendation of focus on offices, retail and hotels in Victoria and NSW.

CITY OF MELBOURNE: BUILDINGS ENERGY USE AND EMISSIONS STUDY

- Uses range of data sources incorporated with Melbourne's unique Census of Land Use and Employment
- Detailed findings on floor space and energy intensity in City of Melbourne
- Gas share of energy use in commercial spaces ranges from 25% (retail) to 40% (offices); offices largest floor space and energy user in City of Melbourne

LIMITATIONS OF DATA

- Data is available in categories that may not be applicable for policy or technical responses.
- Regional: stronger data sources available in capital city centres (e.g. through Melbourne study) than in suburban or regional areas. This may overrepresent certain building types, primarily offices (including A-level office buildings rather than lower- or mid-market offices)


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APPENDIX 2: PROJECT INDUSTRY REFERENCE GROUP

MEMBERS

Organisations participating in the Industry Reference Group are as follows:

ABB	Energy Efficiency and Electrification Alliance (3EA)
ACOR Consultants	Energy On
AIRAH	Energy Smart Water
Alan Pears (independent / RMIT)	Facility Management Association of Australia
Arup	Green Building Council of Australia
ASBEC	Grosvenor Engineering Group
Australian Alliance for Energy Productivity (A2EP)	Let Me Be Frank
Australian Institute of Architects	Master Plumbers and Mechanical Services Association of Australia
Australian National University	Monash University
Bridgeford Group	Owners Corporation Network
CSIRO	Plumbing Industry Climate Action Centre
Daikin Australia	Rheem
DeltaQ	Rinnai
Earthworker	Stiebel Eltron
Electrical Trades Union (ETU)	UNSW
EMU Solutions	Viessmann
Energy Consumers Australia	

Observers: ACT government, DEECA Victoria, DCCEEW NSW, CEFC, City of Sydney, City of Melbourne, City of Waverley

TERMS OF REFERENCE

The Commercial Buildings Electrification Roadmap Industry Reference Group (IRG):

1. Remit

1.1. Has been established to advise the EEC/PCA Commercial Buildings Electrification Roadmap project on matters relating to the electrification of commercial buildings that may include:

1.1.1. Technical and practical considerations;

1.1.2. Government policy;

1.1.3. Technologies and deployment;

1.1.4. Industry, skills and supply chain;

1.1.5. Data, research and existing literature;

1.1.6. Analysis of building stock and typologies; and

1.1.7. Any other matters relevant to project.

1.2. Will be established from December 2024 until June 2025 and/or completion of Stage 1 of the Commercial Buildings Electrification Roadmap project, and may be extended in the event of further project stages.

2. Membership

2.1. Membership may include:

2.1.1. Industry associations.

2.1.2. Peak bodies.

2.1.3. Unions.

2.1.4. Training and education bodies.

2.1.5. Researchers.

2.1.6. Businesses.

2.1.7. Governments (on an observational basis).

2.1.8. Other stakeholders.

2.2. The IRG may establish working groups, whose membership may include:

2.2.1. Representatives from the IRG.

2.2.2. Representatives from individual businesses.

2.2.3. Technical experts otherwise outside of the ICG membership (2.1).

2.3. Includes one (1) representative from each organisation.

2.4. Allows additional representatives from each of the membership organisations to join meetings as observers (observers may contribute to discussions).

2.5. Allows members to nominate a proxy in their place if unable to attend or vote.

2.6. Is not remunerated or compensated financially for any costs incurred.

3. Roles

3.1. Is a consultative body with primary functions identified in 1.1.

3.2. Acknowledges that the scope of the IRG's advice may cover at least the following issues as they relate to commercial buildings electrification:

3.2.1. Government policy, including standards and regulation.

3.2.2. Technical considerations.

3.2.3. Data and existing research.

3.2.4. Workforce and skills.

3.2.5. Environmental sustainability.

4. Operation

4.1. Operates:

4.1.1. Under the oversight of the EEC's Head of Policy (Jeremy Sung), with the project led by:

4.1.1.1. The EEC's Senior Advisor – Policy and Research, Rob McLeod and the EEC's Project Officer, Natalie Corveddu (Conveners).

4.1.2. With a Chair, who is appointed by the IRG, presiding over meetings and general business of the IRG; and

4.1.3. With a quorum of five (5) members.

4.2. Meets on a regular and ad hoc basis acknowledging that:

4.2.1. IRG meetings will be scheduled to review or provide input to key project milestones, with an expectation of at least three (3) meetings prior to conclusion of Stage 1 of the Commercial Buildings Electrification Roadmap project;

4.2.2. Ad hoc and working group meetings will be scheduled as required.

4.3. Requires members with a potential conflict of interest to notify the Chair and Conveners where any conflicts of interest may arise, and to excuse themselves when appropriate to do so.

4.4. Does not set formal agendas or take formal minutes, with the Conveners circulating:

4.4.1. A brief action-oriented agenda in advance of meetings;

4.4.2. Project documents or drafts for review, if required; and

4.4.3. A summary of agreed positions and/or actions following the meetings.

5. Decisions of the IRG

5.1. Acknowledges that:

5.1.1. The IRG is a consultative body whose remit is outlined in 1.1.

5.1.2. In the event decisions are to be taken by the IRG regarding its advice, any recommendations, and/or endorsements, these decisions shall be taken one of two ways:

5.1.2.1. A consensus approach will be undertaken where the IRG agrees it can or must achieve this outcome.

5.1.2.2. Where the IRG is unable or does not have the time required to achieve consensus, steps will be taken to streamline and collate differing IRG views to be presented clearly to applicable stakeholders.

5.1.3. Working groups established by the IRG will apply the same approach to decision making as outlined at 5.1.2.

5.1.4. Decisions taken by the IRG regarding its advice and recommendations do not bind the members of the IRG, observational governments, project funding governments, and the EEC, nor their members, staff, executive leadership teams, Boards and/or members of Parliament.

6. Confidentiality

6.1. Acknowledges that:

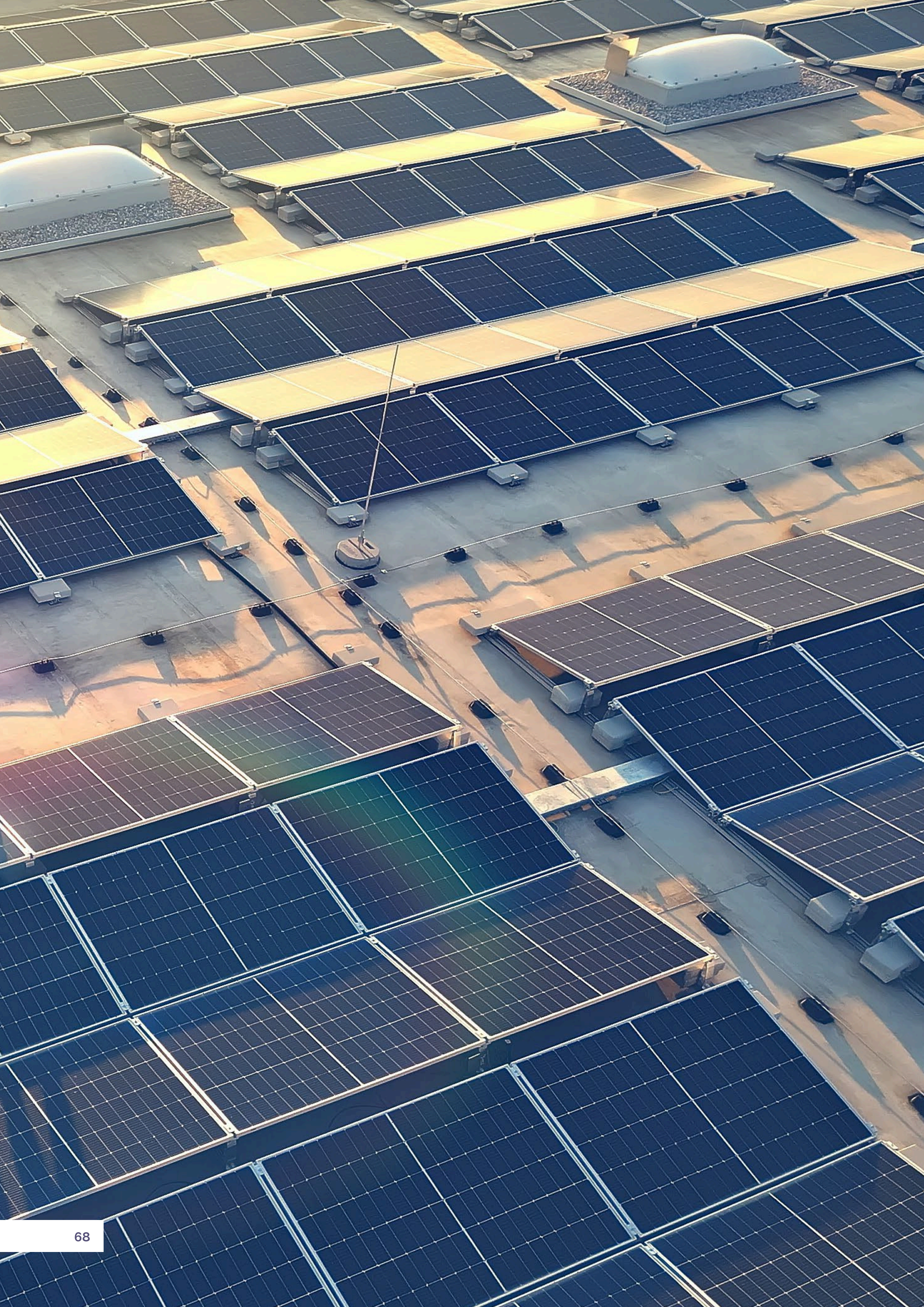
6.1.1. IRG discussions are held under the Chatham House Rule, meaning participants are free to use the information received, but neither the identity nor the affiliation of the speaker(s), nor that of any other participant, may be revealed, without explicit consent to do so.

6.1.2. Unpublished documentation provided to the IRG is to be considered confidential and must not be shared externally.

7. Acceptance of Terms of Reference

7.1. Acknowledges that:

7.1.1. Participation in IRG activities including attendance of meetings is taken as acceptance of the Terms of Reference.



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