March 2025

Discussion Paper Electrification of new development

We acknowledge the Gadigal of the Eora Nation as the Traditional Custodians of our local area.

CITY OF SYDNEY

The Council of the City of Sydney acknowledges the Gadigal of the Eora Nation as the Traditional Custodians of our local area. We acknowledge Elders past and present and celebrate the diversity of Aboriginal and Torres Strait Islander peoples and their ongoing cultures and connections to Country.

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Front cover: Aerial photo (August 2024)
Photo: City of Sydney

Image on next page: Sydney skyline in the evening
Photo: Jamie Williams / City of Sydney


MACQUARIE

Executive summary

Sustainable Sydney 2050: Continuing the Vision establishes our target for net zero emissions by 2035. A transition to net-zero buildings and moving away from burned gas is essential to achieve our net zero target and reduce greenhouse gas emissions from buildings.

This discussion paper sets out a path for most new development in our local area to be all-electric, with no reliance on fossil fuel gas. It is supported by technical research and extensive stakeholder engagement, attached to this paper.

The purpose of this discussion paper is to stimulate public discussion and invite feedback so we can better understand the benefits and challenges of transitioning to all-electric new buildings, and to guide us in preparing changes to our planning controls.

Electrification has been driven by the need for sustainable building practices in response to climate change and evolving building owner, consumer and investor expectations. However, all-electric buildings offer many benefits beyond easy access to renewable energy - from reduced long term operational costs to healthier spaces for occupants. All-electric buildings are future proofed for a decarbonised world if energized from renewable sources, avoiding costly retrofitting and replacement of outdated technologies, whilst reducing the risk of stranded assets.

Currently, gas consumption accounts for 6% of our local area's total greenhouse gas emissions[1]. The amount of greenhouse gases emitted per unit of electricity will go down as the electricity grid decarbonises through renewable energy sources.

However, the amount of greenhouse gases emitted per unit of gas is fixed, because it burns a fossil fuel. Once a building is connected to gas, it is likely to remain connected for decades due to the high cost of disconnecting from the gas network and retrofitting reticulation, equipment and appliances with electric alternatives. New gas connections are adding to a significant cumulative emissions liability that will make it challenging and costly to meet and maintain our net zero target.

Fossil fuels like gas have historically been used for heating, energy, and cooking. Electrification enables buildings to not rely on fossil fuels. Changes in Green Star and NABERS tools now support higher scores for electrified buildings and the National Construction Code is setting a path for buildings to be electric. Corporate tenants and investors are increasingly preferring all-electric buildings which can be powered by renewables.

Electrification of new buildings presents a compelling case for ensuring more sustainable, healthy, and future-proof buildings. That is why we are considering introducing planning controls to disallow fossil fuel gas network connections in new development which we assess through the planning system.

A clear policy position would help electricity and gas network providers plan and transition their infrastructure in a cost-effective way, to meet the needs of our community now and in the future. It would also provide certainty to builders, developers, business owners, investors, tradespeople and community members and help them prepare for more sustainable, healthier electric buildings.

Whilst existing technologies can support the transition, overcoming cost barriers and understanding the benefits of electrification remain key challenges.

We recognise there can be difficulties that stakeholders face in transitioning from gas to electric systems depending on the service and industry, even when designing for an all-electric building at the beginning. We are committed to understanding our community's needs and we want to make sure consider all the impacts of a potential change like this to our community.

Your feedback to this discussion paper and the below questions will help guide our approach to the electrification of new buildings.

1. Do you agree with the benefits of all-electric buildings outlined in the paper, and do you see any other benefits? If not, what are the concerns?
2. Do you agree with the challenges to electrifying new development and are there any others that we haven't mentioned? How might these challenges be overcome?
3. How important do you think electrification of new development is to achieve our environmental targets?
4. Are there specific development types (residential, commercial, business, industries etc.) or gas end uses (domestic hot water, space heating, cooktops, ovens) that should be prioritised or deprioritised for electrification? Or are there any types of development that shouldn't be required to be all-electric? How can different approaches for development types be managed in mixed-use developments?
5. Which of the planning control options do you think should be implemented? Should any of these approaches be combined, excluded or modified and why?
6. If the controls apply to alterations and additions, what should the threshold be? For example, for new houses and residential flat buildings, the threshold could be a construction/refurbishment cost of $50,000, $100,000 or more. For refurbishments to existing non-residential developments and which affect building services, the threshold could be where the works affect at least 50 percent of the total volume of the building where there is no increase in the gross floor area. Alternatively, the threshold for both development types could be where there is a creation of new additional floor space. Could other planning controls or regulations be used to establish a threshold of 50% or another figure?
7. If the planning controls are implemented, should they come into effect right away? Or should the implementation of planning controls be phased in with warning? If so, how? Should there be a different approach to phasing across the range of development types?
8. Are there certain business types or industries that should be allowed to continue to connect to the fossil fuel gas network in new buildings? If so, why? For these business types or industries, should there be a requirement for the building to be electric ready for a future transition?
9. What would the impacts for builders and developers be if the planning controls came into force soon? For example, could it create challenges in sourcing and managing the necessary materials, electric appliances and systems, equipment, and labour needed to meet all-electric development requirements? Would there be greater space requirements if instantaneous gas heaters were phased out? Are alternatives cost neutral or cost effective?
10. What industry support is needed for all-electric new development? How would any suggested measures help?


Steadfast

Introduction

Purpose of this document

This discussion paper sets out the evidence, impacts and considerations for introducing planning controls to require new development (subject to DA approval) in our local area to be all-electric.

Appended to this discussion paper is the Research on Electrification of Developments at Appendix 1 and the Engagement Outcomes Report at Appendix 2.

Electrification of new buildings is possible and achievable in many instances and can bring clear environmental, health and economic benefits. However, electrification may be challenging in some circumstances and for some uses. Transitioning to all-electric new buildings may also bring implementation challenges, such as supply chain capacity, material shortages, capital costs and design.

We invite industry and community feedback so we can better understand the benefits and challenges of transitioning to all-electric new buildings and to help guide changes to our planning controls. Included in this discussion paper are discussion points to stimulate further conversation.

How to have your say

We invite your feedback on this discussion paper from 31 March to 5 May 2025 at sydneyyoursay.com.au.

Who we spoke to

This discussion paper has been shaped by detailed research and many voices. We have conducted 30 interviews with key stakeholders including advocacy organisations, development and industry participants and the electricity distributor and gas supplier for our area (See Appendix 2).

What's next

This discussion paper is on public exhibition, and we are seeking your feedback by 5 May 2025.

Following this period of public consultation, we will consider feedback and how the new planning requirements for development approvals might be drafted for inclusion in our planning controls.

Any proposed planning control changes will be reported to Council for consideration and, if approved, undergo a formal public exhibition process for further industry and community comment. Following consideration of submissions, and making any necessary changes, we would then report again to Council and ask them to formally adopt the new planning controls.

It is vital that we hear from you – our local residential community, business owners, service providers and stakeholders. Your feedback is of great value.

Image on previous page: Sydney Town Hall, George Street
Photo: Abril Felman / City of Sydney

Scope

This paper looks at why and how we might use planning controls to disallow new connections to the existing fossil fuel gas network in new residential and non-residential development. We also ask whether such requirements should be applied when major works and refurbishments are carried out on existing buildings.

Any planning controls would not affect existing gas connections to existing buildings that are not being redeveloped. Bottled gas (liquefied petroleum gas), or connections to a 100% renewable gas network are also not included.

The term ‘fossil fuel gas’ is used in this discussion paper, to differentiate from renewable gas. We are discussing non-renewable gas in the existing gas network.

Our commitment to a more sustainable city

We have developed ambitious strategies to make our city more resilient and sustainable for our residents, workers, visitors and businesses. We aim to set the stage for cutting carbon emissions by 70% and ensure that at least half of the electricity used in our area comes from renewable sources by 2030. We have also set a target for net zero emissions across our local area by 2035. Our operational target is to cut emissions by 80% from 2006 levels by June 2025. This target doesn’t include offsets.

What we’ve done for electrification

To achieve our operational target, we are electrifying our property portfolio and converting more of our fleet vehicles to electric. Our future buildings will be fully electrified, with no new fossil fuel connections[2].

In late 2024, we exhibited draft planning controls to improve indoor air quality and deliver health benefits in new residential development by preventing the installation of indoor gas appliances (cooktops, ovens and space heating). The draft controls were added in response to submissions received about the health impacts associated with indoor residential gas usage. The feedback will be reported to Council in 2025.

Our ongoing actions

We are committed to increasing the number of net zero emissions buildings. We have made significant progress through the Better Buildings Partnership, the Sustainable Destination Partnership, CitySwitch, Smart Green Apartments, and targeted grants for sustainability projects.

From June 2022 to July 2023, we ran a campaign to boost adoption of 100% accredited GreenPower electricity plans.

Since 1 October 2023, our net zero performance standards require large offices, hotels, and shopping centre developments to reduce energy use through efficiency and renewable energy or be capable of achieving net zero energy prior to commencing use.

The Better Buildings Partnership is a collaboration between 12 property companies, who own 100 commercial office buildings in our local area. The Better Buildings Partnership has a goal for all members to have a pathway to electrify their building portfolios by June 2025 and have worked with sector experts to create a set of resources to assist with electrification.

CitySwitch is a national program to support improved sustainability in office tenancies managed by the City of Sydney on behalf of a national steering committee. CitySwitch has built a program for net zero office tenancies.

We work with our strata communities through our Smart Green Apartments Program. This program supports owners corporations to understand their energy use and identify opportunities for energy efficiency including electrification feasibility studies. Since 2016, owners corporations have

invested over $3.3 million in upgrades which will return significant savings, including almost $14 million in running costs and avoiding 54,000 tonnes of carbon dioxide equivalent emissions. On average, participating owners corporations can reduce their energy use by 35%.

We recently released the *Electrification of transport strategy and action plan*[3], which includes actions to encourage the transition to electric vehicles, including to support electrification of existing buildings, including strata buildings. We have also committed to the Global Cooksafe Coalition along with the City of Melbourne, as the first Government Supporters. The Global Cooksafe Coalition is an alliance that promotes universal access to safe and sustainable cooking on electric appliances powered by renewable energy[4].

Next steps

New technologies are helping more buildings meet their heating, cooling and cooking needs with electricity rather than gas. Our research shows that increasing gas use would exceed our carbon budget in the future due to the long lifespan of gas assets. The use of all-electric technology results in significantly improved energy efficiency and lower greenhouse gas emissions, reducing our need to buy carbon offsets to achieve the ‘net’ in ‘net-zero’. In many circumstances, electricity is far more efficient than burning gas or fossil fuels, where around two-thirds of energy is wasted as heat. There are predicted gas shortages in the domestic market and the gas grid is unable to transition to renewable energy sources on par with the electricity grid.

Exploring the challenges and opportunities for requiring all-electric new developments through planning controls for applicable development applications aligns with our goals to reduce emissions and improve energy efficiency.

What's happening in other places

The NSW Government has a legislated target to achieve net zero emissions by 2050. The NSW Government has committed to deliver a Gas Decarbonisation Roadmap in this term of government and will consider including targets. The Roadmap will provide clarity to industry and households on gas decarbonisation, including supporting business and household electrification and energy bill reduction[5]. The NSW Government has also committed to setting targets for 2035 and 2050 to increase electrification of homes and small businesses in NSW as Action 3 of its recently released NSW Consumer Energy Strategy[6].

The NSW Government has yet to commit to banning new gas connections, leading local councils to introduce their own controls. Across Australia and internationally, multiple jurisdictions have implemented bans or phasedowns on fossil fuels to reduce gas use in buildings. Councils can introduce guidelines and rules for the developments they approve. Examples of these approaches are described below.

Waverley Council

Planning controls in the Waverley DCP, which came into effect in 2022, do not permit gas cooktops, gas ovens, and gas internal space heating systems in new residential development. Electric systems must be provided in lieu of gas[7]. The controls allow outdoor gas hot water systems, but applicants must include electrical capacity, infrastructure and space to enable easy retrofitting of electric hot water systems in the future.

Parramatta Council

Planning controls that apply to the Parramatta city centre in the Parramatta DCP came into effect in 2023 and require all new residential and non-residential buildings to be all-electric. All energy requirements associated with normal operations must use grid provided and/or on-site renewable electricity[8]. The planning controls only apply to the city centre area and do not apply to the broader council area.

Lane Cove Council

Planning controls in the Lane Cove DCP, which came into effect in 2023, disallow the installation of all gas appliances and systems in new development (residential and non-residential) as part of a development application across the whole council area[9].

ACT Government

As part of their plan to phase out fossil fuel energy use in Canberra by 2045, the ACT Government has introduced regulations[10] that prohibit new fossil fuel network connections in all residential, commercial, and community facility land-use zones as well as residential buildings in non-residential zones. The regulation has applied to new gas connections since 1 March 2024, following a transition period. It covers all residential buildings and most other use types, meaning renovations that involve decommissioning an existing gas connection fall under this regulation. However, existing gas connections remain unaffected. The regulations include exemptions for connections in commercial or community facility zones. Any exemption requires the review and approval by the relevant Minister.

Victorian Government

As part of its Gas Substitution Roadmap, the Victorian Government implemented a statewide ban on residential reticulated gas connections from 1 January 2024[11]. The prohibition applies to new planning applications for dwellings, developments, or residential subdivisions. It does not apply to other building types and does not restrict the use of bottled gas. Additionally, the Victorian Government has committed to all new government buildings, including schools and hospitals, being constructed without gas and investigating options to progressively electrify most commercial buildings where appropriate electric appliance options are readily available.

International Measures

Outside Australia a range of measures have been implemented including phase downs, tax penalties, bans and industry initiatives. Some government entities that have implemented measures to reduce the consumption of gas include New York City[12], Washington DC[13], California[14] and London[15].

Image on next page: The Galleria 27-51 Palmer Street Woolloomooloo – Smart Green Apartments Program
Photo: Katherine Griffiths / City of Sydney

Why we should electrify

New dwellings are typically constructed and sold with certain basic appliances installed, including an oven, cooktop and hot water system. A heating and cooling system may also be installed. Infrastructure to support appliances and systems is planned and installed during construction. For example, gas appliances require gas infrastructure, while electric appliances need an adequate power supply. Changing fuel types after construction can be challenging. For example, swapping from electric to gas requires retrofitting gas infrastructure, and swapping from gas to electric can require upgrading the power supply to a building. For strata buildings there are common services, shared services and individual occupant services. For these reasons, the most appropriate long term fuel selection should be determined at the specification and construction stages.

New homes and most new businesses can meet their energy needs with energy-efficient electric appliances. This pathway has become more appealing due to improvements in the quality and efficiency of appliances. These appliances are better for the environment, cheaper to operate and contribute to improved air quality by reducing pollutants compared to gas burning options, which is better for our health. The recently released NSW Consumer Energy Strategy highlights the advantages of electrifying homes and businesses, including bill savings and health benefits[16].

However, many new developments are still creating new connections to the fossil fuel gas network. This is because it can be cheaper to build a building that is connected to gas if extensive electricity network upgrades would be required to service an all-electric development. This means developers may have limited incentive to deliver an all-electric building, despite the long-term environmental benefits for the community and cost savings and health benefit for tenants and owners.

Allowing new fossil fuel gas connections only increases the transition challenges for building owners and energy users in the future. By providing clarity in the planning and regulatory framework we can help the community including builders, developers, gas fitters, electricians and suppliers in planning for electrification. A clear planning and regulatory framework for all-electric development would also aid electricity and gas network operators with forecasting and to manage their systems cost-effectively to meet our future energy needs.

Electric homes are healthier

Burning gas for heating and cooking releases nitrogen dioxide, carbon monoxide, and other pollutants, making gas appliances significant sources of indoor air pollution. Lower-income households and renters face greater health risks from gas exposure, as they are more likely to live in smaller homes with older gas appliances and inadequate ventilation with less choice or ability to improve conditions[17].

A body of evidence links gas-powered cooking appliances to childhood asthma. Evidence provided in a report from the Climate Council estimates that gas cooking in the home contributes to up to 12% of the childhood asthma burden in Australia, creating a risk comparable to household smoking[18]. Additionally, gas appliances can generate harmful indoor air pollution in commercial kitchens and other settings, and in rare occasions, leaks can lead to explosions or fires.

Air pollutants can also originate from heating appliances, such as space heaters and domestic hot water systems, as combustion products can circulate poorly and leak when vented indoors[19]. Good ventilation can reduce, but not eliminate, harmful indoor air pollution from gas appliances – such as space and water heating and cooking. The effectiveness of ventilation depends on the type of exhaust fan or flue, and their proper use and maintenance. Beyond asthma, gas exposure can lead to other respiratory issues, neuropsychological development problems and carbon monoxide poisoning[20].

Protecting consumers from rising costs

Amid a cost-of-living crisis, electrifying new developments is an opportunity to potentially reduce energy bills and ease cost of living pressures for future residents and businesses. Additionally, avoiding dual connection charges (for both gas and electricity) can lower daily connection costs.

Electrification reduces energy bills for residentials and businesses

Research estimates substantial cost savings from electrifying new development[21]. In the City of Sydney, it has been estimated that:

- Each new household could save an average of $626 annually on energy bills, or $8,109 in today's dollars over 40 years. This amounts to a total of $371 million in total bill savings for all new homes in our area over the same period.
- The commercial sector would save a total of $173 million over 40 years.

As consumers leave the gas network, prices increase for those remaining

Growth in electrification means that the gas network users will shrink - consumers will leave the gas network in the local area and there won't be many new gas users. Despite this, the cost of running the gas network will remain much the same. Gas network owners will need to recoup the costs of investments they have already made from a smaller pool of users. To do this, the gas network owner could increase prices to maintain its revenue.

The transition needs to be managed equitably, and intervention is required to ensure vulnerable communities aren't locked into bearing these costs. The gas network's fixed costs are shared among all connected households and recovered through bills. As more households disconnect from the gas network, fewer households share the fixed costs, raising the cost for those remaining. Higher gas prices can drive more households to leave the network, creating a cycle known as the gas network 'death spiral'[22].

Government policies may accelerate this process, but they are not the only driver. This trend will occur even if governments don't pursue electrification as a decarbonisation strategy. We know this because we are already seeing economically driven electrification, with some businesses and homes replacing gas appliances with high efficiency electric alternatives to benefit from lower energy bills and reduced energy consumption. We are also seeing health benefits drive the replacement of gas cooktops with electric induction cooktops.

Vulnerable households bear the brunt of rising gas prices

Renters, low-income households and residents of residential flat buildings with existing gas connections may bear the brunt of the gas network contraction. They cannot easily replace gas appliances or afford the transition to electric systems. This means they'll be trapped with rising gas prices while those who can afford to, and those who have the choice to switch to electric systems do so.

Policy and regulation are essential to ensure a fair and equitable transition

The risks to these vulnerable households from the gas network 'death spiral' strengthens the case for preventing gas connections in new developments and to stop expanding the gas network. We can then focus on helping community members with an existing gas connection transition through our programs, grants and educational materials. Furthermore, gas networks subsidise new connections through funding sourced from the existing consumer base. Phasing out new connections would help prevent additional costs from being imposed on the existing gas consumer base.

As the NSW Government has not yet committed to all-electric new development, we must take on a necessary leadership role in developing a clear stance on the use of gas in new developments would help gas network providers manage their assets and energy regulators manage their tariff structures to minimise the financial impact to consumers as the transition from fossil fuel gas to renewable energy sources or electricity progresses.

Reducing carbon emissions

Each new connection that uses fossil fuel gas makes it more difficult to meet our net zero target. Fossil fuel gas primarily consists of methane, which is a potent greenhouse gas that is a significant contributor to global warming. As renewable energy makes our electricity grid greener and cleaner, the benefits of electrifying a home and business grow too.

The shift towards electrification seeks to enhance energy efficiency and reduce emissions. Instead of traditional gas-fired hot water heaters, high-efficiency electric systems like heat pumps can be used to lower energy consumption and emissions, although, these can have a higher upfront cost.

As the grid decarbonises, the emissions advantage of electricity will increase. In comparison, the emissions created by burning fossil fuel gas cannot be reduced by renewable energy sources and can only be offset or replaced. Renewable gases like hydrogen and biomethane remain costly and unproven at scale to date. Current evidence suggests these solutions are unlikely to become financially viable for buildings soon[23].

The electricity grid is rapidly decarbonising with the rise of renewable energy. By 2030, experts expect the grid to be 82% renewable[24]. This shift paves the way for all-electric developments to achieve net zero operational energy. Tasmania serves as a strong example, running on 100% renewable electricity since November 2020[25].

Our local area has undergone a rapid increase in dwellings over the past decade, which is expected to continue for a period and taper off. The projected growth in residential and commercial developments provides an opportunity to implement electrification initiatives at scale. If most new buildings adopt all-electric systems from the start, we can substantially reduce future emissions. Introducing planning controls that require electric systems in these developments could accelerate our transition to net-zero emissions, building on the momentum of ongoing efforts.

Research indicates substantial emissions savings from electrifying new development[26]. In the City of Sydney area, a cumulative greenhouse gas emissions savings in the commercial sector has been estimated at 1.97 million tonnes over 40 years. The cumulative emissions savings in the residential sector has been estimated at 1.68 million tonnes over the same period.

By aligning future construction with a clear electrification goal, we can enhance our chances of achieving net-zero emissions by 2035.

Avoiding future transition costs

The NSW Government has a legislated target to achieve net zero emissions by 2050. This means that buildings with fossil fuel gas connections will need to be transitioned or offset in the future.

Retrofitting buildings, especially residential flat buildings, is challenging, costly and disruptive. Many existing designs lack the necessary space, ventilation and weight requirements for electric systems, and existing infrastructure may not support the required electrical capacity. By connecting new buildings to gas, we're locking in future transition costs for the community. By building in gas appliances now, they may need to be replaced before the end of their working life to transition to an electric energy source, which is not cost effective and wasteful.

Implementing planning controls for the electrification of new buildings now will mean that they are future-proofed, reducing the financial and logistical burdens of retrofitting and replacing gas systems in the future.

Image on next page: Sydney skyline in evening.
Photo: Jamie Williams / City of Sydney

Policy and regulation

National

Australian net zero target

The Australian Government is developing a Net Zero Plan to guide Australia's transition to the legislated target of net zero greenhouse gas emissions by 2050. The Future Gas Strategy acknowledges that Australia cannot reach this target without reducing and decarbonising our consumption of natural gas[27]. The Strategy puts forward increased energy efficiency and the electrification of processes that currently use natural gas as a way forward, alongside replacing natural gas with low-emission gases and offsetting natural gas use where alternatives are not viable[28].

National Construction Code 2025 plans for all-electric buildings

The National Construction Code (NCC) is Australia's main set of technical design and construction provisions for buildings. Updated every three years, it reflects new research, industry practices, and technologies. The latest proposed revision, the draft NCC 2025, proposes measures to encourage electrification in new developments[29].

Under the draft, buildings that are to use gas powered systems for space heating, water heating and swimming pool heating must be designed to enable future replacement of gas systems with efficient electric alternatives. This means developers will need to ensure there is enough electrical capacity, space, ventilation and weight capacity for installing efficient electric systems later. However, the draft does not address gas appliances like cooktops. Additionally, there are new energy efficiency requirements (coefficient of performance – CoP) for electric equipment.

Though the draft is still subject to change, it indicates that the Australian Building Codes Board sees the future of the built environment in electrification rather than gas. These measures would provide strong incentive for new developments to adopt all-electric systems from the outset, as most electrification costs will be covered during construction. Any gas infrastructure costs would be over and above the costs of providing the electrical infrastructure.

Rating tools encourage and support electrification

The main sustainability rating tools in Australia are the National Australian Built Environmental Rating System (NABERS), the Nationwide House Energy Rating System (NatHERS) and Green Star Design and As Built from the Green Building Council of Australia (GBCA).

Until 2021, achieving higher NABERS energy ratings was more challenging for electric heat pumps than for gas boilers. However, the recent revision of the carbon coefficient for grid electricity will lessen this impact. Regular updates every five years will align with the decarbonisation of electricity grids across states and territories. As a result, star ratings for fossil fuel free buildings will increase every five years, while ratings for buildings using gas, will decline. The NABERS Renewable Energy Indicator displays how much of a building's energy comes from renewable sources. At present all-electric buildings using renewable electricity is the only way to achieve a score of 100.

NatHERS does not penalise electric buildings at all.

Green Star Buildings rewards making buildings fossil fuel free. It is also mandatory for buildings targeting a 5- or 6-Star and will be mandatory for 4 Star ratings from 1 January 2026.

State

NSW net zero target

The NSW Government has a legislated target to achieve net zero emissions by 2050.

State Environmental Planning Policy (Sustainable Buildings) 2022

Major commercial development and state significant development

The Sustainable Buildings SEPP requires offices over 1,000 sqm in floor area, hotels with over 100 rooms, and any non-residential state significant development to provide a “net zero statement”. This statement must either commit to avoiding on-site fossil fuel use or show that adequate space and electrical capacity are available for converting to all-electric by 2035. Where a development is designed to transition to operate as fossil fuel free in the future, the statement must specify and describe the fossil fuel systems proposed and justify why they have been used rather than fossil fuel free alternatives.

Additionally, major commercial developments are required to purchase carbon offsets equal to 10 years of any on-site fossil fuel use.

These measures aim to strongly discourage gas use in these developments. It is our expectation that it is unlikely gas supply will be provided in these development types unless there is a specific need where an electric equivalent is not yet available. It is unclear whether a transition to all-electric services by 2035 will be mandated and how this will occur. The standards will be reviewed in 2025.

Residential development

The Sustainable Buildings SEPP requires the use of the Building Sustainability Index (BASIX) tool that mandates standards to lower water and energy consumption and reduce greenhouse gas emissions in residential development. The Sustainable Buildings SEPP has recently updated the BASIX tool. While gas appliances remain an option, the greenhouse gas emission factor for grid electricity has been reduced due to increased renewable energy generation. This change makes it easier for all-electric homes to meet BASIX standards, likely leading to fewer gas connections.

The Sustainable Buildings SEPP also prevents local planning controls in both the local environmental plan (LEP) and DCP from including measures to reduce greenhouse gas emissions or improve the thermal performance of residential developments, unless a development bonus is offered.

Local

City of Sydney net zero target

Sustainable Sydney 2050: Continuing the Vision establishes our target for net zero emissions by 2035.

Net zero planning controls require high efficiency and renewables

We introduced energy and net zero requirements for large commercial development into our Sydney LEP 2012 and Sydney DCP 2012 in October 2023. Development applications for new office buildings, hotels and shopping centres and major redevelopments of existing buildings must comply with minimum energy ratings from January 2023 and procure 100% renewable electricity from 2026. The net zero controls cover electricity use and do not address gas usage, as this is a focus of the Sustainable Buildings SEPP.

Draft air quality controls for new residential development avoid indoor gas appliances

As part of proposed changes to our Sydney DCP 2012 reported to Council in 2023, we included draft planning controls to improve indoor air quality and deliver health benefits in new residential

development by preventing the installation of indoor gas appliances (cooktops, ovens and space heating). The inclusion was made in response to submissions received about the health impacts associated with indoor residential gas usage. These draft planning controls were placed on public exhibition in December 2024 and will be reported back to Council in 2025.

Opportunities for local planning controls

The Sustainable Buildings SEPP requires offices over 1,000sqm in floor area (base building), hotels with over 100 rooms and any non-residential state significant development to be designed with the capacity to convert to all-electric services by 2035. It is unclear whether a transition to all-electric services by 2035 will be mandated and how this will occur, presenting an opportunity for local electrification planning controls to encompass these development types.

Other opportunities to apply local planning controls through development approvals include:

- residential development
- offices under 1,000sqm in floor area and hotels under 100 rooms
- large tenancy areas of office buildings
- retail and personal services uses and shopping centres
- industrial and manufacturing uses
- food and drink premises, entertainment facilities, business premises and a wide range of other specific land uses.

For residential development, the Sustainable Buildings SEPP prevents local planning controls from including provisions aimed at reducing greenhouse gas emissions. To avoid inconsistency with the SEPP, several NSW councils have introduced DCP controls that prevent gas appliances by using health and economic justifications, supported by legal advice from the Environmental Defenders Office[30]. As above, we have taken a similar approach in our DCP to introduce draft air quality controls for internal gas uses in residential development. Outdoor gas uses, such as domestic hot water systems, are not covered by these draft controls.

There is a limitation whereby some of these land uses are covered by State Environmental Planning Policy (Exempt and Complying Development Codes) 2008, which means local planning controls largely have no impact. For example, certain commercial or industrial buildings can be constructed as complying development. Typical fit-outs and change of use for most business uses in existing buildings is also exempt or complying development.

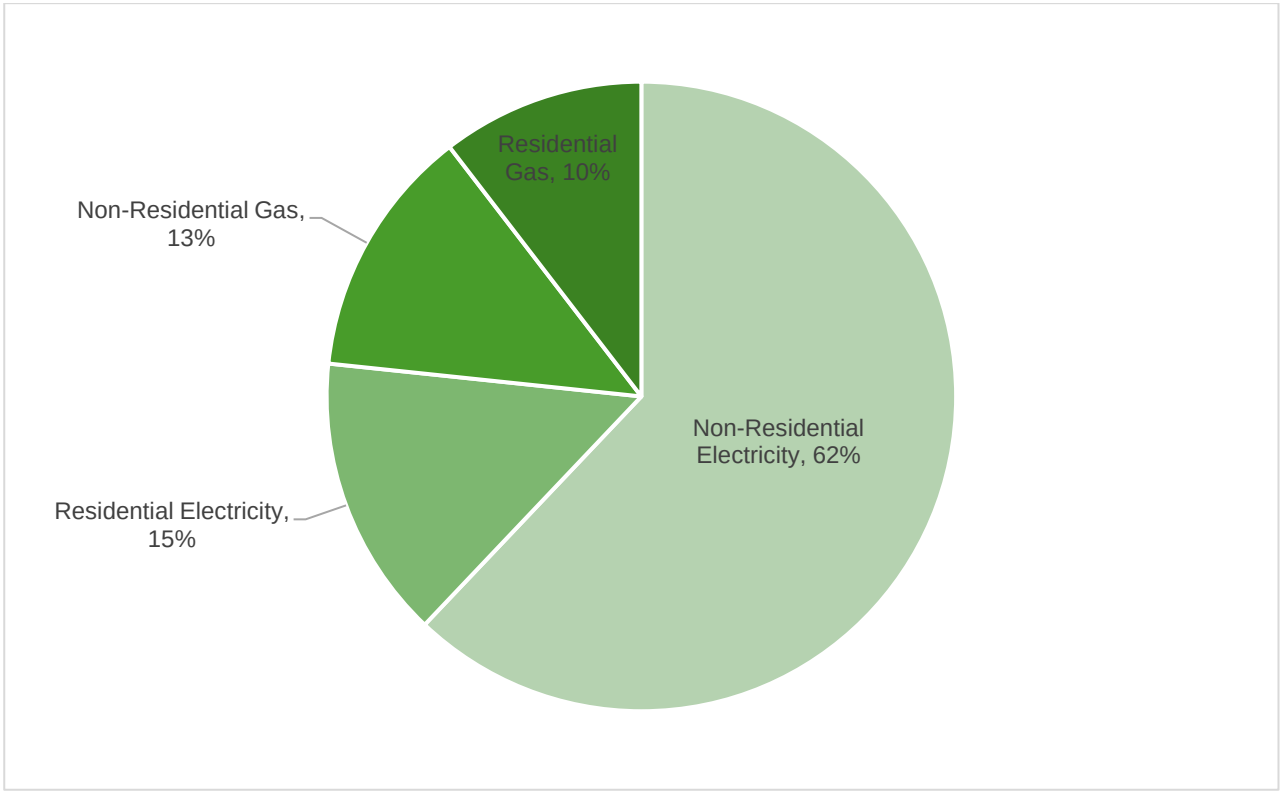
There is a small amount of industrial gas use in our area, for light industrial and manufacturing, warehouse and cold storage purposes, which could be affected by new planning controls. There may also be specialist uses, such as in hospitals and laboratories, where there may not be a simple electric alternative that is feasible or available.

Gas use in our area

Almost a quarter of our total energy use comes from gas, a source that cannot benefit from the greening electricity grid and will require costly offsets to meet and maintain our net zero target.

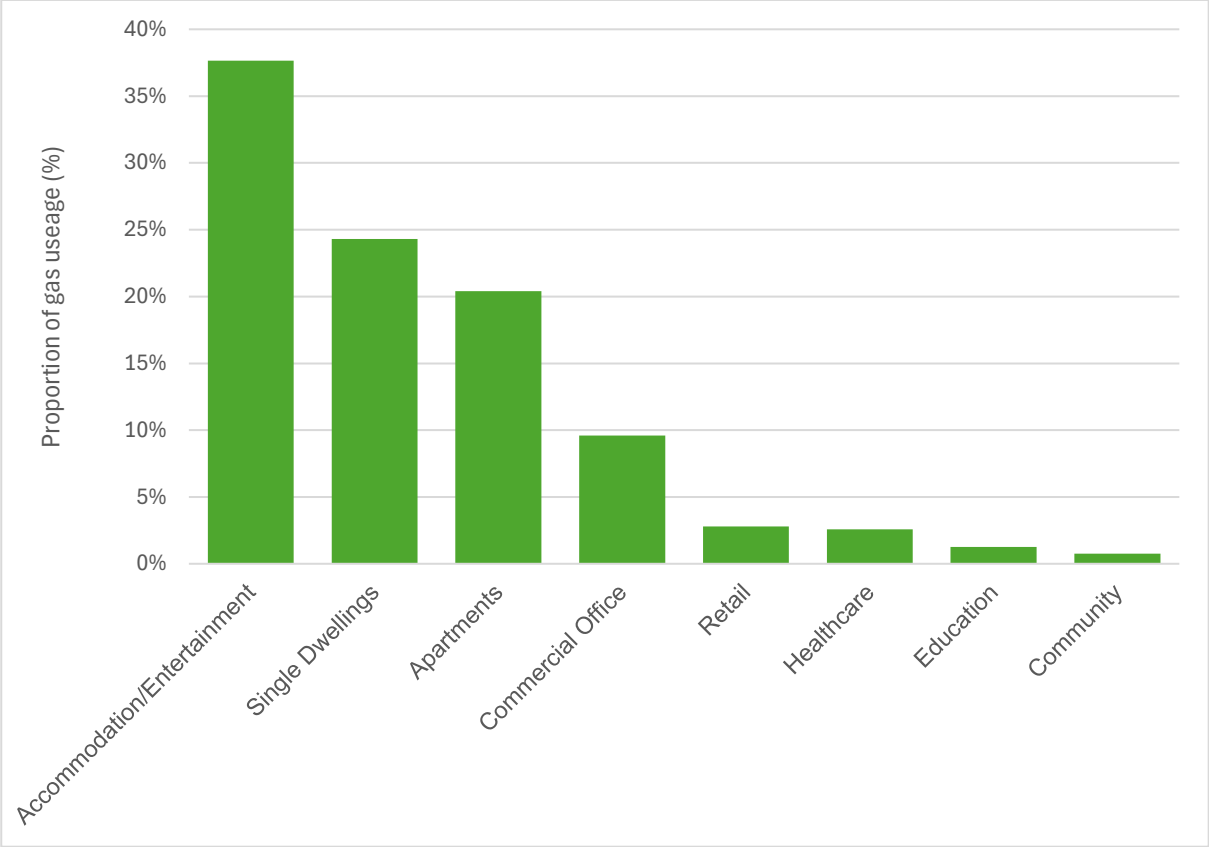
Gas accounts for 23% of the total energy use in our built environment, while electricity makes up 77%. In our area, non-residential electricity use represents 62% of total energy consumption, and gas accounts for 13%. Residential electricity and gas use contribute 15% and 10% respectively to the LGA's energy use, totalling 25% (See Figure 1).

Figure 1. Total energy use by residential and non-residential buildings (FY22/23)[31]



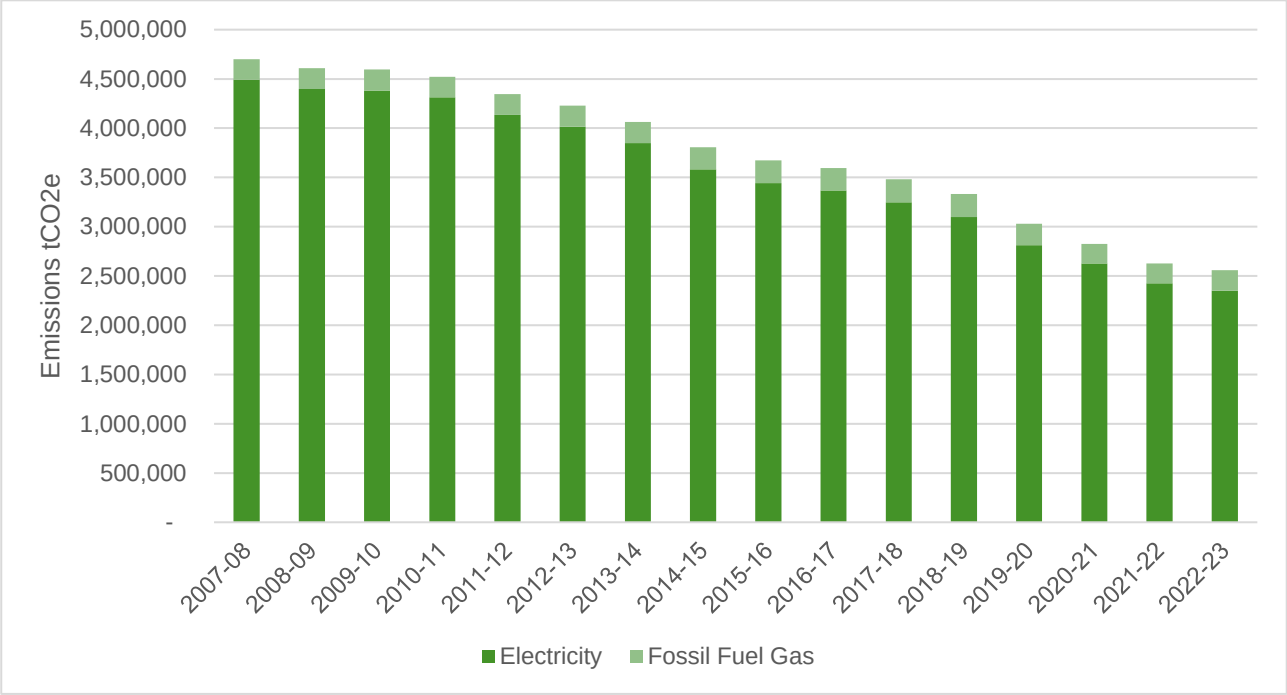
Residential gas use is disproportionately high, accounting for nearly half of the gas consumption in our area, despite residential buildings representing only 25% of total energy usage (See Figure 2). This is largely due to the reliance on gas for domestic hot water heating. With a significant portion of new developments each year being residential, there is a valuable opportunity to target this sector with the potential policy.

Figure 2. Total gas usage in built environment (FY 22/23)[32]



In our area, electricity consumption and CO_{2e} emissions from electricity have been decreasing since 2005, while gas CO_{2e} emissions have remained constant over the years (See Figure 3). As described earlier in the paper, the emissions advantage of electricity will continue to grow as the grid decarbonises, with the grid expected to be 82% renewable by 2030[33].

Figure 3. Annual CO_{2e} emissions from electricity and gas (2005-2023)[34]



We use a tool to monitor and report carbon emissions, energy and other metrics in our area. The data shows the breakdown of gas end uses in our area, highlighting the proportion of gas consumed for each purpose across various sectors. Thes data is aggregated based on assumed averages and is indicative only. It is not the actual metered gas used. The data shows:

- Water heating indicatively accounts for about 46% of the total gas demand in our area, primarily within the residential property sector.
- Space heating is the second largest use, contributing around 36% of total gas demand.
- Appliances and equipment including cooking account for the remaining 18%, with demand spread across various sectors.
- There is also a small amount of industrial gas use in our area, for light industrial, manufacturing, warehouse and cold storage purposes.

How do we electrify

Research shows a way forward for electrification

We engaged an independent consultant to explore electrification opportunities for new development in our local area and to determine the best technical solutions for each building type. The resulting research paper is available with the public exhibition of this discussion paper (See Appendix 1).

The research identifies the energy usage profiles in our area and includes a qualitative assessment of all-electric space heating, hot water systems, and electric appliances available in Australia. It compares electrification options to traditional gas alternatives and identifies potential implementation challenges. It also pinpoints opportunities for energy efficiency improvements, especially in the residential sector (houses, residential flat buildings and student accommodation/hotels) as well as in commercial office buildings, retail and educational facilities.

Opportunities based on gas usage

Data from 2022-23 shows that in our area, non-residential buildings primarily use electricity, while residential buildings use almost the same amount of gas as electricity. Residential development (single dwellings and residential flat buildings) indicatively accounts for about 45% of all gas consumption in our area. The data reveals a heavy reliance on gas for domestic hot water heating, indicating significant impact potential for electrification in the residential sector.

Tourist accommodation (hotels, serviced apartments and backpackers) also primarily relies on gas for domestic hot water, followed by cooking and some space heating.

In non-residential development, space heating is the primary use, followed by hot water and cooking.

Technical solutions and potential implementation challenges

The research looks at various building types, including single dwellings, low-to-mid-rise residential (<12 storeys), high rise residential (>12 storeys), tourist accommodation and non-residential typologies.

The findings indicate that technologies like electric heat pumps and induction cooktops are effective replacements for gas counterparts but may require more space and higher upfront costs.

There are many technical solutions that are current, mainstream and widely available in the Australian market. The research outlines specific considerations for choosing between different systems to electrify space heating and domestic hot water across different building types and outlines the most effective and suitable solution. For example, spatial constraints are generally less significant for single dwellings compared to residential flat buildings, making it easier to install larger storage tanks alongside heat pumps or split systems. These tanks can store hot water and be filled during off-peak energy times, making it easier to meet the daily hot water needs of the household efficiently depending on space availability.

Another critical factor is the demand profiles for each building type. High-rise residential flat buildings, for example, experience unique demand patterns for hot water during early morning and evening peaks. Systems must be designed to accommodate these patterns effectively without overloading electrical infrastructure.

For restaurants, the optimal solutions for space heating and domestic hot water involve compact, efficient systems like direct expansion split air-conditioning and electric storage water heaters, designed to meet the specific needs of high-occupancy and variable-demand environments.

To identify feasible solutions, the research also looks at where cost advantages for specific space heating and domestic hot water appliances increase or decrease as the size of the development increases.

Ultimately, while technical solutions for space heating and domestic hot water vary by building types, there are no prohibitive technical barriers to electrifying new development.

Electric systems may have higher upfront costs, but they offer better energy efficiency. The increasing availability and affordability of electric alternatives like heat pumps and induction cooktops makes the transition to all-electric buildings achievable. The draft NCC 2025 also includes provisions to enable electrification providing a strong signal and certainty to industry, which will further support the maturity and scale of the supply chain.

Electrifying new developments would increase the maximum electrical demand, which can mean network upgrades paid for at the development stage. However, the research indicates that these costs can be minimised with efficient electric systems and energy efficiency strategies, reducing the need for upgrades to electrical infrastructure.

The research recommends implementing high-efficiency requirements for electric plant and appliances in new developments. This would lower energy consumption, reduce overall energy demand and greenhouse gas emissions, help manage peak demand and reduce operating costs (See Appendix 1).

Challenges to electrification can be overcome

Capital costs

Two main capital cost concerns arise with the electrification of new developments, as raised by some stakeholders (See Appendix 2). First, electric appliances and systems can cost more than their gas counterparts. Second, when developing a site, developers may need to pay for network upgrades to meet the increased electrical capacity demand.

Heat pumps and induction cooktops have been available for many years but with higher capital cost. With rising demand, innovation in these technologies is expected to accelerate. Evidence indicates that as demand grows and markets expand, these electric appliances are becoming less expensive[35].

Network augmentation refers to upgrades needed when existing on-street electrical capacity cannot support a new development’s maximum demand. In our area, because of the scale of development, a new substation or kiosk is usually required to augment on-street capacity, even if the building is intended to be serviced by both electricity and gas. This means there may not be additional network upgrade costs associated with an all-electric development. However, some development may require larger substations, that will result in additional cost to the developer.

Well-designed all-electric buildings utilise management systems to control power consumption from the grid and take advantage of off-peak electricity. Implementing load management strategies and efficient electrical systems can reduce the impact, scale and cost of these upgrades.

Network capacity

A concern that has been raised by some stakeholders is about the network capacity to accommodate the increased demand from electrification (See Appendix 2).

To investigate this further, we have engaged with Ausgrid, our local electricity provider. They forecast annual demand and indicate that growth rates align with available distribution network capacity. Ausgrid recognises the shift towards electrification and that decarbonisation strategies may accelerate this process. We will continue to work with Ausgrid regarding local level network capacity and electricity demand forecasting.

The Australian Energy Market Operator (AEMO) manages the national electricity market. In August 2024, AEMO released a 10-year electricity outlook, concluding that there would be no power supply reliability gap if existing renewable projects are delivered in full[36].

Renewable gas alternatives

A concern that has been raised by some stakeholders is about closing out the opportunity for gas alternatives to fossil fuel gas, such as biomethane (also known as biogas or 'green gas') and hydrogen gas (See Appendix 2).

At this stage, hydrogen is unlikely to be a competitive, scalable option for many current fossil fuel applications due to cost and physical limitations. Significant upgrades to the existing gas network would be necessary, along with replacing appliances to be hydrogen compatible, which would be more expensive[37].

Biomethane does not require appliance or network upgrades but faces economic and logistical barriers. While these alternatives are unlikely to scale into a substitute for wide-scale electrification, they could be suitable for gas users where electrification is not feasible, such as certain manufacturing and industrial applications[38].

Cooking preferences

A challenge in transitioning to all-electric development is the perception that electric induction cooking may not meet cultural and culinary needs. Some cuisines, like those using woks, clay pots, and copper cookware or methods such as flame grilling, traditionally rely on gas for its high, direct heat. This is especially true in the food and beverage industry, where gas is seen as essential for certain cooking techniques. For residential developments, personal preferences for gas cooking have also led to concerns about its impact on buyer demand and property sales.

Research and demonstrations from groups like the Global Cooksafe Coalition and Asian Australians for Climate Solutions show that induction cooktops can meet most of these needs[39]. They reach higher temperatures than gas, making them suitable for wok cooking, and are more energy-efficient, delivering the same taste and performance as gas cooktops. Ambassador chef demonstrations have showcased induction woks as effective alternatives.

In retail developments, particularly food and beverage premises, transitioning from gas can present operational challenges for tenants. Some developers are helping tenants switch to electric alternatives. Mixed-use developments are adopting transitional solutions, such as limited bottled gas or single gas connections for specific restaurants, while designing buildings with the electrical capacity to fully transition to electric systems in the future.

These approaches demonstrate that while cultural and operational preferences remain a challenge, practical solutions and emerging technology are making all-electric developments increasingly feasible.

Image on next page: Green Power Launch
Photo: Abril Felman / City of Sydney


CHT CLUB

What we have heard so far

Stakeholder interviews

We held 30 individual meetings with key stakeholders between May and August 2024, to investigate planning controls for all-electric new development. The Engagement Report – Electrification of new development (engagement report) is included at Appendix 2 and outlines the engagement process and the feedback received.

We spoke to those who work in or represent members of:

- the gas, plumbing or electrical industry
- gas or electricity supply
- the hospitality sector
- the development or property sector
- social housing and affordable housing
- sustainability organisations
- social advocacy organisations
- consumer advocacy organisations
- health advocacy organisations.

The engagement report captures insights from key stakeholders about the future electrification of new development for our local area. Participants expressed a mix of support and concern about potential future planning controls requiring all-electric systems and appliances for new development, emphasising the need to balance benefits with practical challenges.

We heard that all-electric systems and appliances offer health, environmental and operational cost benefits compared to gas.

We also heard concerns about electrical capacity and supply, the capital cost implications and incompatibility with cultural cooking preferences. These issues were raised both by participants who were otherwise supportive, and participants who were opposed to potential planning controls altogether.

Participants discussed the difficulties of retrofitting gas-dependent buildings to be all-electric, including integrating the new electric systems with existing building infrastructure and cost barriers. Some argued that these retrofitting challenges support the need for a policy requiring all-electric new developments.

Stakeholders called for a clear policy position from us on new gas connections, citing challenges in navigating NSW's regulatory framework and the lack of commitment from the NSW Government. We also heard from industry participants operating in areas where gas has been regulated such as Victoria and the ACT, that the focus has quickly and easily shifted towards working out how to effectively implement electric alternatives, rather than debating whether to make the transition.

Key consultation themes

Health

- Gas heating and cooking cause indoor air pollution and health impacts, with gas cooktops contributing to up to 12% of childhood asthma cases in Australia[40].
- Lower-income households, renters and those living in residential flat buildings face greater risks due to generally smaller and inadequately ventilated spaces with limited choice to change appliances and systems.
- Gas cooking can have even more adverse health impacts in commercial settings.
- Gas hot water systems also pose health risks.
- Renewable gases will not alleviate health concerns.

Sustainability

- Emissions savings drive the shift towards electricity.
- The emissions intensity of electricity has decreased and will continue to improve with renewables on the grid.

Rising costs

- Heat pumps and induction cooktops are more efficient than gas, leading to energy bill savings.
- Avoiding the gas connection fee (the daily charge) saves money, as consumers will only pay one connection fee for electricity instead of two (one for gas and one for electricity).
- Fewer customers on the gas network will drive gas prices higher, disproportionately affecting low-income households, renters and those living in residential flat buildings.

Future conversions

- Retrofitting gas-dependent buildings to all-electric poses physical and financial challenges.
- Abolishing existing gas connections incurs costs and complexities.
- Preventing new gas connections avoids future retrofitting costs.

Energy supply

- Increased electricity demand could strain the current network.
- Relying solely on one energy source poses risks, gas is a backup during blackouts.

Capital cost of development

- All-electric developments are costlier due to appliance prices and the need to pay for network upgrades (additional substations or kiosks) to meet increased electrical capacity demands.
- Challenges with fitting electric systems and infrastructure within the building envelope.

Renewable gas alternatives

- Not investing in the existing gas network could limit future green gas technology advancements.

Cooking preferences

- Electric induction cooking may not align with cultural cooking methods or personal preferences.
- Traditional cookware often does not work on induction cooktops.
- Retail tenants prefer gas for cooking.

Supply chain issues

- Electric appliance supply chains, like heat pumps, face vulnerabilities and limited local manufacturing.

Implementation considerations

- Controls and implementation timing must be transparent.
- Transition arrangements should protect development applications and approvals.
- Incentives or financial support should be provide

Planning control options

Discussion

We want your input to shape our planning controls guiding new development in our area. We are seeking community and industry feedback on options to prevent or discourage new developments connecting to the gas network.

Planning control options

The following options could be introduced independently or in combination.

Option 1 – continue with controls to address indoor gas appliances in new residential development

We could proceed only with the recently exhibited draft air quality controls which disallow the connection of indoor gas appliances and systems in residential development approvals, with the aim to reduce indoor air pollution and improve health outcomes. This option still allows for gas fired hot water systems and will not capture all the benefits of electrification. Buildings wanting to get the benefits of electrification in the future would bear the higher costs of retrofitting.

Option 2 – expand controls to domestic hot water systems in new residential development

We could build on the previous approach and expand these controls to also address domestic hot water in residential development by disallowing the use of gas fired hot water systems in development approvals. This ensures full electrification of residential cooking, space heating and water heating systems. It captures the full benefits of electrification and avoids future transition costs.

Option 3 – implement controls for new non-residential development

We could further extend the electrification requirements to non-residential development, by introducing similar controls that disallow gas appliances and systems for cooking, space and water heating for these developments. This could provide certainty towards achieving the benefits of electrification given the uncertainty around implementation of other state planning controls and building regulations.

Option 4 – expand to major alterations and additions

In addition to new residential and non-residential developments, buildings undergoing major alterations or additions could also be required to be all-electric. The Sustainable Buildings SEPP thresholds for BASIX and non-residential development could be used to determine when a major alteration or addition would need to electrify. This would assist meeting overall emissions reductions targets with more buildings using grid renewables but may be more challenging for some buildings and delay otherwise beneficial upgrades.

Option 5 – providing flexibility in specific circumstances

There could be exceptions for certain types of non-residential development, such as industrial uses or food and drink premises or specialist manufacturing.

We could also include a provision to allow applicants to demonstrate that a gas connection is necessary for specific processes where electric alternatives or the use of bottled gas as a temporary solution is not feasible. In these circumstances, we could require electrical capacity and

space to be provided to enable future electrification, in line with the approach taken by the draft NCC 2025.

Option 6 – implementation timing

For new applications, the planning controls could come into effect as soon as they are adopted, or they could be delayed to give the market time to prepare and adapt. Requirements for some development types, such as food and drink premises, could be staged even later.

Consultation questions

The following questions prompt further discussion with our community and industry. The answers and feedback we receive will help to shape our way forward.

1. Do you agree with the benefits of all-electric buildings outlined in the paper, and do you see any other benefits? If not, what are the concerns?
2. Do you agree with the challenges to electrifying new development and are there any others that we haven't mentioned? How might these challenges be overcome?
3. How important do you think electrification of new development is to achieve our environmental targets?
4. Are there specific development types (residential, commercial, business, industries etc.) or gas end uses (domestic hot water, space heating, cooktops, ovens) that should be prioritised or deprioritised for electrification? Or are there any types of development that shouldn't be required to be all-electric? How can different approaches for development types be managed in mixed-use developments?
5. Which of the planning control options do you think should be implemented? Should any of these approaches be combined, excluded or modified and why?
6. If the controls apply to alterations and additions, what should the threshold be? For example, for new houses and residential flat buildings, the threshold could be a construction/refurbishment cost of $50,000, $100,000 or more. For refurbishments to existing non-residential developments and which affect building services, the threshold could be where the works affect at least 50 percent of the total volume of the building where there is no increase in the gross floor area. Alternatively, the threshold for both development types could be where there is a creation of new additional floor space. Could other planning controls or regulations be used to establish a threshold of 50% or another figure?
7. If the planning controls are implemented, should they come into effect right away? Or should the implementation of planning controls be phased in with warning? If so, how? Should there be a different approach to phasing across the range of development types?
8. Are there certain business types or industries that should be allowed to continue to connect to the fossil fuel gas network in new buildings? If so, why? For these business types or industries, should there be a requirement for the building to be electric ready for a future transition?
9. What would the impacts for builders and developers be if the planning controls came into force soon? For example, could it create challenges in sourcing and managing the necessary materials, electric appliances and systems, equipment, and labour needed to meet all-electric development requirements? Would there be greater space requirements if instantaneous gas heaters were phased out? Are alternatives cost neutral or cost effective?
10. What industry support is needed for all-electric new development? How would any suggested measures help?

Image on next page: Sydney Town Hall, CityTalks: Big Ideas transforming global cities.
Photo: Mark Metcalfe / City of Sydney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SYDNEY

References

[1] Climate Change Action Plan (CCAP) City Platform (Kinesis / City of Sydney).
[2] City of Sydney. (2023) Green Report 2022/23. Available at: https://www.cityofsydney.nsw.gov.au/research-reports/green-reports
[3] City of Sydney. (2023) Electrification of transport in the city strategy and action plan. Available at: https://www.cityofsydney.nsw.gov.au/strategies-action-plans/electrification-transport-strategy-action-plan
[4] Global Cooksafe Coalition. 'What we do'. Available at: https://cooksafecoalition.org/what-we-do/
[5] NSW Parliament (2023, September 27). 'Energy – Gas Substitution Roadmap'. Available at: https://www.parliament.nsw.gov.au/lc/papers/pages/qanda-tracking-details.aspx?pk=97328
[6] Department of Climate Change, Energy, the Environment and Water. (2024). 'NSW Consumer Energy Strategy'. Available at: https://www.energy.nsw.gov.au/nsw-plans-and-progress/government-strategies-and-frameworks/energy-strategy#strategy
[7] Waverley Council. (2024). 'Development Control Plan 2022'. Available at: https://www.waverley.nsw.gov.au/__data/assets/pdf_file/0016/231523/Waverley_DCP_2022_Full_Version.pdf
[8] City of Parramatta. (2021). 'Development Control Plans'. Available at: https://www.cityofparramatta.nsw.gov.au/sites/council/files/2023-12/PDCP-2023-Book-version_0.pdf
[9] Lane Cove Council. (2023). 'Electrify Your Council'. Available at: https://350.org.au/files/2023/12/Electrify-Your-Council-Council-Forum2-Slides-Lane-Cove.pdf
[10] ACT Government. (2021). 'Preventing new gas network connections'. Available at: https://www.climatechoices.act.gov.au/policy-programs/preventing-new-gas-network-connections#:~:text=The%20ACT%20Government%20has%20been,phase%20out%20fossil%20fuel%20gas
[11] Department of Planning, Victoria. (2024). 'Victoria's Gas Substitution Roadmap'. Available at: https://www.planning.vic.gov.au/guides-and-resources/strategies-and-initiatives/victorias-gas-substitution-roadmap
[12] City of New York Press Office. (2021, December). 'Mayor de Blasio Signs Landmark Bill to Ban Combustion of Fossil Fuels in New Buildings'. Available at: https://www.nyc.gov/office-of-the-mayor/news/852-21/mayor-de-blasio-signs-landmark-bill-ban-combustion-fossil-fuels-new-buildings
[13] Council of the District of Columbia. (2022, July) 'B24-0420 – Clean Energy DC Building Code Amendment Act of 2021'. Available at: https://lims.dccouncil.gov/Legislation/B24-0420
[14] ICDC., CSGC. CCI. (2023) 'Affordable Housing and Sustainable Communities Program'. Available at: https://sgc.ca.gov/grant-programs/ahsc/docs/20231214-AHSC_Round_8_Program_Guidelines.pdf
[15] Ministry of Housing, Communities and Local Government. (2019). 'The Future Homes Standard'. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/852605/Future_Homes_Standard_2019_Consultation.pdf
[16] Department of Climate Change, Energy, the Environment and Water. (2024). 'NSW Consumer Energy Strategy'. Available at: https://www.energy.nsw.gov.au/nsw-plans-and-progress/government-strategies-and-frameworks/energy-strategy#strategy
[17] Climate Council. (2021). 'Kicking the gas habit: How gas is harming our health'. Available at: https://www.climatecouncil.org.au/wp-content/uploads/2021/05/Kicking-the-Gas-Habit-How-Gas-is-Harming-our-Health.pdf
[18] Climate Council. (2021). 'Kicking the gas habit: How gas is harming our health'. Available at: https://www.climatecouncil.org.au/wp-content/uploads/2021/05/Kicking-the-Gas-Habit-How-Gas-is-Harming-our-Health.pdf

[19] Tianyuan Li, Matthew A. Shapiro, Mohammad Heidarinejad, Brent Stephens. (2024) 'Ten questions concerning building electrification'. Available at: https://www.sciencedirect.com/science/article/pii/S0360132324004955
[20] Climate Council. (2021). 'Kicking the gas habit: How gas is harming our health'. Available at: https://www.climatecouncil.org.au/wp-content/uploads/2021/05/Kicking-the-Gas-Habit-How-Gas-is-Harming-our-Health.pdf
[21] Strategy. Policy. Research. (2024) 'Electrifying new residential and commercial buildings in NSW – cost and emissions impact assessment'. Prepared for 350.org. Available at: https://350.org.au/files/2024/05/Electrifying-new-residential-and-commercial-buildings-in-NSW_Final.pdf
[22] Australian Energy Regulator. (2023). 'Review of gas distribution network reference tariff variation mechanism and declining block tariffs – Issues paper for stakeholder feedback'. Available at: https://www.aer.gov.au/system/files/Review%20of%20gas%20distribution%20network%20reference%20tariff%20variation%20mechanism%20and%20declining%20block%20tariffs.pdf
[23] Grattan Institute. (2023). 'Getting off gas: why, how, and who should pay?'. Available at: https://grattan.edu.au/wp-content/uploads/2023/06/Getting-off-gas-why-how-and-who-should-pay.pdf
[24] International Energy Agency. (2023, April). 'Australia 2023 Review'. Available at: https://www.iea.org/reports/australia-2023/executive-summary
[25] World Economic Forum. (2020). 'Tasmania is now powered entirely by renewable energy'. Available at: https://www.weforum.org/agenda/2020/12/tasmania-renewable-energy-sustainable-hydropower/
[26] Strategy. Policy. Research. (2024) 'Electrifying new residential and commercial buildings in NSW – cost and emissions impact assessment'. Prepared for 350.org. Available at: https://350.org.au/files/2024/05/Electrifying-new-residential-and-commercial-buildings-in-NSW_Final.pdf
[27] Australian Government. (2024). 'Future Gas Strategy'. Available at: https://www.industry.gov.au/sites/default/files/2024-05/future-gas-strategy.pdf
[28] Australian Government. (2024). 'Future Gas Strategy'. Available at: https://www.industry.gov.au/sites/default/files/2024-05/future-gas-strategy.pdf
[29] Australian Building Codes Board. (2024) 'National Construction Code 2025 Public Comment Draft'. Available at: https://consultation.abcb.gov.au/engagement/ncc-2025-public-comment-draft/
[30] Environmental Defenders Office. (2023) 'Further advice on Electrify your Council campaign'. Available at: https://350.org.au/files/2023/10/New-EDO-Legal-Advice_Gas-Bans-and-DCPs_Oct-2023.pdf
[31] Climate Change Action Plan (CCAP) City Platform (Kinesis / City of Sydney).
[32] Climate Change Action Plan (CCAP) City Platform (Kinesis / City of Sydney).
[33] International Energy Agency. (2023, April). 'Australia 2023 Review'. Available at: https://www.iea.org/reports/australia-2023/executive-summary
[34] Climate Change Action Plan (CCAP) City Platform (Kinesis / City of Sydney).
[35] ClimateWorks Australia. (2020) 'Decarbonisation Futures: Solutions, actions and benchmarks for a net zero emissions Australia.
[36] Australian Energy Market Operator. (2024) '2024 Electricity Statement of Opportunities'. Available at: https://aemo.com.au/-/media/files/electricity/nem/planning_and_forecasting/nem_esoo/2024/2024-electricity-statement-of-opportunities.pdf?la=en&hash=2B6B6AB803D0C5F626A90CF0D60F6374
[37] Grattan Institute. (2023). 'Getting off gas: why, how, and who should pay?'. Available at: https://grattan.edu.au/wp-content/uploads/2023/06/Getting-off-gas-why-how-and-who-should-pay.pdf
[38] Grattan Institute. (2023). 'Getting off gas: why, how, and who should pay?'. Available at: https://grattan.edu.au/wp-content/uploads/2023/06/Getting-off-gas-why-how-and-who-should-pay.pdf
[39] Global Cooksafe Coalition. (2023). 'The future of cooking is electric.' Available at: https://cooksafecoalition.org/wp-content/uploads/2022/11/23098-GCR-Cooksafe-Report-D11.pdf
[40] City of Sydney. (2024). Engagement Outcomes Report. Available at: Appendix 2