



ACT
Government

Regulating for the prevention of new fossil fuel gas network connections

Issues Paper
**Environment, Planning and
Sustainable Development Directorate**

2023



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1. Help develop the ACT's regulation to prevent new gas network connections

We want you to help us develop a regulation to prevent new gas network connections in the ACT.

The ACT is committed to taking real action on climate change and becoming a net-zero emissions city by 2045. Now that the ACT has secured a nation-leading 100% renewable electricity supply, we're turning our focus to reducing our remaining emissions sectors – namely fossil fuel gas and transport. Fossil fuel gas accounts for more than 20% of our emissions, making it the second largest source of emissions in the ACT, following transport emissions. That is why the ACT is preparing to electrify our city and transition away from the use of fossil fuel gas by 2045 at the latest.

We know that emissions from gas are harmful to the environment and to the health of ACT residents and that an all-electric Canberra will allow us to power our city, homes and businesses in a cheaper way. We also know that it is possible for the majority of Canberrans to fully meet their energy needs with electricity now.

The commitment to phase out fossil fuel gas means that we will need to prevent, where practical and feasible, all new sources of fossil fuel gas use well in advance of 2045. This will help us to minimise the transition task ahead of us, avoid future emissions and ensure that our electricity and gas network owners can effectively plan and ready our city for an all-electric future.

Aside from the public benefits of reduced greenhouse gas emissions, new fully electrified buildings have the advantage of:

- > **Lower long-term energy costs** – retail gas prices are expected to continue to rise as production turns to increasingly more expensive sources while average electricity prices are expected to fall as more renewables enter the grid. For many households, this can amount to savings on energy bills of hundreds or thousands of dollars each year.
- > **Lower health impacts** – we now know that emissions from fossil fuel gas have negative impacts on human health. Impact on air quality and exposure to damaging pollutants released by gas combustion can cause serious health issues including asthma in children.
- > **Avoiding longer-term conversion costs** – new buildings that are built fully electric will save owners money on electrifying building infrastructure and appliances in the future. In the case of new multi-unit dwellings, where additional space is required to support all-electric capacity, costs of transition are likely to be high and raise difficult implementation issues.

What is fossil fuel gas?

The National Gas Law (NGL) governs access to fossil fuel gas pipeline services and elements of the broader natural gas market in Australia. 'Natural gas' is a defined legal term¹ in the NGL. It is a fossil fuel, consisting predominately of methane and is non-renewable.

The ACT Government prefers the term 'fossil fuel gas' as it clearly identifies that we are discussing non-renewable gases. For the purposes of this paper, fossil fuel gas has the same meaning as 'natural gas' in the NGL, and refers only to gas delivered through, or connected to, the gas pipeline network.

¹ *National Gas Law [iii]*, section 2.

Approximately 80% of all new homes in the ACT are still connecting to fossil fuel gas and new network connections are ongoing for business and industrial uses. This contrasts with existing premises, which are generally seeing reductions in gas appliance use and increasing conversion to electric appliances.

Building owners and energy consumers do not have to pay for the global impacts of emissions from their gas use through their utility bills. Similarly, architects, builders and property developers — who often make the decision to install a gas connection — have limited incentive to consider the long-term additional costs of gas connections on tenants and owners. The result is that new gas connections are made in many circumstances where an all-electric build is a better choice for the environment and the future users of the building.

Whilst most new homes and businesses can meet their energy needs through electric

options, the ACT Government does recognise that there may be some circumstances where this is not currently feasible. For example, some industrial processes requiring high grade heat are challenging to electrify. In other cases, in commercial kitchens electric alternatives exist but are not always available through local supply chains. Understanding specific business and industry needs is a key objective of this consultation.

This Issues Paper is seeking views of the community, to better understand the impacts, implementation considerations and community views of potential approaches to prevent new fossil fuel gas connections in the ACT.

The feedback from this process will assist the Government to determine when new connections to the fossil fuel gas network should be prevented; and how prevention can be implemented while maximising the benefits for the ACT community.

How to provide feedback

Our community is part of the solution. Your suggestions and feedback will help us to develop a new regulation on preventing new gas network connections in the ACT. This project will impact the way our city infrastructure is designed and built to better support our communities and protect our environment.

The community can provide ideas and feedback in a number of ways including by submitting a written submission, completing an online survey, or providing feedback at one of our in person or online engagement activities.

To find out more and have your say, please contact us:



[visit yoursayconversations.act.gov.au/pathway-to-electrification](https://yoursayconversations.act.gov.au/pathway-to-electrification)



Email us at gastransition@act.gov.au

Community consultation will close on 20 April 2023.

Consultation questions

Identifying land or premises that are subject to the regulation (Chapter 6, Key Issue 1)

1. Would you want to see planning zones, as outlined in the Territory Plan, used as the primary means of identifying the areas where new gas connections would be prohibited? What would be the challenges with this approach?
2. Do you have other ideas for identifying land in the regulation that is flexible and responsive to the ACT growing and changing? What would be the costs or benefits of this alternative approach?

What types of land, areas, or premises should be included in the initial regulation? (Chapter 6, Key Issue 2)

3. The ACT Government has a current preference to include residential and commercial properties in the initial regulation. Are there other impacts that need to be considered if the regulation was applied to these, or any other land use types?
4. Are there specific land use types, areas or premises in the Territory you would expect to see excluded from the initial regulation (for example particular district shopping areas, or low-density developments)? If so, why? Should this exclusion be for 1, 3 or 5 years?
5. Are there any activities within the Territory that must use a new connection to the fossil fuel gas network? Are there any electric, or zero emission, alternatives to these now? If yes, what is preventing their adoption? If not, do you think this will change in the next 3-5 years?
6. Should any other areas be included in the regulation and if so, what would be the benefit of including these other zones or areas?

Application of the regulation to greenfield and infill developments (Chapter 6, Key Issue 3)

7. Do you have a view about whether the regulation should apply the same way to new developments (in new greenfield suburbs) and in-fill developments, for example knock-down re-builds or renovations where the gas connection is abolished?
8. What are the costs, benefits and impacts of prohibiting new gas connections in all infill developments, including knock-down, re-builds or renovations where the gas connection is typically temporarily abolished to allow for construction to occur, in the same way as it's applied to greenfield development?

Exemptions to the regulation (Chapter 6, Key Issue 4)

9. Are there certain business types or industries that should be allowed to continue to get new gas connections (e.g be exempt from the initial regulation)? If so, why? Should the exemption apply for 1,3 or 5 years? What would be the impacts if they were not exempt?
10. What type of matters should be considered when developing a process for exemptions to the regulation?
11. Given the impact on emissions and energy network planning, it is the ACT Government's preferred position that the number of exemptions are limited and are for circumstances where alternatives are not feasible. How stringent should the exemptions process or exemptions test be?
12. Who should pay for a regulatory process or assessment to get an exemption?
13. Do connections to the smaller secondary, high-pressure, pipeline offer a viable alternative (economically/financially and technically/logistically) for gas reliant businesses and trades?

Reporting (Chapter 6, Key Issue 5)

14. What sort of information should the gas network operator be required to provide to the ACT Government about fossil fuel gas connections or supply?
15. What information should the gas network operator be required to provide to existing and/or potential customers?

Commencement date (Chapter 6, Key Issue 6)

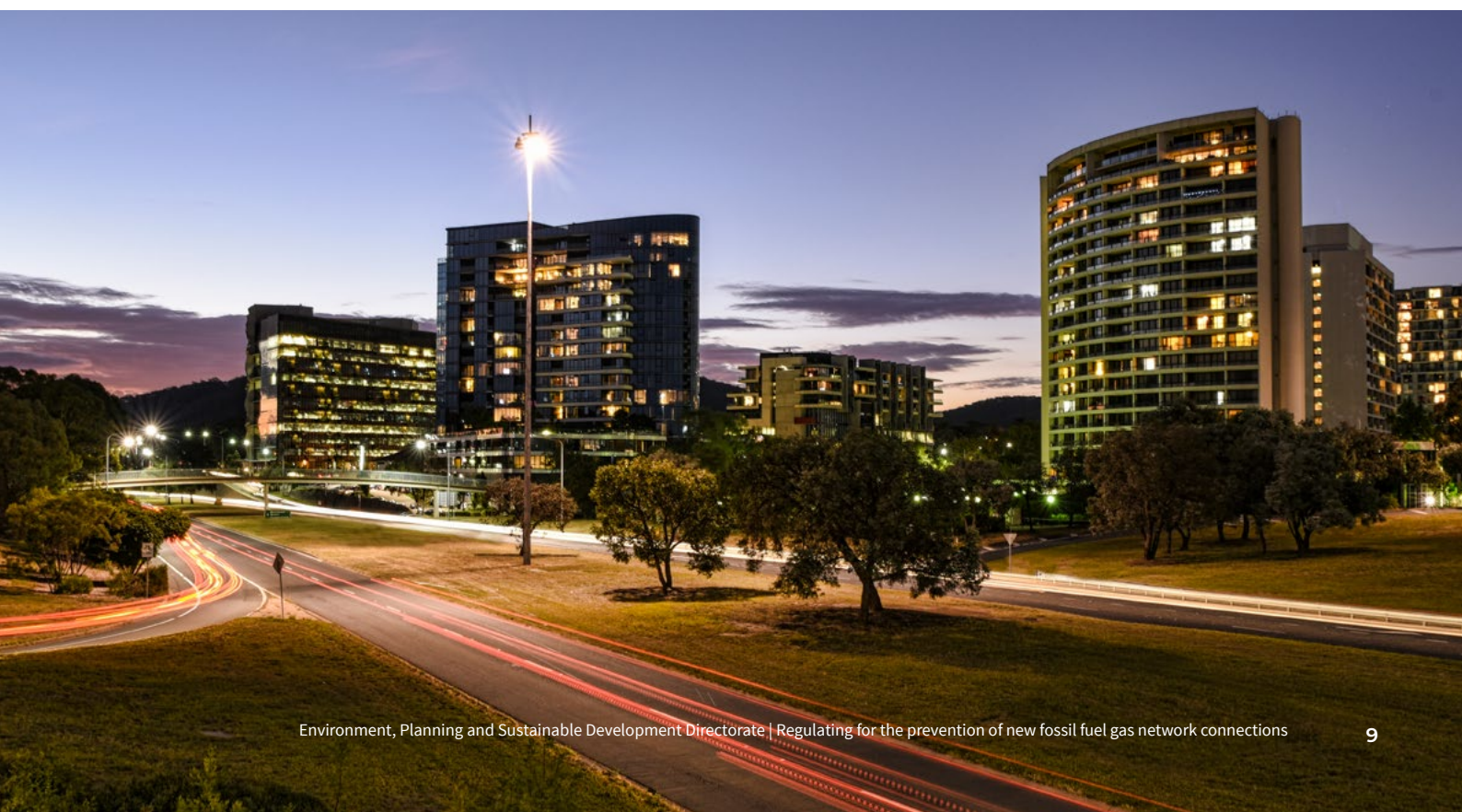
16. What would be the impacts for builders and developers if a regulation commenced in November 2023? For example, could there be issues for their utility and supply chain planning?
17. Do you think any prohibitions on connections should be phased depending on the type of building or development it is? For example, should a prohibition on residential areas apply to all types of residential buildings from the date of commencement, or should it commence with high-density in year 1, medium density year 2 etc. What types of building development do you think should have a phased or staged introduction and why?
18. Are you concerned about impacts on development costs and economic activity if a regulation commenced in November 2023? If so, how do you think those impacts could be managed?

Transitional matters and other considerations (Chapter 6, Key Issue 7)

19. Do you think developments with existing approvals should be provided with a choice, or encouraged, to change an existing approval from gas to electric? You might want to think about:
 - when this process should be triggered, i.e. once approval has been given but prior to construction commencing or completion?
 - any cost impacts of resubmitting development applications so the development is all-electric?
20. Other than building and development approvals, are there other transitional matters that the ACT Government should consider in developing the regulation?
21. What workforce skills and industry capabilities are required to support a regulated requirement that new developments be built all-electric?
22. Are you concerned that the proposed regulation may impact on your individual rights? If so, please tell us how you think it might impact on your rights?

Future work: The Integrated Energy Plan (Chapter 7)

23. Are there any actions, regulatory interventions or levers you would like to see prioritised in the ACT Government's development of the first Integrated Energy Plan?



1.1 Scope of this consultation

The ACT Government is seeking the views of the community to better understand the potential options and impacts of preventing new fossil fuel gas network connections in the ACT.

The feedback from this process will assist the Government to determine when new connections to the fossil fuel gas network should be prevented, and how prevention can be implemented while maximising the benefits for the ACT community.

Out of scope

This consultation is focused on exploring when new connections to the fossil fuel gas network should be prohibited. Gas connections which fall outside the scope of this consultation will not be affected by the regulation developed following the conclusion of this consultation. Examples of gas connections that fall outside the scope include existing connections, connections to a 100% renewable gas network, and gas appliance connections that are not connected to the gas network (for example plumbed LPG connections).

Emissions from existing gas connections

The impact of, and emissions associated with existing fossil fuel gas connections in the ACT are not the focus of this consultation. The ACT Government provides education programs, advice and support to assist consumers with existing fossil fuel gas connections to reduce their gas consumption and make their homes and businesses more energy efficient. This will be the focus of the forthcoming Integrated Energy Plan, which will be released by early 2024.

Policies and programs will continue to be developed to lower emissions from existing fossil fuel gas connections and help consumers transition away from fossil fuel gas use by 2045.

Green gas, renewable gas and hydrogen gas

Exploring options of introducing ‘green gas’ or ‘hydrogen gas’ (renewable gas) in the ACT is not the focus of this consultation. This consultation is focused on how to prevent new connections to the existing fossil fuel gas network. The outcome of this consultation will not prevent the ACT from using renewable forms of gas in the future if that technology emerges as a reliable and cost-effective energy option for the Territory.

Despite plans to regulate hydrogen blends and other renewable gases under the National Gas Law and Regulations, there are significant challenges that must be overcome before 100% renewable gases can be used in the ACT. These challenges are likely to include the need for significant community investment in new gas appliances, large scale renewable gas production facilities and electricity infrastructure.² Whilst we will continue to monitor and evaluate the research and economics of green gas, the ACT Government does not currently view green gas as a viable widescale option to support the Territory’s emissions reduction targets.

Transport emissions

Transport emissions in the ACT are not the focus of this consultation. The ACT Government is committed to reducing transport emissions and the [ACT Zero Emissions Vehicle Strategy 2022-2030](#) is addressing transport emissions through policy initiatives and zero emissions vehicle uptake targets. The ACT Government currently provides zero interest loans, free stamp duty and vehicle registration for 2 years on eligible electric vehicles. Through the [ACT Transport Strategy 2020](#) and the [Zero-emission Transition Plan for Transport Canberra](#), the ACT Government has committed to procuring a zero emissions public transport fleet, which includes the purchase of battery electric buses.

² See discussion about this issue in GPA Engineering (11 January 2023) ‘[Hydrogen Impacts on Downstream Installations and Appliances: COAG Energy Council Technical Review](#)’, South Australian Government, accessed 31 January 2023.



2. The ACT's commitment to climate action

2.1 The ACT's policy framework

Zero emissions target

The ACT continues to lead the world in taking action on climate change and has some of the most ambitious emissions reduction targets in the world. The ACT is committed to achieving net zero emissions by 2045 (based on 1990 levels). We'll get there progressively. We aim to reduce emissions by:

- > 40% by 2020 (this target has been met)
- > 50 to 60% by 2025
- > 65 to 75% by 2030 and
- > 90 to 95% by 2040.

The targets, which cover all emissions in the ACT including from residences, transport, business and Government, are legislated under the [Climate Change and Greenhouse Gas Reduction Act 2010](#). This Act was independently reviewed in 2021.

Paris Agreement

The ACT's steps towards reducing emissions will in turn assist Australia to meet its nationally determined contributions to the Paris Agreement on Climate Change, which aim to limit the increase in the global average temperature to well below 2 °C above pre-industrial levels. According to the Intergovernmental Panel on Climate Change (IPCC), global warming of more than 2 °C would have serious global consequences, such as an increase in the number of extreme weather events.

Our pathway to electrification

In 2020, the Government reinforced its focus and attention on reducing emissions from fossil fuel gas by including a range of commitments in the [Parliamentary and Governing Agreement for the 10th Legislative Assembly for the Australian Capital Territory](#) (Parliamentary and Governing Agreement), including legislating to prevent new fossil fuel gas network connections in greenfield residential developments in the ACT and to commence a project to advance all-electric infill developments, with a goal of no new gas connections to future infill developments from 2023.

On 4 August 2022, the ACT Government released its position paper [Our Pathway to Electrification](#). This paper outlines that the pathway to reaching net zero emissions from fossil fuel gas by 2045 will be driven through electrification. Over the next 22 years the ACT will transition away from fossil fuel gas to renewable electricity, allowing for some capacity for renewable gases for specific purposes if required.

The ACT Government has also committed to supporting energy grid stability and providing support to vulnerable households for the switch to renewable electricity.

ACT Climate Change Strategy 2019-2025

In 2019 the ACT Government released the [ACT Climate Change Strategy 2019-2025](#) (Climate Change Strategy). The Climate Change Strategy outlines the next steps to reducing emissions in the ACT and increasing resilience to the impacts of climate change. This strategy includes actions to reduce emissions from fossil fuel gas, including developing a plan by 2024 to achieve zero emissions from gas use by 2045.

Key actions contained within the Climate Change Strategy include:

- > **Action 4.03:** Amend planning regulations to remove the mandating of reticulated gas in new suburbs.
- > **Action 4.05:** Develop a plan for achieving zero emissions from gas use by 2045, including setting timelines with appropriate transition periods for phasing out new and existing gas connections.

CBR Switched On – ACT'S Economic Development Priorities 2022-2025

[CBR Switched On – ACT's Economic Development Priorities 2022-2025](#) outlines the ACT Government's priorities broadly across the economy. The priorities are described through three missions:

- > **Mission 1:** A city that gives you back time.
- > **Mission 2:** Towards a net zero city and beyond.
- > **Mission 3:** Knowledge based economic growth.

Mission 2 outlines an ambition for the electrification of the ACT's economy, which includes phasing out fossil fuel gas. By meeting our targets and building on our status as an early mover on climate action, we can attract new talent, ideas and investment to Canberra.

2021-25 Suburban Land Agency Sustainability Strategy

The Suburban Land Agency [Sustainability Strategy 2021-2025](#) (the Sustainability Strategy) is designed to help Canberra become a sustainable city, while at the same time meeting the ACT's growing housing needs. It provides a strategic framework for planning, decision-making and actions that will improve the environmental sustainability of Suburban Land Agency projects. The Sustainability Strategy centres on four key themes, one of which is 'Zero Emissions Suburbs'. A priority of this theme is 'All-electric Homes and Precincts' and further specifies:

- > establishment of net zero emissions targets for new suburbs
- > development of all-electric estates and precincts
- > support for community and industry to build all-electric homes and buildings
- > development of the Molonglo Group Centre as an all-electric commercial centre with no new connections to gas network, in partnership with expert stakeholders.

2.2 The authorising law

Climate Change and Greenhouse Gas Reduction Act 2010 (ACT)

The *Climate Change and Greenhouse Gas Reduction Act 2010* (the CCGGR Act) supports the development of policies and actions to address climate change, sets targets to reduce greenhouse gas emissions and outlines monitoring and reporting obligations.

The principal target of the CCGGR Act is to reduce greenhouse gas emissions in the ACT to achieve net zero emissions by 30 June 2045.

Amendments to the CCGGR Act were presented to the legislative assembly on 4 August 2022, as introduced by the [Climate Change and Greenhouse Gas Reduction \(Natural Gas Transition\) Amendment Bill 2022](#) (the Bill). The proposed amendments to the CCGGR Act will allow the Minister for Water, Energy and Emissions Reduction (the Minister) to make a regulation to prohibit new gas network connections for fossil fuel gas in prescribed circumstances. The Bill is an important step for the Territory to achieve its legislated net zero emissions target.

The proposed amendments have not yet been passed by the legislative assembly and debate on the Bill is expected in the middle of 2023.

Key features of the regulation-making power contained in the Bill include:

- > **Section 13A(1)** will limit gas distributors from providing new connections for natural gas in certain areas or premises, as prescribed by a regulation. This power is limited to regulations for new gas connections and would not impinge on connections for a future 100% renewable gas network if it became available.
- > **Section 13A(2)** provides that the chief planning executive's advice must be sought and considered before making a regulation. This is to ensure that any planning implications are considered and integrated prior to making a regulation.
- > **Section 13A(3)** specifies that compliance with Part 2A of the Bill, including section 13A(1) is a condition of a gas distributor's licence. This provides scope for monitoring and enforcement by the Independent Competition and Regulatory Commission through the Utilities Act 2000 and the utility licence annual reporting process.
- > **Section 13B(1)** creates a mechanism to modify the national energy laws, but only to the extent that those laws need to be modified to give effect to section 13A, in particular to prevent new connections for natural gas in prescribed circumstances.
- > **Section 13B(3)** allows the regulation to require that a gas distributor provide certain information to the Territory and to existing or potential customers.

The Bill also inserts an additional Object to the CCGGR Act under the new section 5(aa). This object is to implement measures to meet the targets set under the Act, confirming the Government's commitment to take legislative steps to ensure the Territory can achieve net zero emissions by 2045.

2.3 What is happening in other jurisdictions?

The ACT is proud to be a world leader in climate action. Taking steps to regulate new gas connections with the goal of phasing out fossil fuel gas use and transitioning to electrification is a new area of climate change and public health action, with only a small number of other cities and jurisdictions beginning to take legislative steps in this direction. The phasing out of the use of fossil fuel gas in the Territory is in line with broader national and global trends and by being at the forefront of this approach the ACT will be best placed to succeed and maintain a leadership role in the new national and international energy market.

Australia

The Australian Government has foreshadowed a meaningful and substantial package will be made available in the May 2023 budget to assist Australian households and businesses transition to electrification and commenced consultation on a National Strategy to improve energy performance in November 2022.³ While substantive policy in this area is yet to emerge at a federal level, electrification will play a key role in the energy transition and in support of the Australian Government's legislative target of reaching net zero emissions by 2050.

Victoria

In July 2022, Victoria released the [Gas Substitution Roadmap](#). Victoria's Roadmap has a strong focus on electrification of fossil fuel gas use and energy efficiency improvements. Victoria has a significant industrial sector that relies on fossil fuel gas as a feedstock and ensuring that fossil fuel gas resources are directed towards those businesses who cannot electrify is a key theme.

On 4 August 2022, Victoria gazetted [Gas Connection Amendment VC221](#) (Amendment VC221), which is intended to facilitate all-electric developments to support implementation of Victoria's Climate Change Strategy 2021 and Victoria's Roadmap. Amendment VC221 removed the mandatory requirement for new developments to be connected to natural gas. Prior to Amendment VC221, local councils were also obliged to follow the advice of the gas supply authority. Now only subdivisions which are proposed to be connected to natural gas are referred to the local gas authority.⁴

The ACT removed the mandatory requirement for gas infrastructure to be included in new developments in 2020.

International

In international markets, two approaches are emerging as first steps in reducing emissions and health impacts from fossil fuel gas: these are, prevention of new connections and appliance specific prohibitions.

Prevention of new gas connections

Beginning in 2019 with the city of Berkeley, municipalities in California, USA, have passed ordinances to prevent new developments from connecting to natural gas or using gas appliances.⁵ Major cities within California and across the United States, including Los Angeles, New York, Chicago and Seattle have enacted, or are in the process of enacting, similar policies. In Boston, the city council recently voted to sign up for a pilot program banning fossil fuels from most new construction except labs and hospitals.⁶

3 Australian Government (10 November 2022) [National Energy Performance Strategy: Consultation Paper](#), accessed 30 January 2023.

4 Victorian Government (2022) [VC221 Explanatory report Approval Gazetted](#), accessed 30 January 2023. See also 'View more details and documents' on the Victorian Government, Department of Transport and Planning webpage '[Amendment VC221, Browse amendments](#)'.

5 Municipal Code (US) [Ch 12.80](#).

6 Wintersmith S (14 September 2022) '[Boston moves to ban fossil fuels in new construction](#)', GBH News, accessed 30 January 2023.



In New York State, legislation is being considered by the State legislature which would prohibit fossil fuel use, including fossil fuel gas, in new buildings less than seven stories by the end of 2023 and from mid-2027 for buildings seven stories or more.⁷

In 2021, California changed the state building code to strongly encourage new buildings to not connect to natural gas and in 2022, the State's utility board ended subsidies for gas line extensions to new buildings. Previously, customers were not charged the full cost of extending a gas line to their new building. One of California's utility commissioners described the elimination of those subsidies, as the removal of a "perverse" financial incentive to expand the gas system rather than building new homes and commercial facilities completely electric.⁸

In August 2022, the city Victoria in the province of British Columbia, Canada announced that new construction will be required to be zero emissions by 2025, with new building codes to be developed preventing the use of fossil fuel in buildings.⁹ By 2030, the city of Vancouver also in the province of British Columbia, Canada plans for all new buildings to be zero emissions, with the exception of restaurants being allowed to continue to cook with natural gas.

7 Senate Bill [S6843C](#) 2021 (US).

8 Clifford Rechtschaffen, California Public Utilities Commission (CPUC) Commissioner quoted in Symon E (16 September 2022) '[CPUC Passes New Policy Ending All New Gasline Subsidies in Favour of All-Electric Homes](#)', California Globe, accessed 31 January 2023.

9 Vancouver Sun (9 August 2022) '[By 2025, new Victoria buildings can't use natural gas or other fossil fuels, council decides](#)', accessed 31 January 2023.

Prohibitions on gas powered appliances

From 2022, in the city of Vancouver equipment for space heating and hot water appliances in new low-rise residential buildings must be zero emissions and by 2025, all new and replacement heating and hot water systems must be zero emissions. From the end of 2023, in the province of Quebec, Canada it will be illegal to replace furnaces with any heating system powered by fossil fuels.¹⁰

In 2022, the state of California banned the sale of natural gas-powered space heating and hot water appliances by 2030. From 2030, residential properties in California seeking to replace such appliances will only be able to purchase zero emission appliances.¹¹

According to EDF Energy, a British integrated energy company, 78% of the fuel used to heat buildings in the United Kingdom comes from fossil fuel gas.¹² From 2025, the government of the United Kingdom has committed to banning gas boilers in newly built residential homes with the goal that all new buildings are net zero from 2025. The United Kingdom is also aiming to phase out the installation of all gas boilers beyond 2035.¹³

The Netherlands is the only country in Europe with proportionally more homes reliant on gas for heating than the United Kingdom. The Dutch Central Bureau of Statistics records that 92% of households rely on gas for heating. Since 2018, all new residential homes were banned from connecting to the gas grid and by 2050 all buildings in the Netherlands must use a low-carbon alternative fuel source.¹⁴

The European Commission, the Executive of the European Union (EU), is considering steps to phase out the use fossil fuel boilers. Within the EU, a small number of countries have banned the use of oil heaters and gas boilers in certain circumstances such as a de facto ban in place in France to prohibit the installation of gas boilers in new buildings.¹⁵

In January 2023, the United States Consumer Product Safety Commission advised that they were considering options for regulating the installation of new gas stoves across the US, citing public health concerns. The Commission is currently researching emissions from the appliances and looking for ways to reduce related indoor air-quality hazards.¹⁶ This may include requirements for ventilation when installing gas stoves.

10 Chung, N (2 February 2022) [‘Why oil and gas heating bans for new homes are a growing trend’](#), CBC News, accessed 31 January 2023.

11 Alund N (24 September 2022) [‘California’s pioneering climate change plans to nix gas heater sales by 2030’](#), USA Today, accessed 31 January 2023.

12 EDF Energy (n.d.) [UK Gas Boiler Ban – Everything You Need to Know](#), EDF Energy website, accessed 31 January 2022.

13 Secretary of State for Business, Energy and Industrial Strategy (October 2021) [‘Heat and Buildings Strategy’](#), United Kingdom Government.

14 Cole L (27 October 2021), [‘How the Netherlands is turning its back on natural gas’](#), BBC Online, accessed 31 January 2023.

15 Marcacci S (15 November 2020) [‘The World’s Three Largest Economies Go All-In on Heat Pumps: How Policy Can Cut Gas Use and Energy Bills’](#), Forbes, accessed 31 January 2023.

16 Natter, A (12 January 2023) [‘No ban of gas stoves is planned, Head of US Safety Agency says’](#), Bloomberg (Online), accessed 30 January 2023.



3. The ACT's gas network today

3.1 Fossil fuel gas use in the ACT

Fossil fuel gas use accounts for about 23%¹⁷ of our current emissions and finding a way to reduce those emissions is a complex challenge. While our renewable electricity supply has been secured largely through direct government action of contracting with renewable energy generators, reducing emissions from fossil fuel gas use will be something the entire ACT community needs to work towards together over the coming decades.

In 2020 the Territory Plan, a statutory document that guides planning and development in the ACT, was amended to remove the mandatory requirement to install gas infrastructure in new suburbs. However, despite changes in the Territory Plan, improvements in energy efficiency for new builds, education campaigns, upgrades to government properties, and direct incentives for customers to switch from fossil fuel gas to electricity, emissions from fossil fuel gas use in the ACT have not declined.

Natural gas combustion emissions and fugitive emissions (kilotonnes)

Units ktCO ₂ -e	2017-18	2018-19	2019-20	2020-21	2021-22
Combustion emissions	372	368	366	369	371
Fugitive emissions¹⁸	34	33	46	50	53

Source: ACT Greenhouse gas inventory report 2021-22

On average, about 7.45 petajoules of fossil fuel gas is distributed through the Territory each year.¹⁹

Key statistics: ACT fossil fuel gas demand and mains connections

CO₂-e scope 1 emissions	371 kilotonnes per annum
Total connections	138,761
New connections	2970 per annum (2% increase per year)
Average consumption per connection²⁰	
Residential	26 GJ
Small-medium business (100GJ-1TJ)	184 GJ
Large customer (1-10 TJ)	2600 GJ
Contract customers (>10TJ)	28,600 GJ

A key trait of the ACT market is the seasonality of demand, where most of the consumption occurs in the winter months. This is because the ACT's primary use of fossil fuel gas is for space heating.

¹⁷ Point Advisory (18 November 2022) [ACT Greenhouse gas inventory for 2021-22](#), Environment, Planning and Sustainable Development Directorate, ACT Government.

¹⁸ Fugitive emissions are losses, leaks, and other releases of gas to the atmosphere that are associated with industries producing, transmitting and distributing fossil fuels.

¹⁹ Average sourced from ACT Energy Industry annual levy determinations for the years 2017 to 2021, as determined pursuant to section 54H of the Utilities Act 2000 (ACT). A 3-year average has been used to account for yearly weather fluctuations.

²⁰ Average connection consumption data provided by Evoenergy. Evoenergy does not specifically identify business and residential customers in its system. It is assumed that all small customers (<100 GJ/year) are residential. It is acknowledged that this classification may include some small business customers. **Note:** The ACT Government has assumed the large customer average consumption at 1TJ, as Evoenergy was not able to verify the consumption figure prior to publication. It is likely the average consumption is closer to 5TJ.

Winter consumption is on average around five to six times more than summer consumption.²¹

The consideration of phasing out of new fossil fuel gas connections is one strategy on our journey to achieve emissions reductions from fossil fuel gas. Phasing out new fossil fuel gas

connections will mean that the number of properties that will need to transition away from fossil fuel gas in the future is constrained, reducing transition costs, and avoiding new emissions sources.

3.2 Who uses gas in the ACT?

The ACT is predominately a residential market

According to Evoenergy, the Territory's gas distributor, there are approximately 139,000 fossil fuel gas mains connections in the ACT. A connection in this paper refers to individual

gas meters (signifying a customer) within the Territory, not individual gas network connections. For example, an apartment block may have several gas meters (and customers) for a centralised gas hot water system, but only one physical connection to the gas network.

Understanding different customer types

Classification of customers is not always consistent across gas businesses, industry or regulators. In this document we use the following terms:

Residential customer – this is a customer who uses less than 100 GJ per year.

Small business – this is a customer who uses between 100 GJ – 1 TJ a year.

Large commercial – this is a customer who uses more than 1TJ a year

Contract customer – this is a customer with an industrial sized (large) connection who is directly connected to the high-pressure 'secondary' gas network. These customers use over 10 terajoules of gas a year.

Evoenergy's systems do not specifically identify if connections belong to a residential customer or a business customer, instead customers are classified based upon annual consumption. To identify the most accurate proportion of gas users within the Territory to customer classes (residential, small business and large customer), we have used the Australian Energy Regulator's (AER) retail performance report²². As of June 2022, fossil fuel gas users in the ACT were comprised as follows:

- > 97.2% residential
- > 2.8% small business
- > 0.1% large commercial
- > 'Contract customers' are not categorised in the AER's retail performance report. There are 43 contract customer connections in the ACT (see further information below).

21 GHD Advisory (26 April 2022) [Economic and Technical Modelling of the ACT Electricity Network: Base Case Report](#), Environment, Planning, Sustainable Development Directorate, ACT Government: 29.

22 Evoenergy's figures note 94% small tariff, 4% medium tariff and 1.5% large tariff. Both the small and medium tariff could include both residential and business customers.

Residential customers account for 51% of the annual gas demand each year in the ACT. Small business and large commercial uses 30%, and contract customers use 19%.

There are a range of commercial business gas users across the ACT. They are generally located in commercial centres, including district and local shopping areas. A small business customer will use an average of 184 GJ of gas per year, an average large commercial customer will use 2.6 TJ per year.

A contract customer is a very large gas user (>10 TJ per annum), who is usually connected to the network's high-pressure gas mains. These customers have a different connection type,

and the AER and other jurisdictions often refer to these as 'Industrial connections'. Contract customers are the largest consumers of gas in the ACT, each using an average of 28.5 terajoules of fossil fuel gas per year. In the Territory most of these users are government, scientific research, medical, community facilities (pools and cultural institutions) and hotels.

Unlike Victoria and New South Wales, there is a limited industrial base in the ACT. This means that there are limited manufacturing and industrial process users in the Territory. While there are not many industrial sized connections (contract customers) these customers use almost 20% of the ACT's total fossil fuel gas each year.

Customer type	Share of the ACT's Annual gas demand
Contract (>10TJ pa)	19%
Commercial (1-10TJ pa)	14%
Small business (100GJ - 1TJ pa)	16%
Residential (<100GJ pa)	51%

3.3 What is gas used for in the ACT?

Residential, small business and commercial users

For residential and most commercial customers, fossil fuel gas is used primarily for:

- > space heating,
- > water heating, and
- > cooking.

Space heating accounts for approximately 75% of residential and commercial fossil fuel gas demand in the ACT.²³ Some small businesses, such as hairdressers and beauty salons, use high volumes of hot water in servicing their customers and often use fossil fuel gas to heat this water. Similarly, many restaurants use gas as their primary source of energy for cooking.

Specialised commercial, trades, manufacturing, and health services

Some business customers use fossil fuel gas for processes that require heat, such as laundromats, food production, coffee roasters, medical sterilisation, manufacturing, glass and steelworks, and automotive bodyworks.

Many pools and health facilities also use fossil fuel gas to heat high volumes of water.

23 GHD Advisory (26 April 2022) [*Economic and Technical Modelling of the ACT Electricity Network: Base Case Report*](#), Environment, Planning, Sustainable Development Directorate, ACT Government: 32-33.

Contract customers

These customers are connected to the high-pressure gas network and use very large quantities of gas each year. These customers have a larger connection, often termed an 'industrial connection'. Industrial sized connections are used by a range of industries, including construction (for asphalt production), scientific research, food production, and public swimming pools. Contract customers may also use fossil fuel gas for backup electricity generation

Gas may be used for processes that require high heat such as sterilisation. Many contract customers may also be using gas for heating buildings, including cultural facilities such as museums and galleries that use gas for climate control to protect artworks and artefacts.



3.4 Gas industry workers in the ACT

Gas fitters and appliance workers

There are approximately 1,650 gas fitting and gas appliance worker licences in the ACT.²⁴ A licence could include a business that may have more than 1 gas fitter operating within it. Gas fitting forms a part of the plumbing trade. To become a gas fitter, a person must undertake a Certificate III in plumbing. While there are some specialised commercial gas fitters, almost all of Canberra's licensed gas fitters maintain a trade license in plumbing or drainage. About 60% of licenced gas fitters are under 40, meaning that they are likely to still be working in 2045 when the fossil fuel gas transition must be complete.

Gas fitters provide a range of services, including the installation of new appliances and new gas pipework within a property with a new connection, as well as gas appliance maintenance, upgrades and replacements in properties with existing connections.

Given the number of new gas connections each year (~3,000), for business viability it is assumed that most licensed gas-fitting work is likely to relate to appliance replacement, maintenance, and upgrades, rather than new connections specifically. Access Canberra Constructions Occupations works permit records indicate that many gas-fitters are also undertaking plumbing and drainage work. Despite this, there will be licensed gas-fitters whose work is largely linked to new construction and new gas connections.

Gas network and pipeline workers (Evoenergy gas distribution)

Evoenergy owns the gas distribution and transmission network within the ACT. Jemena manages the gas network on Evoenergy's behalf, with the local workforce provided by Zinfra. Zinfra employs approximately 55 staff and subcontractors to carry out field work on the ACT gas network. Evoenergy have advised that 16.15 full time equivalent staff work on new gas connections for Zinfra. Many staff work across both new and existing connections and provide maintenance and replacement services.

Energy retailers

There are currently five energy retailers that sell fossil fuel gas in the ACT. All five retailers also sell electricity in the ACT, and the majority have their head offices based outside of the ACT.

Energy retail businesses do not provide connection services. A retailer may encourage and market gas related products to potential new future customers or building and construction industry stakeholders.

The ACT Government does not currently have any statistics or data from energy retailers about how many employees they have within the ACT who work directly on retailing gas or seeking new gas connection customers.

Retail businesses that supply gas appliances

The ACT Government does not have current figures of the number of businesses or employees that are involved in retailing gas mains connected appliances within the ACT. General observations of retail stores that sell heating, hot water or cooking appliances within the ACT is that they offer a wide range of products, suitable for various energy sources, including:

- > Electric
- > 'Natural gas'
- > LPG
- > Wood
- > Ethanol.

Whilst the ACT Government acknowledges that regulations will impact sales of fossil fuel gas network appliances within the Territory, it is expected that these businesses will be able to offer sales of alternative appliances to meet the market demand.

24 Data from ACT Government's construction occupations licensing records.



4. The challenge we are trying to address

New homes and most new businesses can meet their energy needs today with energy efficient electric appliances, that are not only better for the environment but are also cheaper to run and, when cooking, are better for our health.

However, despite the construction of several successful gas free suburbs and development areas within the ACT, incentives to build all-electric homes, public education, and public messaging regarding the benefits of electric homes, approximately 80% of all new homes in the ACT are still connecting to fossil fuel gas and new network connections are ongoing for business and industrial uses. This contrasts with existing homes and businesses, which are generally seeing reductions in gas appliance use and increasingly rapid conversion to electric appliances.

Property developers, architects and builders — who often make the decision to install a gas connection in a new building — have limited incentives to consider the long-term additional costs of a gas connection on tenants and owners. The result is that new gas connections are made in many circumstances where an all-electric build is a better choice for the environment and will yield long term savings for future users of the building.

Similarly, a property purchaser may be deterred from purchasing an all-electric building, given the potentially higher upfront costs, as they are not able to factor in the long-term savings from lower energy bills and the additional costs that will be incurred to retrofit the property with electrical appliances in the future. The adverse environmental and health impacts of fossil fuel gas use may also not factor into a purchaser's decision, due to a general lack of awareness about these issues.

We know that by allowing new fossil fuel gas connections to continue, we create a larger transition problem that will need to be funded by building owners and energy users in the future. The longer we delay, the higher the transition costs will be.

By regulating new gas connections, we can assist the electricity and gas network owner to plan and manage both networks in the most cost-effective way to meet the needs of Canberra. Similarly, a regulation will help builders, developers, gas fitters, electricians, gas component suppliers, gas consumers and government plan for the ACT's electrification.

4.1 New fossil fuel gas network connections conflict with the Territory's legislated net zero emissions target

Every new connection that uses fossil fuel gas is a new source of emissions that will need to be transitioned in the future to meet the Territory's legislated net zero target.

The primary component of fossil fuel gas is methane which is a potent greenhouse gas. Methane is the second most potent greenhouse gas after carbon dioxide and is a significant contributor to global warming.

What is a new network connection?

A new network connection in this paper refers to the number of new gas meters installed over the reported period. This has been approximated to mean the number of new gas customers.

A new connection in this paper may not necessarily refer to the physical connection to the network. For example, a high-rise apartment may have 1 physical connection to the gas network but could have 200 individual gas hot water meters (and associated customers) within the building.

Connection figures in this paper have primarily been sourced directly from Evoenergy. The paper notes circumstances where alternate data has been sourced.

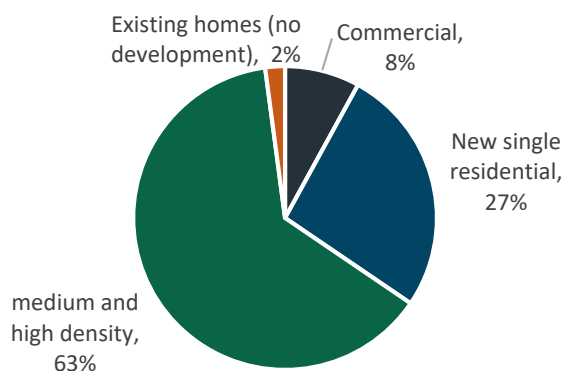
How many new fossil fuel gas connections are there each year?

According to AER, the number of customers on Evoenergy's gas network has been steadily growing by 2% per annum for the past 5 years.²⁵

Over the period 2019-2021, Evoenergy reported a total of 8910 new connections. This is an average of almost 3,000 new connections per year. These figures provided by Evoenergy do not include new commercial customers in buildings where gas is already connected, for example when a new tenant requests a new connection in a retail building. It is estimated that an additional 215 new connections per annum are made for commercial customers. To understand new commercial customer connections data, we have used the AER's retail performance statistics. More information on commercial customers is detailed below.

While new connections do occur in existing homes and existing commercial properties, most new connections are associated with new buildings. About 63% of all new connections are associated with new medium and high-density developments and 27% associated with new single residential properties.

Source of new connections



Commercial connections

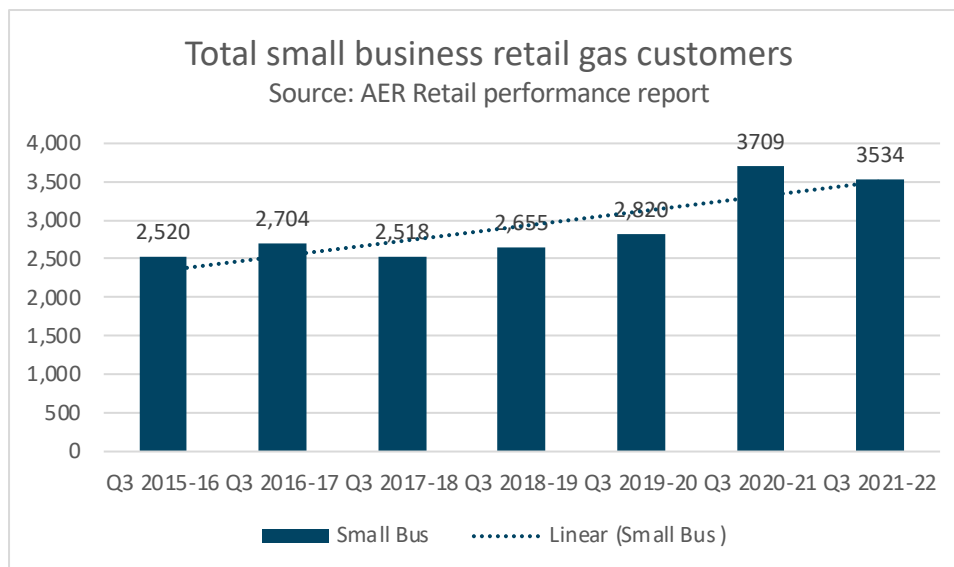
The AER monitors the number of active retail contracts across different customer types. While the number of active retail customers do not necessarily determine the number of new connections, it can clarify growth in sectors of the market, particularly when other data is not available. The data provided by Evoenergy showed that there were 14 new commercial connections over the reported timeframe,

however Evoenergy does not specifically capture new business connections within buildings where other gas connections already exist. The AER's data shows that small business and large customers grew by approximately 950 and 50 respectively over the period 2019-2021, and that there was an unusually high number of new business customers in 2021.

²⁵ Source: Australian Energy Regulator: Evoenergy 'Regulatory Information Notices'. Data includes Queanbeyan.

Based on historic retail contract data, the ACT Government estimates 200 new small business and 15 new large commercial customers are connecting to the fossil fuel gas network each year.

Percentage of new developments connecting to fossil fuel gas



The majority of new connections are associated with new developments, with approximately 80% of all new low density residential homes connecting to gas. Of these, approximately 60% are on new undeveloped land, also known as greenfield areas.

Approximately one third of all new mixed-use, medium and high-density properties connect gas: these developments can have a higher yield of new gas customers. For example, every new medium or high-density development that connects to gas could translate to between

10-100+ new connections. About 70% of new medium and high-rise connections occur on existing developed land, also known as infill development areas.

Whilst accurate records are not currently available for new commercial and retail buildings, it is estimated that approximately 30% of all new commercial and retail buildings include a gas connection.

For Industrial sites, it is estimated that approximately 50% of new industrial process buildings connect to gas.

New building type	Estimated percentage of buildings connecting to gas
Residential- single and low density	80%
Residential – medium and high density	30%
Commercial and retail	30%
Industrial	50%

4.2 The impact of new gas connections

New fossil fuel gas connections increase the Territory's emissions and negate current efforts to reduce emissions from this energy source. They also pose a community health risk and create a transition challenge for potential future owners and tenants.

The ACT Government's announcement that its transition away from fossil fuel gas will be led by electrification, except for the very small number of niche instances where there is genuinely no possibility of replacing fossil fuel gas with a

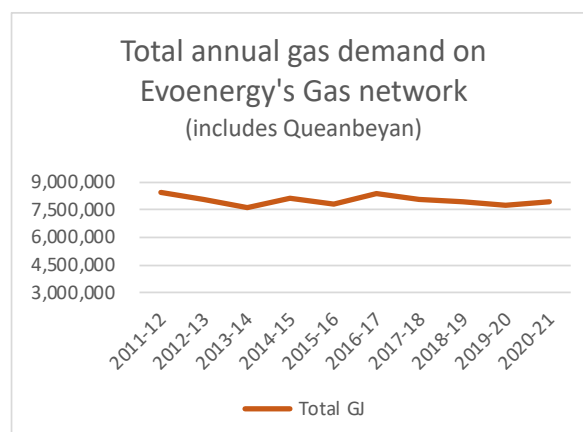
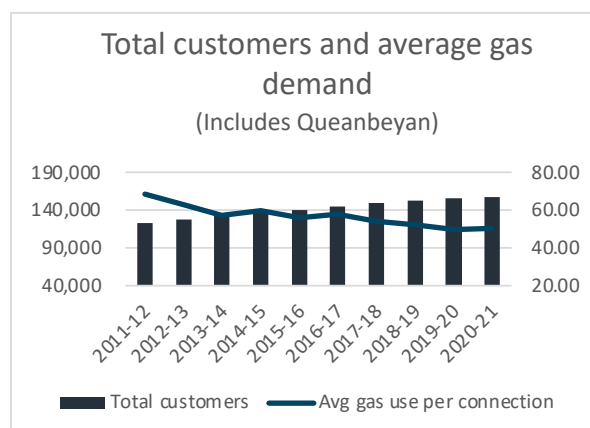
comparable electric appliance in the future. This means that new developments that include new fossil fuel gas connections and gas appliances may need to transition their energy source before the end of life of the current asset.

While single residential properties may be able to undertake this transition with limited cost and technical difficulty, medium and high-density properties which rely on fossil fuel gas can pose a particularly complex and high-cost transition challenge.

Emissions from new connections

Because every new connection to fossil fuel gas uses methane, each new connection contributes to the Territory's greenhouse gas emissions. These new connections limit the Territory's emissions savings that are being made by consumers who are reducing their reliance on fossil fuel gas.

This is shown by the average consumption per connection dropping steadily over the past 10 years (by a total of 28%) while total gas distributed has remained relatively steady.



Source: Australian Energy Regulator, Evoenergy Regulatory Information Notices, ACT Government analysis

Using average consumption per connection data, each new connection has the potential to increase the Territory's emissions as follows:

Connection Type	Average consumption per connection	Annual emissions potential per connection ²⁶
Residential	26 GJ	1.3 t CO _{2-e}
Commercial – small	184 GJ	9.5 t CO _{2-e}
Commercial – large	2600 GJ	134 t CO _{2-e}
Contract customer	28600 GJ	1474 t CO _{2-e}

²⁶ Calculated in accordance with Department Industry, Science, Energy and Resources 'National Greenhouse Accounts Factors' Australian National Greenhouse Accounts, August 2021.

Locking in future transition costs

New buildings that include fossil fuel gas connections will need to be transitioned to an emission's free energy source before 2045. Many buildings, particularly multi-unit apartments, will be particularly difficult and costly to transition. This is because the current building designs do not include sufficient space for electric appliances, and the buildings may not have sufficient electrical capacity.

The costs to retrofit buildings in the future will vary greatly, depending on building and site limitations, the appliances chosen and electrical capacity.

Quantified costs:

- > New appliances (e.g. heating and hot water systems and cooking appliances)
- > Installation costs (labour and electrical works)

- > Health impacts of burning fossil fuel gas inside homes.

Not yet quantified costs:

- > Space impacts (particularly in medium and high-density properties)
- > Infrastructure costs.

Unquantifiable cost

- > inconvenience (particularly with multi-unit properties where customers may need to move out).

Designing and building new properties to be all-electric from the start will avoid these future costs for building owners.

4.3 Gas impacts on health

Methane leakage from transmission, storage and distribution of gas

Due to methane's effects on climate, the United States' Environment Protection Agency (US EPA) has found that methane, along with five other Fugitive emissions from fossil fuel gas (methane) supply is a significant environmental concern.

Fugitive emissions are losses, leaks, and other releases of gas to the atmosphere that are associated with industries producing, transmitting and distributing fossil fuels. During the production, transmission and distribution of fossil fuel gas, leakage and operational releases of methane occurs and escapes into the atmosphere. This escape of gas is called 'fugitive emissions'. According to the ACT Greenhouse Gas Inventory report for 2021–22, fugitive emissions from fossil fuel gas made up 3% (or 53kt CO₂-e) of the ACT's overall emissions. Fugitive emissions are calculated in accordance with a formula outlined in the *Climate Change and Greenhouse Gas Reduction (Greenhouse*

Gas Emissions Measurement Method) Determination 2021.²⁷ New gas connections expand gas infrastructure, and the potential for fugitive emissions.

Health impacts of burning gas in homes

In recent years, studies have started to emerge showing a correlation between gas cooking in homes and negative health effects. The most prominent of these being an increased risk of Asthma and other respiratory illnesses.

When a gas burner is used, several health damaging pollutants are released into the air including Nitrogen Dioxide (NO₂), Carbon Monoxide (CO), Nitrous Acid, Formaldehyde and ultrafine particles.

27 The National Greenhouse and Energy Reporting Scheme (NGERS) has recently updated its methodology for calculating fugitive emissions. The ACT Government is considering whether the ACT Measurement Method requires updating to reflect the new National approach.

These gasses are subsequently inhaled by the household occupants. Published in the International Journal of Epidemiology, a meta-analysis of 41 studies found that children living in a household with gas cooking had a 42% higher chance having current asthma, and a 24% higher chance of developing life-time asthma than those who didn't live in a household with gas cooking.²⁸ This study further confirmed the results of another meta-analysis which found that children exposed to higher levels of NO₂ in indoor spaces were at a greater risk of developing a respiratory illness.

A paper published in the Medical Journal of Australia estimated that 12.3% of the total asthma burden in children aged 14 years or under can be attributed to gas stove emissions.²⁹

It is not only the young who may be affected by gas cooking, both the elderly and vulnerable adults could experience an increased risk of illness, especially when paired with another factor such as COVID-19. A research study from Emory University studied the COVID-19

deaths from more than 3,000 United States of America counties and found statistically significant, positive associations between long-term exposure to elevated levels of NO₂ in air pollution and COVID-19 case-fatality and mortality rate. The study observed that NO₂, a component of urban air pollution often related to traffic, can have adverse health effects even at very low concentrations.³⁰ Nitrogen Dioxide (NO₂) is released when a gas burner is used.

One independent study comparing particle pollution produced by cooking with fossil fuel gas and electricity found that while gas cooking led to a significant rise on nitrogen oxides (NOx) (a mixture of nitric oxide and nitrogen dioxide) in the indoor air, the use of an electric cooker led to no increase in the baseline NOx.³¹

Not only is the environment a driver for the transition off gas: community health and safety is another important consideration. Preventing new connections will limit further exposure of our community to the potential health effects of burning gas inside homes.

4.4 Stranded assets

Under current policy settings, the gas network is expected to remain an important energy source for the next 10-15 years and will remain economically viable until the mid-2030s. After this time the decline in customers' demand for fossil fuel gas, and its diminishing availability,

will put pressure on the economic viability of the network remaining in its current form. The ACT Government will continue to work with industry, critical services and businesses who do not have a viable option to transition to electricity by 2045.

28 Lin W, Brunekreef B and Gehring U (December 2013) '[Meta-analysis of the effects of indoor nitrogen dioxide and gas cooking on asthma and wheeze in children](#)', International Journal of Epidemiology, 42(6).

29 Knibbs L, Woldeyohannes S, Marks G and Cowie C (April 2018) '[Damp housing, gas stoves, and the burden of childhood asthma in Australia](#)', Medical Journal of Australia, 208(7).

30 Liang D, Shi L, Zhao J, Liu P, Sarnat J, Goa S, Schwartz J, Liu Y, Ebelt S, Scovronick N and Chang H (November 2020) '[Urban Air Pollution May Enhance COVID-19 Case-Fatality and Mortality Rates in the United States](#)', The Innovation, 1(3).

31 Dennekamp M, Howarth S, Dick C, Cherrie J, Donaldson K and Seaton A (2001) '[Ultrafine particles and nitrogen oxides generated by gas and electric cooking](#)', Journal of Occupational and Environmental Medicine, 58: 513. See also an independent study which examined methane and NOx emissions from natural gas cooking: Lebel E, Finnegan C, Ouyang Z and Jackson R (2022), Environmental Science & Technology, 56: 2529-2939;

Gas network assets

The transition of the energy system away from reliance on fossil fuel gas has created uncertainty about the future of gas demand. The AER has identified that without regulatory certainty and appropriate management by regulators, there is a risk that the impact of declining gas demand will lead to a significant increase in gas access prices for consumers who remain reliant on the fossil fuel gas network. This future scenario is in line with broader trends in the national and international energy market.

The gas network in the ACT is owned by Evoenergy, and managed by Jemena on Evoenergy's behalf. The gas network is regulated under the National Energy Customer Framework (the Framework), which includes the National Gas Law (NGL) and the National Gas Rules (NGR). Under the Framework, the operator of the gas network can recover from customers the costs of investing in a pipeline over that asset's working life. If customers leave the gas network earlier than expected,

it is possible that the operator will not recover all the investment costs, risking the asset becoming "stranded". The AER describes stranded assets as investments that are no longer able to earn an economic return prior to the end of their economic life due to changes in technology, market changes, regulation, or some combination of these.

The operator of the gas network may also decide to pass on the outstanding costs of the investment to the customers who remain on the network.³² This means that there is a risk that customers who remain reliant on the gas network in the future may bear the burden of significant increase in gas access prices as other customers leave.

The ACT Government understands that with regulatory certainty and the correct policy settings in place businesses can be deterred from making unsound investments and consumers can be protected from being locked into supply of fossil fuel gas through the gas network when other electric options are available.

32 Australian Energy Regulator (November 2021) [Regulating gas pipelines under uncertainty](#): 25

Understanding the potential value of stranded gas assets

One of the challenges of the transition is carefully managing the capital investment and depreciation of regulated gas assets (which are the gas distribution pipes that transport fossil fuel gas to a connection). These are owned and operated by Evoenergy. These assets have an expected economic life and the AER allows Evoenergy to recover its investment from consumers over the expected economic life. This is usually between 50 to 80 years, and if the network isn't viable for the whole 'economic life' then Evoenergy won't have time to recover their investment cost. This approach is designed to spread the cost of the investment over a longer period of time to manage the cost for consumers. The AER could increase the depreciation rate by reducing the economic life of the assets., however, while this would mean that the pipes would get paid off quicker, the supply costs would also go up for consumers.

For example, a new gas pipeline installed in 2023 may be expected to last until 2075 to meet new gas connection needs. However, if the AER approved an accelerated depreciation of this new pipeline so the installation costs could be recovered by the network owner before 2045, customers would be likely to face higher supply costs on their gas bill.

By mid 2026, Evoenergy's asset base is expected to be valued at \$381m. If the network continued to depreciate at the current rate they could have \$146m worth of assets left stranded at 2045.

Home and business appliances

Knowing that the ACT's energy system is transitioning from reliance on fossil fuel gas to renewable-based electricity, it is important to make smart decisions now when planning new residential, commercial and industrial developments to avoid incurring large conversions costs to an all-electric build in the future.

For example, new residential developments built today that connect to gas and include gas appliances for heating and cooking may need to have those appliances replaced before the end of their working life to transition to an all-electric energy source. Building all-electric now will avoid future gas appliance replacement and remove the risk of assets not being able to be used for their full economic life and becoming stranded in the future.

The cost of converting a new building from a mixture of fossil fuel gas and electricity, to fully electric, will vary depending on the structure of the building and the gas and electricity systems already in use. While it will be relatively simple to transition most houses away from gas use, there will be buildings where this will be far more costly and complex for residents, such as some multi-unit residential apartments. Examples of the costs and complexities of transition of a multi-unit apartment include costs of retrofitting the building to install electric appliances for heating and cooking and a lack of additional space required for installation. Other factors such as insufficient electrical capacity within the building, switchboard upgrades, owners corporation arrangements, structural engineering challenges for centralised hot water systems, and the need to relocate residents during work may also present challenges.





The unintended consumer impact of not preventing new gas connections

Brendan's newly constructed home also included a fossil fuel gas connection. He has several gas appliances including a mid-range gas cooktop, gas storage hot water heater and ducted gas heating. The total upfront appliance costs for these three gas appliances cost approximately \$9,000 in 2023. The average life of these appliances is expected to be about 15 years before needing replacement or major repair (whilst some may last longer and others will last less). As his gas appliances reaches end of life or it is getting closer to 2045, Brendan will have to replace his appliances to electric, which will involve installation costs, including possible electric circuit upgrades, as well as upfront appliance purchase cost (approximately \$19,000*). This means that Brendan has had to “double-dip” on installation costs and spend more money transitioning to electric, than if his new house was constructed fully-electric.

The closer we get to 2030, the more likely new gas appliances will not see out their full economic or functional life.

In addition, gas hot water and gas heating is less efficient than heat pump hot water and reverse cycle air conditioning. This means that Brendan will have paid more money to heat his home and hot water than if he had been fully electric from the start.

**Based on the purchase of an average induction cooktop, hot water heat pump and reverse-cycle air-conditioner, and installation costs for a household of 4 in a medium-sized house in February 2023 dollar terms.*



5. Why are we introducing a regulation?

Existing education, incentives and energy efficiency improvements are seeing significant reductions in the amount of fossil fuel gas used on a per connection basis: but corresponding Territory wide emissions reductions from fossil fuel gas are not being seen.

The reason for this is simple. Continued high rates of new fossil fuel gas connection is displacing the emissions savings that current customers with existing gas connections are making.

There are regulatory gaps and market failures that are leading builders and buyers to choose to make a new fossil fuel gas connection without awareness of the climate impacts on society, and the health impacts on occupants. Additionally, many current and future fossil fuel

gas consumers are not aware of the longer-term savings from an all-electric build.

The ACT Government is committed to reducing the emissions of the ACT to benefit both the local community and to take responsibility for the Territory's contribution to global emissions.

Regulation may be appropriate to restrict an individual's choice when the harms experienced by society, from the individual's choice, is greater than private benefit to the individual.

This Issues Paper seeks your views on when new fossil fuel gas network connections should be prevented, and the need for any exemptions, noting there may be circumstances where it not currently feasible for energy needs to be met through fully electric options.

5.1 Existing regulatory frameworks

National Energy Laws require gas distributors to offer gas connections and do not consider climate impacts

The ACT has adopted the National Energy Customer Framework. The Framework requires a gas distributor to offer gas connection services. If the gas distributor does not offer a connection service in accordance with the national rules, they will be in breach of their authorisation (licence).

The national connection requirements are written so that they are 'pro-connection': that is a connection is provided for free if it is determined that the distributor will recover the cost of connection over the expected life of the asset. The national rules do not consider any climate or health related costs associated with a new connection and the gas that will be used.

To overcome the obligation to provide connection services in the national energy laws, the Territory must create its own laws that replace the national law requirements

in prescribed circumstances and will allow prohibitions in those circumstances.

The ACT Government believes that embedding the regulation-making power within climate legislation is the most appropriate place for the regulation. Whilst a prohibition on connections could have been made within planning or building legislation, not all new gas connections are associated with new buildings or developments. For example, a homeowner may choose to install a gas cooktop or gas hot water system at some stage after a property is built, and this would not require Building or Development Approval. Whilst Building or Development Approvals will be key considerations in the commencement and transition period of any future regulation, a regulation that focuses on the 'connection' itself rather than on new buildings can 'cover the field' of all circumstances where a new connection may occur.

National Construction Code is energy source neutral

The **National Construction Code** (NCC) is Australia's primary set of technical design and construction provisions for buildings. As a performance-based code, it sets the minimum required level for the safety, health, amenity, accessibility and sustainability of buildings.

In 2022, Building Ministers from across Australia agreed to update the NCC to include new minimum energy efficiency standards, bringing about an overhaul of the Nationwide House Energy Rating Scheme (NatHERS). NatHERS provides an energy home efficiency rating out of 10 stars. This rating takes into account a home's design and construction, material used including walls, insulation, roofs and windows. Updates to

the NCC will set a minimum 7-star rating for new homes, an increase from the previous 6 stars. Performance of appliances used for heating and cooling, hot water, solar generation and battery storage will also be included in the new Whole of Home rating. The Whole of Home rating will provide a score out of 100 and encourage the building and construction industry to consider the efficiency of appliances used in new residential homes.

Energy efficiency changes to the NCC will commence nationally by 1 October 2023 but may vary by state and territory.³³ Read [here](#) for information on the Territory's implementation of the NCC.

Previous Territory Plan legislation that required mandatory gas infrastructure likely over-supplied the market

Up until September 2020, it was a requirement that all new greenfield developments included reticulated gas infrastructure, namely the network of pipes and distribution systems used to supply fossil fuel gas to properties. In 2020, the Territory Plan was amended, and this requirement became voluntary.

Over recent years, Canberra homeowners have been moving away from using gas in their homes. In October 2022, Evoenergy reported that they had approximately 7,700 'non-consuming' connections on the network. Of these 5,200 had been temporarily disconnected, but not abolished (removed). A temporary disconnection may include the distributor placing a disk or 'wading' in the meter so that no gas can pass through it, but the gas meter remains in place for potential future customers. In addition, almost 2,000 properties had their service abolished (removed) between 2017-2021: it is acknowledged that many of these properties may have reconnected after a site redevelopment.

Unlike new connections which are often provided for free, there is a cost to abolish the meter and gas service. This is because the charge considers the time taken for

appropriately trained personnel to attend an average site, excavate the connection in the street and establish traffic control if required, disconnect the service connection and remove the gas meter. The AER establishes the charge as reasonable for the service provided. The current cost [\$705 + GST + retailer administration fee] is viewed by some stakeholders as a barrier to exit, so instead of abolishing the service, many choose to disconnect (with the retailer) and leave the connection in place.

This results in what is known as "cross-subsidisation", where remaining active gas users pay the cost to maintain the service at the non-consuming properties. As more people exit the network, this number is expected to increase, and it could put cost pressure on people who cannot afford to leave the network.

Gas free suburbs have been proven to be effective in the Territory, examples of their success can be found in Swinger Hill, Ginninderry and recent stages of greenfield development which are gas free.

If a stakeholder requires access to the network for fossil fuel gas, there remains a significant number of properties with existing gas connections that can be purchased or tenanted.

33 Department of Climate Change, Energy, the Environment and Water (29 August 2022) [National construction code \(NCC\) updates mean energy efficiency ratings expansion for new residences](#), Australian Government, accessed 31 January 2023.



Proposed changes to the Territory Plan will not prevent gas connections post development

The ACT Government consulted with the community on potential changes to the Territory Plan from 1 November 2022 to 3 March 2023. Included in these changes is a proposal to prevent fossil fuel gas connections being made to new residential subdivisions, both greenfield and redevelopment areas.

The subdivision of land is when one parcel of land is split into multiple lots or parcels of land, often for sale.

However, these proposed changes will not prevent fossil fuel gas connections being made following development, as building or development approval is not required when requesting a gas connection.

Information about consultation on the Territory Plan, including a copy of the draft new Territory Plan can be found [here](#). The new planning system is expected to commence in late 2023.

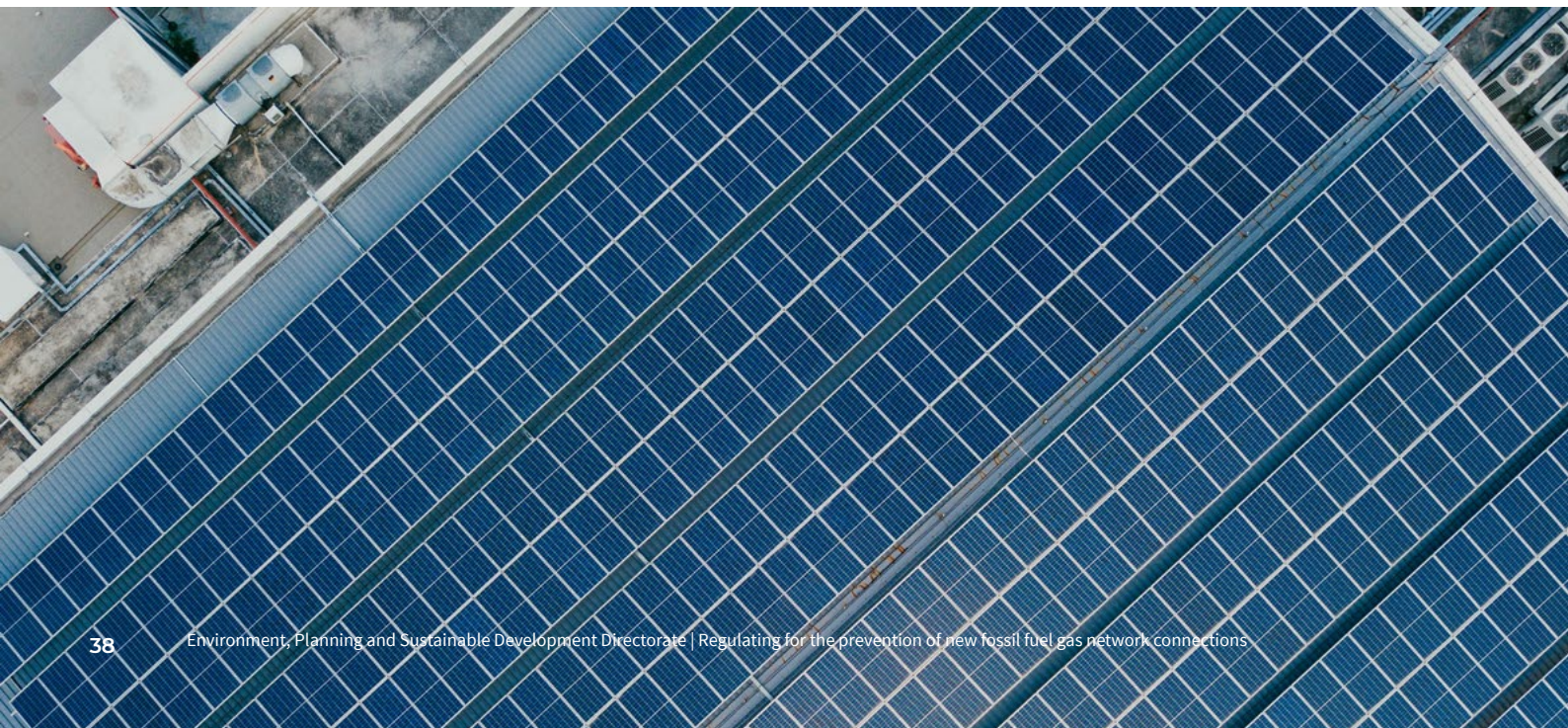
5.2 Why does the government need to get involved?

In general, individuals will make the best decisions for themselves and their households, however the nature of some goods and services prevents optimal economic and social outcomes for the community. There are several key problems that indicate that the market is not responding to signals relating to fossil fuel gas emissions and that regulatory intervention may be required. These problems are 'market failures' and indicate that government intervention may improve overall wellbeing.

Several studies have shown that all-electric is the most cost-effective energy option for new buildings (at above market discount rates). That all electric builds are not more common may suggest the presence of market failures. These include:

1. Developers, builders and buyers of properties may not factor in climate and health impacts as part of the cost when deciding whether to create a new connection to the fossil fuel gas network. Instead, society bears these costs as seen through the impacts on climate change and on the health network.
2. Split incentives mean that developers have little reason to build all-electric buildings, as they do not enjoy the benefits of lower energy bills and avoided future transition costs.
3. Building buyers/tenants/mortgage providers do not have information on long term energy price rises, and most do not value long-term savings from better performing buildings at point of construction, sale or rent.

For most businesses, as opposed to households, energy costs present too small a percentage of their operating costs to make energy a material consideration in the choice of building they occupy.
4. Even where consumers do have the information to act to take advantage of energy and emissions savings many fail to do so for a variety of reasons.
5. Some energy retailers may offer incentives to property developers (such as free gas appliances) to install gas embedded networks in high-density properties: locking future owners into gas supply arrangements. The creation of a range of new fossil fuel gas connections can lock a building into higher energy consumption, emissions and operating costs and there is limited information and disclosure of this information to unit buyers.



5.3 What is the objective of regulation and how will we measure its achievement?

The ACT Government is committed to reducing the emissions of the ACT to benefit both the local community and to recognise the Territory's contribution to global emissions.

A future regulation would be the first step under the Government's gas transition pathway to achieve net zero emissions from fossil fuel gas by 2045.

It is proposed that a future regulation would be measured by two primary methods:

1. Total number of new fossil fuel gas network connections each year; and
2. Reduction in Territory emissions from fossil fuel gas as reported in the ACT Greenhouse Gas Inventory Report.





6. Issues for preventing new gas connections in the ACT

We want you to help us make the ACT's regulation on new fossil fuel gas network connections

The ACT Government is seeking community and stakeholder views on the impacts and costs of taking various approaches in a future regulation to prevent new gas connections in the ACT.

The ACT Government has legislated to reduce greenhouse gas emissions in the ACT to achieve net zero emissions by 30 June 2045, recognising that the Government, community and business have important contributions to make to avoid

serious damage to the environment from climate change. All new fossil fuel gas connections in the ACT will need to have ceased in advance of 2045. By 2045 the only new connections that will be made will be connections to a 100% renewable gas network, or developments that are subject to exemption. This chapter sets different approaches that could be included in a future regulation and seeks your views on this important work.

Key Issue 1: Identifying land or premises that are subject to the regulation

Under section 13A(1) of the proposed amendments to the *Climate Change and Greenhouse Gas Reduction Act 2010* (CCGGR Act), the regulation can prescribe an area, or stated premises in an area, where a gas distributor must not provide a new gas connection for natural gas. This means that if the Bill containing the proposed amendments passes the Legislative Assembly, the Executive will have the power to make a regulation that identifies particular types of land, areas or premises where gas distributors will be prohibited from providing new gas network connections. There are several ways the regulation could identify the types of land or premises to which the prohibition applies, as well as possible exemptions to this prohibition.

These options could include identifying land by:

- > Planning zones
- > Districts e.g. Belconnen, Gungahlin, Tuggeranong, Weston Creek
- > Suburbs
- > Specific property addresses
- > Parcels of land (also known as 'blocks').

Planning zones – preferred approach

The [Territory Plan 2008](#) ('the Territory Plan') uses [planning zones](#) to specify the planning controls for a particular area or block of land and includes residential, commercial and industrial zones. These zones determine how the land can be used and what can be built there.

Planning zones in the Territory Plan

The Territory Plan contains 23 different zones which are divided into seven main groups. These main groups include residential zones, commercial zones, industrial zones, community facility zones and parks and recreation zones.

The Territory Plan is a legal instrument made under section 46 of the *Planning and Development Act 2007*. A copy of the Territory Plan, which sets out the different zones can be accessed [here](#).

One approach could be for the regulation to identify the planning zones where new gas network connections are prohibited. For example, this could be all residential zones, or specific residential zones such as ‘medium density residential zones’ and ‘high density residential zones’. The population of the ACT is growing, and the Territory’s building and infrastructure needs are changing. The advantage of using planning zones in the regulation is that the regulation will not need to be amended as land use changes and new suburbs emerge. Further, an approach based on planning zones has the potential to apply the same rule to the same kinds of buildings and land use across the Territory. This makes the regulation quite tailored, responsive and adaptable as the ACT changes and grows.

Depending on the needs of industry, during a transition period the regulation could apply to all residential zones and all, or specific, commercial zones immediately and include other commercial and industrial zones at a later date. In special cases, the regulation

could specify, in addition to planning zones, particular suburbs or street addresses included or exempted from the prohibition on new gas connections. Further discussion on potential exemption is outlined in [Key Issue 4](#).

In contrast, if the regulation only identified specific property addresses or blocks of land, it would likely require frequent amendment and could not be as responsive to growth and change. Similarly, identifying regulated land by district or suburb, while potentially useful from a planning perspective, will be less flexible as the regulation will require amendment as new suburbs are formed. It would apply the general rule, of no new fossil fuel gas network connections to all users in a geographic area, even if the needs of end users and their ability to be met by electricity alone, may be quite different. Taking this approach may also require exemptions to be built into the regulation to account for businesses or industries which must continue to rely on gas, despite being located within regulated suburbs.

Territory Plan changes currently under consideration: no new gas connections to residential subdivisions

As noted above, the ACT Government is currently consulting on [potential changes to the Territory Plan](#), including a proposal to prevent new gas connections to be made to any new residential sub-divisions (both greenfield and redevelopment areas).

These changes, if approved, will prevent new gas connections for many new residential properties at the development stage. However, these changes will not capture new gas connections to all residential sites, nor will they capture new gas connections to commercial or industrial sites. These changes will also not capture new gas connections made post development, as development or building approval is not required for a new gas connection.

Consultation Questions – Key Issue 1

- > Would you want to see planning zones, as outlined in the Territory Plan, used as the primary means of identifying the areas where new gas connections would be prohibited? What would be the challenges with this approach?
- > Do you have other ideas for identifying land in the regulation that is flexible and responsive to the ACT growing and changing? What would be the costs or benefits of this alternative approach?

Key Issue 2: What types of land, areas, or premises should be included in the initial regulation?

As noted in [Key issue 1](#), the ACT Government is proposing to utilise zones identified in the Territory Plan as the primary method of identifying areas where gas connections are prohibited in the regulation. It is currently anticipated that the initial regulation will not prohibit all connections in the Territory, and that review and future regulations covering additional land or areas may be required.

This chapter outlines different approaches and considers some of the impacts of including different land zones or areas in a regulation. A future regulation could include a combination of all or some of the approaches discussed below. The ACT Government is seeking stakeholder input regarding the benefits, costs and impacts of including, or excluding, different zones from the regulation

National Capital Plan land

National Capital Plan (NCP) land, including land within the parliamentary triangle, is owned and managed by the Australian Government. A Territory regulation would not apply to NPC land however, the ACT government will work with the Commonwealth to facilitate transition to electrification.

Approach 1: Regulating residential zones or areas – preferred approach includes all residential areas

New connections to residential properties make up the largest number of new gas connections in the ACT

In the ACT, 80% of all new fossil fuel gas connections come from residential properties. Of these approximately 30% are in greenfield areas, and 70% are in existing areas predominately through re-development (urban infill).

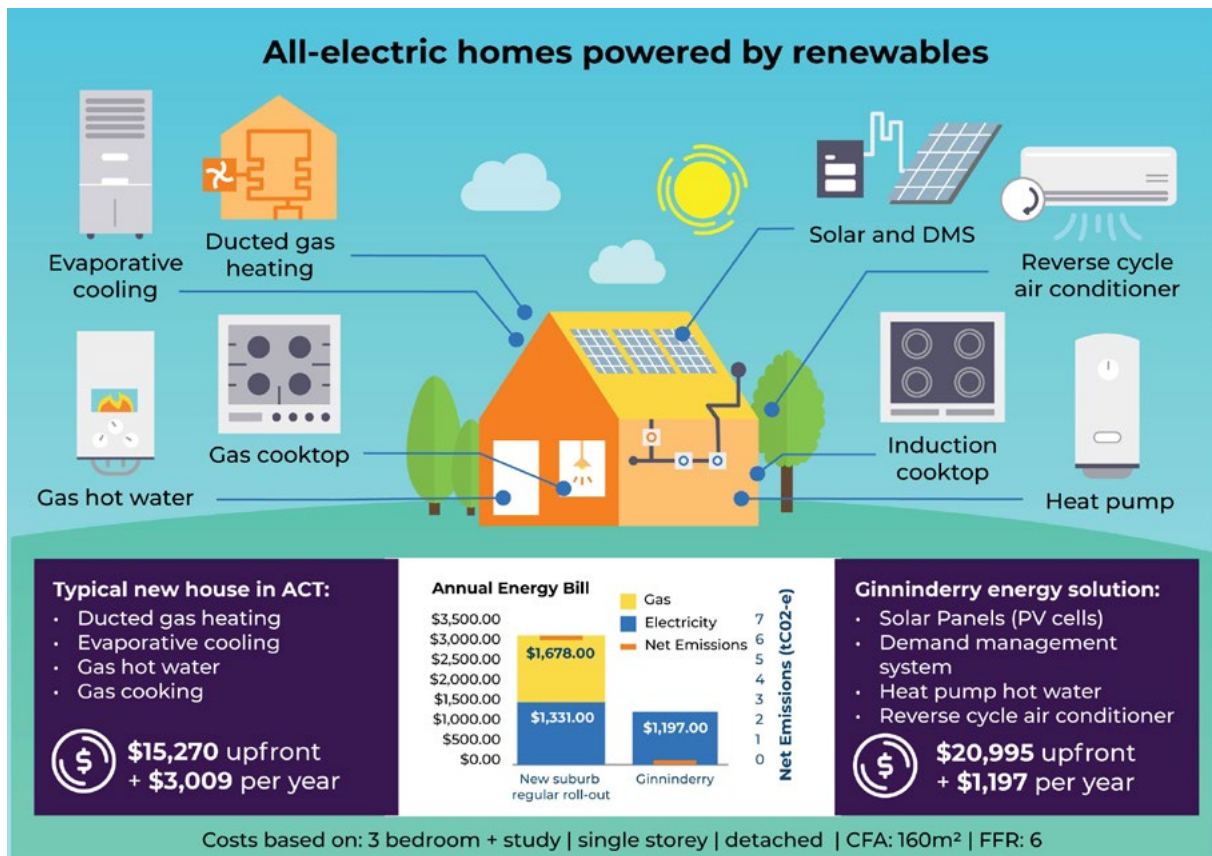
The Territory Plan outlines five residential zones, with RZ1 representing land that is low rise, low density and predominantly single dwelling, through to RZ5 which is high density and multi-story development.

Lower density properties typically tend to be larger properties and will often use fossil fuel gas as an energy source for space heating, hot-water and cooking. In contrast, the higher density properties are unlikely to use fossil fuel

gas for heating, and instead predominantly use gas for centralised hot water systems and sometimes cooking.

Most new low density single residential connections occur in greenfield areas: whereas nearly all new high-density connections occur in infill redevelopment sites.

For new residential properties all-electric alternatives are available and proven: these include hot water heat pump, induction cooking and reverse cycle air conditioning. In 2016, Ginninderry found that, whilst the upfront cost of a three-bedroom, one study all-electric home (which included solar panels and demand management system to reduce instantaneous demand on the electrical network) had an approximate \$6,000 higher upfront cost, there was an almost \$2,000 per annum saving in running costs.



New multi-unit and mixed-development sites can pose a significant net zero transition challenge if they are built to include fossil fuel gas connections. Once a building is complete, retrofitting for all-electric poses several challenges, including insufficient electrical capacity within the building, insufficient space for electric appliances, costs and disruption to residents.

Currently, developers and those making decisions about whether new multi-unit apartments are built with electric or gas appliances are not incentivised to choose

the electric appliances which would benefit the future inhabitant of the apartment and ultimately the person responsible for paying energy bills. In some cases, this may be because gas retailers are providing appliances to the developers to 'lock-in' gas to future owners, or because all-electric buildings have a higher up-front cost to build. It may also be due to a lack of market demand, or because knowledge, skills and supplies to build all-electric is limited. This can have significant future impacts for the apartment owners who may face significant 'transition' costs to switch to electric in the future.

The cost of retrofitting a multi-unit development

Construction Co. Pty has just submitted a development approval to the ACT Government to build a 370 unit apartment block in the Inner North in 2023. They have chosen to include fossil fuel gas in the building for a central hot water system and a gas cooktop in each apartment. As we transition to an electric future, this building will need to change its energy sources. The cost for retrofitting an apartment is significantly higher than a single household. This is due to the complex nature of electricity load, shared cabling, and space constraints within the building.

If this apartment block needed to retrofit, apartment owners could be faced with the following costs (2023 dollars):

Cost Breakdown to retro-fit existing building	Total Cost	Cost per apartment
Induction Cooktop with Individual Heat Pump	\$5,437,920	\$14,697
Induction Cooktop with Instantaneous HWS	\$5,771,280	\$15,598

It is estimated that if the development was built all-electric from the start, the entire building could save between \$3-3.5m in retrofit costs (or between \$8,000-\$9,000 per apartment). Some other considerations during the retrofit design and installation:

- > A new centralised instantaneous hot water system is unlikely to be feasible due to the additional power required for the system. Similarly centralised storage hot water is unlikely to be feasible due to engineering (weight requirements) and space constraints. This means a retrofit solution will impact the space within individual units.
- > Retrofit work would be disruptive for residents and would require the building to be vacated, for a period of months.
- > The cost will vary from site to site depending on the availability of space, the capacity of distribution boards, substations, mains etc.

For these reasons, including multi-unit developments in the regulation are viewed as a priority for the ACT Government.

Conversely, low density, single detached residential homes are less likely to experience significant appliance conversion challenges, although cost will still be a factor.

An approach to the regulation could be to include all, or some, residential zones or areas identified through other means (such as by districts or suburbs). It is the governments preferred position that all residential zones are included in an initial regulation.

Impacts of including residential areas in the regulation

As residential connections are the primary source of new fossil fuel connections, the inclusion of all residential areas in the regulation will have the most impact on gas fitters, the gas network, and the highest emission reduction potential.

Including low density residential properties would result in approximately 1,200 less connections each year.

Including medium and high-density properties would result in approximately 1,700 less connections each year. The potential emissions avoided of these connections is:

	Average annual connections	Average annual consumption per connection	Potential Scope 1 Emissions avoided per annum
Low density (single residential)	1200	26 GJ	1608 t CO ₂ -e
Medium and high-density	1700	15 GJ ³⁴	1314 t CO ₂ -e
		TOTAL	2922 t CO ₂ -e

Given that residential properties represent the largest proportion of new gas connections each year, a conversion of all new residential properties in 2023 could have supply chain impacts for some items. Many supply chains have been impacted during COVID-19 and the inability to source and supply quality efficient electric appliances could delay building completion. The ACT Government believes that clear policy settings, with appropriate commencement lead times, will assist businesses to prepare and make appropriate supply chain arrangements. [Key Issue 6](#) and [Key Issue 7](#) asks for stakeholder input and views relating to transition and commencement timelines.

LPG Uptake

During our industry workshops, several stakeholders raised concerns that by preventing new fossil fuel gas connections there could be an increased uptake of LPG. Many of the stakeholder concerns related to future transition, where customers who already have fossil fuel gas may not be able to afford to convert appliances to electric and subsequently bring LPG bottles into their homes. That is, they would seek to use devices meant to be used outdoors, within the home and potentially risk their safety. Whilst these issues would not apply to homes that are built all-electric, the safe use and placement of LPG is an issue of concern for the ACT Government.

Separately, Ginninderry has allowed homes to connect LPG bottles to the exterior of the house, with connections to the kitchen for cooking. This is known as a 'plumbed' connection. All plumbed connections must be installed by a licensed gas fitter and are subject to an inspection to ensure the safety of residents. In February 2022, it was noted that approximately 7% of completed homes had installed a plumbed LPG system for cooking.

³⁴ As multi-unit apartments are unlikely to use gas for space heating, a lower average consumption has been assumed by the ACT Government.

LPG (liquid petroleum gas) uptake

Liquid petroleum gas, known as LPG, is a type of gas stored as a liquid in pressurised tanks and cylinders. In the ACT is most often used in small bottles for outdoor equipment, such as barbeques, portable outdoor heaters, and camping equipment. In other areas where mains connected gas isn't available it is typically used for heating, cooking and as generator fuel. It is sometimes used as a substitute for fossil fuel gas, however it is not a direct replacement and appliances must have the correct burner / jets for either LPG or 'natural gas' use.

For consumers that choose to connect LPG cylinders into their homes, LPG cylinders must meet the National Construction Code boundary requirements, as well as the Australian Standards for storage, handling and connections. A plumbed system must be installed in a home or business by a certified professional (licensed gas-fitter) and regularly maintained to avoid danger to humans and animals. When installed and handled correctly, a plumbed LPG connection is no more dangerous than a standard 'natural gas' connection. Small bottles for portable equipment is not regulated, however there are storage and handling requirements.

An incorrectly stored, installed, or faulty LPG tank can emit dangerous levels of carbon monoxide which can lead to illness or death.

The overall carbon footprint LPG gas is generally considered to be more energy-intensive than fossil fuel natural gas as it needs to be transported by truck or ship and must be stored in pressurised tanks.

An unintended outcome of regulating to prevent fossil fuel gas connections may result in an increase in the use of LPG.

Approach 2: Commercial and industrial areas – preferred approach includes commercial areas

The Territory Plan identifies commercial zones to include office buildings, retail and commercial spaces and entertainment, accommodation, leisure facilities and high-density residential developments that can integrate business, office, residential and retail spaces. The Territory Plan also outlines 2 industrial zones: general industrial zones and industrial mixed-use zones. Gas reliant businesses are most often located in commercial and industrial zones in the ACT.

An approach to the regulation could be to include all commercial zones, or rather, to include specific commercial areas (through other identification means, such as suburbs or districts) where gas connections are prohibited. The regulation could also seek to include some or all industrial areas.

Commercial businesses typically use gas for heating, water heating and cooking and most of these businesses will be able to use electrical appliances instead of fossil fuel gas in the future. Gas is also used for many industrial processes

in the manufacturing sector. We know that industries with processes which require high temperature heat, such as glass, metals and ceramics may face difficulties electrifying.

New connections for gas reliant businesses

According to the AER, there are approximately 200 new small business and 15 new large commercial customers each year: many of these new commercial customers join the network post the initial building development.

Approximately five industrial process buildings are built each year and only one is likely to create a new fossil fuel gas connection resulting in an average annual consumption of 2,600 GJ of gas.

Mixed use commercial areas are typically high-density residential developments that can integrate business, office, residential and retail spaces.

A typical mixed-use building will include retail and office spaces on the ground floor with residential apartments above. These developments may typically use gas for hot water and cooking (for the commercial and retail spaces), and centralised hot water for the apartments. As noted in the residential section above, mixed-development sites can pose a significant net zero transition challenge if they are built to include fossil fuel gas connections. The ACT Government estimates that 30% of all new mixed-use developments currently include fossil fuel gas connections.

Impacts of including commercial and industrial areas

Including all new commercial connections would result in approximately 215 less connections each year. Including all new industrial connections would result in approximately 1 less connection per year. On average there is 1 new contract customer every 2 years, these customers could be in either commercial or industrial areas. The potential emissions avoided from these connections is:

	Average new annual connections	Average annual consumption per connection	Potential Scope 1 Emissions avoided per annum
Small commercial customers	200	184 GJ	1896 t CO _{2-e}
Large customers (includes 1 industrial customer pa)	15	2,600 GJ	2010 t CO _{2-e}
‘Contract’ customers	.5	28600 GJ	737 t CO _{2-e}
		TOTAL	4643 t CO _{2-e}

The ACT Government understands that there may be some businesses where electric alternatives are not currently well-understood, or economically feasible. However, a declining residential customer base is also likely to put increased cost pressures on gas reliant businesses, meaning running costs are likely to increase. It is therefore important for commercial businesses to consider alternatives to fossil fuel gas at the building design stage. Building with electricity from the outset, where it is feasible, will allow businesses to manage their energy costs and reduce their emissions.

Some businesses may choose to install plumbed LPG if a fossil fuel mains connection is not available. LPG is also a fossil fuel and any plumbed LPG would be a temporary solution if the ACT is to meet its greenhouse gas emissions target, of net zero emissions by 30 June 2045.

Another concern is to ensure that the gas network operator can also effectively manage a declining customer base in an efficient and cost-effective manner: allowing new network

connections that grow the reliance on fossil fuel gas could jeopardise this.

There is a risk that if commercial areas are included in the regulation and industrial areas are not, some businesses in commercial zones might choose to move their operations to an industrial zone to use a fossil fuel mains gas connection. This is only a small risk, and we will continue to monitor and assess business activities once the regulation is in place.

Whilst a general principle of seeking to not connect new commercial properties to the fossil fuel gas network is the ACT Government’s preferred position, it may be appropriate to consider some form of exemption for certain business types. [Key Issue 4](#) outlines considerations for and seeks input in relation to exemptions.

Due to the limited uptake of gas users in industrial areas, we do not propose to include industrial zones in the regulation at this stage. We will continue to monitor gas connections in these areas and consider whether to include these in the regulation in the future.

Approach 3: Other zones or areas

The Territory Plan outlines four other zone types: community facility zones, parks and recreation zones, transport and services zones and non-urban zones.

We do not propose to include any of these zones or areas in the initial regulation as there is no current data available to suggest gas connections are being made in these areas.

For this reason, it is anticipated that the total number of new fossil fuel gas connections to buildings in these zones will be very limited.

We will continue to monitor gas connections in these areas and consider whether to include these in the regulation in the future.

Consultation Questions – Key Issue 2

- > The ACT Government has a current preference to include residential and commercial areas in the initial regulation. What are the impacts and benefits that need to be considered if the regulation was applied to these land areas?
- > Should any other areas be included in the regulation and if so which areas are they and what would be the benefit of including these other areas at this time?
- > Are there specific land use types or areas in the Territory you would expect to see excluded from the initial regulation (for example particular district shopping areas, or low density developments)? If so, why and how long should this exclusion be for 1, 3 or 5 years?

Key Issue 3: Application of the regulation to greenfield and infill developments

The [Parliamentary and Governing Agreement](#) sets out the ACT Government's commitment to legislate to prevent new gas connections in greenfield residential developments and to commence a project to advance all-electric infill developments, with a goal of no new gas connections to future infill developments from 2023.

Greenfield residential developments are property developments that build on undeveloped land. Infill developments are property developments on land that has previously been developed. Typical examples of infill development include:

- > Redevelopment of an open carpark into office space or apartments
- > Replacement of single residential dwellings with medium density housing or units.
- > Redevelopment of an area, with a new commercial and residential precinct

Whilst the above examples result in an increase in land use, or densification, the ACT Government is also interested in views as to whether a future regulation should also include other forms of redevelopment in existing areas, such as 'knock-down rebuilds'.

New gas connections: Knock-down rebuilds and significant construction

A 'knock-down rebuild', where a homeowner demolishes an existing single residential property and replaces with another single residential property does not fit within the typical industry definition of infill development. This is because it does not increase the utilisation of the land. Similarly, a substantial home extension and renovation would also not generally be considered 'infill' development.

When a decision is made to demolish a building or undertake significant construction works, the gas connection to the property is often required to be abolished (removed) to ensure that demolition and construction is safe.

Once the construction is complete if the owner of the property wants to use gas in the building, they must make an application for a **new** gas connection to be established. An application can be made to Evoenergy (the gas network supplier), or an energy retailer who will submit a new gas connection application on the owner's behalf.

It is the Government's current preference that if a gas network connection is abolished (removed) during construction or redevelopment of a site, it should not be exempt from a regulation that would otherwise apply to that land.

Further information about gas connections can be found on the Evoenergy website, linked [here](#).

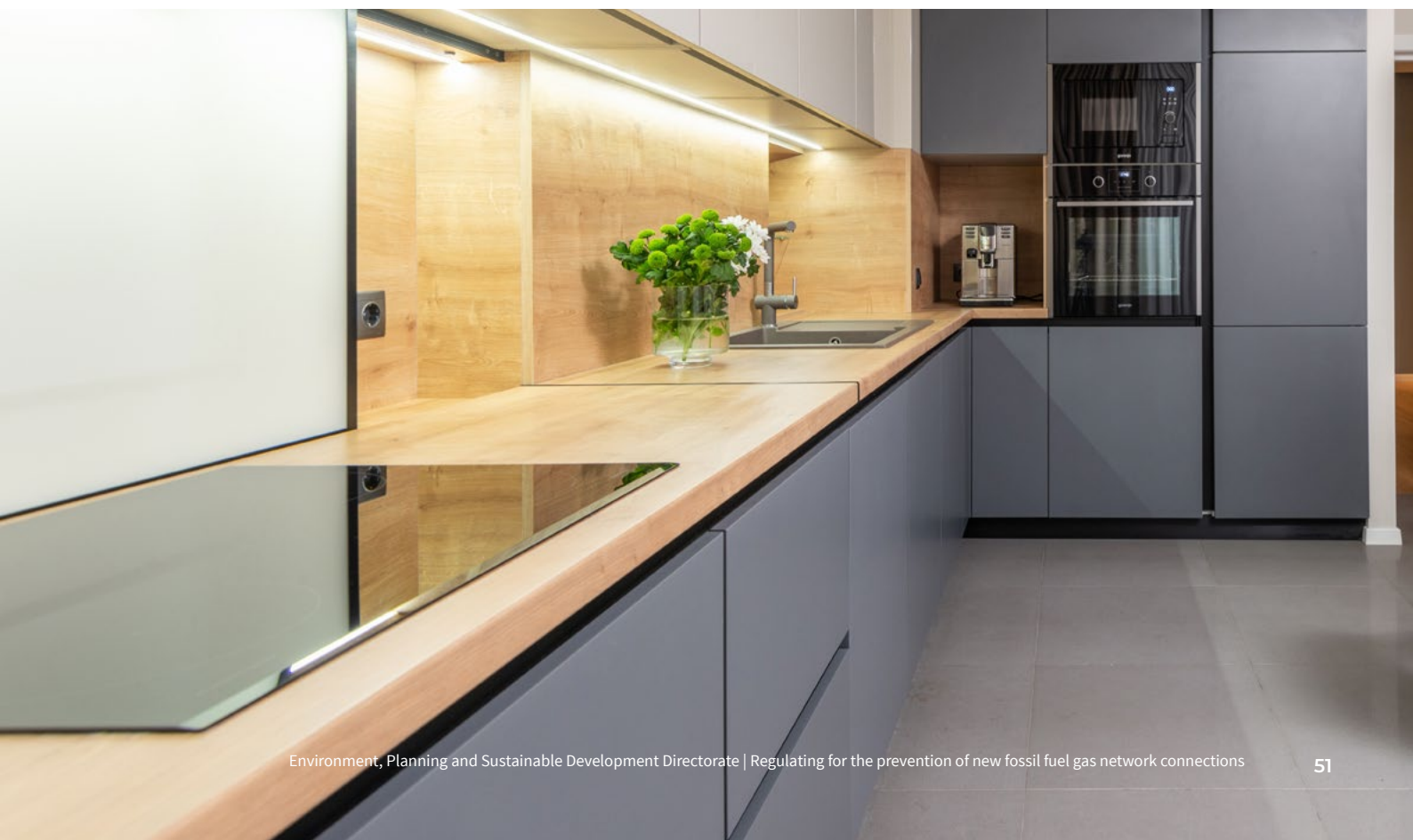
We consider that the best way to ensure that the regulation is equitable across the Territory is to prohibit new fossil fuel gas connections in both greenfield and infill developments, including knock-down rebuilds. Redevelopment offers a logical point in time to transition buildings from gas to electricity, particularly in circumstances where the gas connection must be abolished for safety reasons.

If the regulation is not applied to new infill developments, a large number of consumers will move into these buildings into the future and will be locked into the gas network, with its higher costs and creating new emissions which are entirely avoidable.

We understand that the prohibition applying to greenfield and infill developments will have an impact on the gas fitting industry in the ACT, and on gas reliant businesses. In the case of potential new gas reliant businesses, they may be required to establish in an area where a gas connection is already available, or to consider alternative energy sources, such as plumbed LPG. It is important however that the regulation is clear and consistent in its application to achieve equitable outcomes and to ensure the ACT is able to reach the legislated objective of net zero emissions by 2045.

Consultation Questions – Key Issue 3

- > Do you think the regulation should apply the same way to new developments (in new greenfield suburbs) and in-fill developments (including, for example knock-down re-builds or renovations where the gas connection is typically temporarily abolished to allow for construction)? Please provide reasons for your response.
- > Can you provide details of any impacts, including costs or benefits that may result if the regulation applied to infill developments, including knock-down re-builds, in the same way as it's applied to greenfield development?



Key Issue 4: Exemptions to the regulation

The new regulation will be aimed at prohibiting the creation of new fossil fuel gas network connections to buildings and developments.

All-electric options are proven and available for the primary uses of gas in the Territory (heating, hot water and cooking), and many new buildings are already being designed as all-electric in the Territory. It is expected that, at the design stage, it will be relatively easy for most new developments and buildings to be designed to be all electric.

However, the ACT Government understands that there may be circumstances where an exemption from the regulation on new fossil fuel gas network connections is appropriate. This could apply, for example, where a regulation prevents new fossil fuel gas network connections in a zone and there are minimal incidences where electric alternatives are not feasible, or alternatively, it could apply to a particular mapped area for a period of time.

We are seeking your views about what should be considered when developing exemptions to the regulation. Some key factors to consider could include:

- > environmental impacts
- > economic potential for the Territory
- > geographic location of a new development
- > secure access to energy in emergency (such as backup power generation)
- > buildings or areas of national importance
- > impact on gas network operations, including planning for future phase-out of fossil fuel gas
- > availability and viability of alternative energy sources to fossil fuel gas for intended uses at the site.

It is important to note that gas network design, planning, and operations considerations are a material consideration for any exemption. It is expected that the economics of providing a new connection will change considerably following introduction of a regulation limiting new fossil fuel gas network connections.

We know that regulatory certainty is necessary for the electricity and gas network owner to plan and manage both networks in the most cost-effective way. Exemptions to the regulation can lead to more uncertainty for utility planning and may lead to additional costs for the network owner and gas consumers. Continued connections will make it extremely difficult for Evoenergy to plan a down-sizing of the network.

We are committed to making the exemption process transparent to ensure it is fair. A test could be created by the regulation about what factors should be considered when granting an exemption.

Businesses and buildings that require gas

We want to know what types of industries, businesses or categories of buildings do not have viable all-electric infrastructure and appliances available at this time. This will help us consider whether these should be exempt from regulation and to develop safe, sustainable, and economically viable solutions.

If a business cannot be transitioned to all-electric in the future, one solution could be to install liquid petroleum gas (LPG) bottles on the premises to be used as a short-term solution, noting the significant environmental impacts caused by LPG use and that there are additional considerations and risks posed by inappropriate storage and usage of LPG, and standards governing the placement of LPG cylinders.

For businesses that cannot utilise all-electric alternatives one solution could be to connect those businesses to the existing 'secondary network'. The gas network in the ACT is made up of three pipeline networks:

- > The 37km primary backbone operating at 6,000kPa and which is not suitable for customer connections;
- > the secondary high-pressure network operating at 1,000kPa and extending 220km across the ACT; and
- > the 200kPa medium pressure distribution network extending 4,000km in the ACT, from which most connections currently draw fossil fuel gas.

The high pressure 'secondary network' involves less pipelines of high-pressure steel and it distributes fossil fuel gas to:

- > Greater Queanbeyan;
- > the medium pressure network and;

- > approximately 300 customers that are directly connected to the secondary network. These include 'contract customers' and large tariff customers.

The current gas network will need to downsize in response to the ACT Government's policy to transition to electrification. The medium pressure network will be progressively shut down as users transition to all-electric. Meanwhile, the less extensive secondary network will remain in operation to distribute gas to remaining customers who can afford the significantly higher connection costs for a high-pressure connection and also to customers in Queanbeyan who are not subject to ACT rule changes.

If this network were to remain in place, the network owner Evoenergy could explore options to transition to green and/or hydrogen gas to service this smaller network long-term, while also reducing the Territory's emissions.

Consultation questions – Key Issue 4

- > Noting a regulating would not affect existing connections, are there any specific activities within the Territory that must have access to a new connection to the fossil fuel gas network? If yes, what are they and do you think a zero emissions alternative will be available in the next 3-5 years?
- > Are there certain business types or industries that should be allowed to continue to get new gas connections (e.g be exempt from the initial regulation)? If so, what is the business or industry and what would be the impact if they were not exempt?
 - » If an exemption were granted, would 1,3 or 5 years be sufficient for zero emissions alternatives to become available and viable?
- > What type of matters should be considered when developing a process for exemptions to the regulation?
- > Who should pay for a regulatory process or assessment to get an exemption?
- > Given the impact on emissions and energy network planning, it is the ACT Government's preferred position that the number of exemptions are limited and are for circumstances where alternatives are not feasible. How stringent should the exemptions process or exemptions test be?
- > Do connections to the smaller secondary, high-pressure, pipeline offer a viable alternative (economically/financially and technically/logistically) for gas reliant businesses and trades?

Key Issue 5: Reporting

The proposed amendments to the *Climate Change and Greenhouse Gas Reduction Act 2010* (CCGGR Act) will allow the regulation to require a gas distributor to provide certain information to the Government and to customers. The regulation can require that:

- > the gas distributor gives certain information to the ACT Government about its compliance with the regulation; and
- > the gas distributor gives existing or potential customers certain information.

Information provided by the gas distributor can assist the ACT Government understand the impacts of the regulation and assist it to make policy and decisions about the future of the gas network. The types of information that the gas distributor could be required to provide could

include all requests for a new gas connection made in the ACT and detailed reports on all new gas connections made including the location, type of building the connection was made to and if the information is available, the purpose of the connection.

Requiring that the gas distributor provide certain information to existing or potential gas customers could assist consumers make decisions about the best energy choices for their homes or businesses. The types of information that could be provided to existing or potential customers might include an information sheet outlining the ACT Government's policy regarding the future of the gas network at the time of a connection request, and / or facts about fossil fuel gas emissions, consumption and connection figures.

Consultation questions – Key Issue 5

- > What sort of information should the gas network operator be required to provide to the ACT Government about fossil fuel gas connections or supply?
- > What information should the gas network operator be required to provide to existing and/or potential customers?





Key Issue 6: Commencement date

The ACT Government understands that a regulation will provide clear guidelines on how future fossil fuel gas network connection requests will be treated and provide gas network owners, developers, business owners and ACT residents with certainty when planning.

It is proposed that a regulation will commence by November 2023, or as soon as is practicable afterwards and will only apply to new buildings or developments that do not yet have a Building or Development Approval. This timeframe will align closely with the new National Construction Code (NCC) requirements that a seven-

star energy efficiency rating and minimum accessibility standards will be required in all new homes built from October 2023.

Further, this will provide certainty for those with existing approvals, who have sunk costs in taking developments forward.

However, it is important for us to understand the implications for buildings currently under construction, or where construction has not yet commenced, continuing to access a gas connection for developers and future users of these developments.

Consultation questions – Key Issue 6

- > What would be the impacts for builders and developers if a regulation commenced in late 2023? For example, could there be issues for their utility and supply chain planning?
- > Do you think the regulation commencement should be phased depending on the type of building or development it is?
 - » If so, do you have a view on the optimal phasing, and associated costs and benefits, of the commencement date for different building or land types? For example, should a prohibition on residential areas apply to all residential areas from the date of commencement, or should it commence with high and medium density areas in year 1, low density year 2 etc.
- > Are you concerned about impacts on development costs and economic activity if a regulation commenced in late 2023? If so, how do you think those impacts could be managed?

Key Issue 7: Transition period and considerations

Buildings with a current Development or Building Approval

The ACT Government is committed to developing a regulation in consultation with the community that has minimal impact on existing plans which have already received Development Approval (DA) or Building Approval (BA). However, given the substantial cost associated with converting multi-unit developments to all-electric in the future and the risk that some developments will not have the space to be converted, we are seeking your views on whether it is appropriate for multi-unit developments that have already received a DA or BA to have the option of changing their plans to provide for an all-electric build, instead of proceeding with an approved – but not yet commenced or complete – development with new fossil gas connections and gas appliances.

A development application and subsequent approval (DA) does not specify the detailed level of information required to ascertain whether the development will include fossil fuel gas: this type of information is more applicable to the building approval (BA) process. For this reason, it may be appropriate to set the transitional arrangements to exclude developments that have a BA, with no reference to the status of a DA. Conversely, including only BA's could have implications for developers who have sunk costs in building design and pre-development sales.

The ACT Government anticipates there could be between 30-40 new multi-story buildings (above 4 stories) approved between the electrification pathway announcement and the regulation coming into place.

Providing a choice of being able to change an existing approval, from gas to fully electric, may provide substantial advantages to the builder, whose asset may diminish in value if it proceeds with gas, when fossil fuel gas is being phased out. Further, it may provide benefits to building owners, who do not need to undertake costly retrofits to achieve an all-electric conversion in around twenty years

Supply chain and demand for components required for all-electric buildings

Many building components and appliances required to build all electric come from manufacturers outside Australia. Since the global pandemic there have been widespread global supply chain disruptions including in the building and construction industry, making sourcing some components and appliances difficult in Australia.

Demand for all electric components and appliances is now increasing in other parts of Australia as state and territory governments have started offering incentives to residents who convert to more energy efficient or electric options in buildings. Changes to the NCC to expand energy efficiency requirements for new residential buildings, coming into effect in late 2023, will likely increase demand for all electric buildings in Australia.

Global supply chain disruptions coupled with an ever-increasing demand for all electric components and appliances puts the building and construction industry at risk of having difficulty sourcing the building materials required to comply with a future regulation.

We are considering the need to transition to meet net zero emissions against the risk that rapid transition to electrification could have a negative impact on the building and construction industry and economic activity in the Territory.

Workforce impacts

We understand that regulation is the first step in the broader energy transition and will shape the future of the ACT's workforce.

Initially, the regulation is likely to result in a decline in gas fitting work associated with new developments. The regulation will also impact staff employed to work on the gas network providing new connections. Conversely, work for electricians will increase, with additional electrical work required in new buildings.

We are engaging a consultant to provide modelling of the ACT workforce that will identify the skills required for the ACT's broader energy transition. Skills and job transfer is an important part of the transition, as well as identifying opportunities for new business opportunities.

Impact on individuals' rights

Regulation may be appropriate to restrict an individual's choice when the harms experienced by society, from the individual's choice, is greater than private benefit to the individual.

A reduction in a consumer's right to choose was noted as a concern in the Inquiry into the enabling legislation. The regulation will not ban the use of gas in the ACT. However it will reduce individuals' ability to make a new connection to the fossil fuel gas network in prescribed circumstances.

Consultation questions – Key Issue 7

- > Do you think developments with existing approvals should be provided with a choice, or encouraged, to change an existing approval from gas to electric? You might want to think about:
 - » when this process should be triggered, i.e. once approval has been given but prior to construction commencing or completion?
 - » any cost impacts of resubmitting development applications so the development is all-electric?
- > Other than building and development approvals, are there other transitional matters that the ACT Government should consider in developing the regulation?
- > What workforce skills and industry capabilities are required to support a regulated requirement that new developments be built all-electric?
- > Are you concerned that the proposed regulation may impact on your individual rights? If so, please tell us how you think it might impact on your rights?



7. Future work: The Integrated Energy Plan

Whilst the focus of this Issues Paper is to seek community feedback that will help shape a future regulation to prevent new fossil fuel gas connections, we understand that the community is deeply interested in the broader energy transition, and the development of our 'Integrated Energy Plan'.

The ACT Government will release a draft Integrated Energy Plan in 2023, that will outline the proposed pathway to electrification. Community feedback will be sought on the draft plan. The plan will have a focus on the following themes:



Equitable transition

We understand that low-income households and renters may be disproportionately impacted by the Territory's broader energy transition as reduced demand for gas drives up fossil fuel gas prices.

A benefit of the proposed regulation is that low income, vulnerable households, and renters will not need to transition properties that are built all-electric.

Ensuring that the broader transition is equitable and supports are available for our vulnerable and low-income communities will be a focus in the Integrated Energy Plan.

During transition, low-income households that use fossil fuel gas for heating and cooking may be disadvantaged because they cannot afford the upfront costs associated with upgrading to electrical appliances but will remain locked into the gas network as gas prices continue to rise. Low-income households also tend to have less insulation and other energy-efficient features in their home with fewer financial resources to upgrade, which would otherwise help offset the costs of higher gas bills for heating.

Renters, who are responsible for paying energy bills, may be vulnerable during transition as they typically do not have control over the



energy source used in their rental properties. Landlords may be slow to make the necessary changes to switch to electric appliances, leaving renters with higher gas bills and limited options for heating and cooking. Additionally, renters are often not be able to make energy-efficient upgrades to their home, such as adding insulation in the walls or double-glazed windows, which would help offset the cost of higher gas bills for heating.

The ACT has introduced new requirements that all rental properties without ceiling insulation

or with a thermal resistance value below R2, have either ceiling insulation installed or have the property upgraded to a thermal resistance value of R5 or above (the higher the R-value of the property, the less heat is lost due to insulation). While this is likely to improve the energy performance of rental properties, it will not completely offset the cost of higher gas bills for heating and have no impact on gas bills for hot water heating or cooking.

Future regulatory approaches

We know that additional regulatory approaches, beyond preventing new fossil fuel gas network connections, will be required in the future to help us reach net zero by 2045. Whilst this consultation, and the regulation that will follow, can only determine the circumstances that we may prohibit new connections, the Government is also in the early stages of considering what other regulatory incentives and levers may be needed to achieve net zero by 2045.

We know that in the future it is likely that the cost of fossil fuel gas will continue to rise, pushing the burden of that cost onto those who pay energy bills and potentially having a negative impact on the financial value of properties that use gas appliances.

We are interested in your views as to what additional regulatory interventions or levers should be prioritised in the early stages of the Integrated Energy Plan.

Consultation Questions – Chapter 7

- Are there any actions, regulatory interventions or levers you would like to see prioritised in the ACT Government’s development of the first Integrated Energy Plan?

8. Have your say

8.1 What we have heard so far

Canberrans want to see governments take strong action on climate change and there is broad support for the ACT Government's targets to reach net zero emissions by 2045. Although there is still not widespread awareness of the Government's intent to transition from gas by 2045, the majority of Canberrans are aware of the environmental impacts of gas and consider electricity to be a better energy source for the environment. This is a trend that has been increasing slowly over time, with more Canberrans choosing to make the switch from gas to electric, citing environmental and cost saving factors as a key driver.

As more Canberrans begin to upgrade their appliances and energy systems to all-electric, it is important that we design new buildings in way that does not lock households and businesses into using gas in the future. Preventing new fossil fuel gas network connections by 2023 is the first significant step in the ACT's plan to transition from gas and there are many complex challenges that need to be addressed with the help of our community.

After announcing the ACT's intention to transition from fossil fuel gas, the ACT Government began an education and engagement program to identify key issues for the transition and develop solutions. These activities have centred broadly on providing information to key stakeholders on the modelling behind the ACT's policy direction as well as seeking feedback on the commitment to prevent new gas connections from 2023. Two recent stakeholder engagement activities were delivered in November 2022 as part of this project. A series of key themes have arisen out of these two activities.

Pathway to Electrification Industry Forum

On 10 November 2022, the ACT Government held the first of what will be a series of ongoing industry forums, designed to share feedback on the Territory's transition pathway. The Pathway to Electrification Forum brought together key stakeholders from impacted industries and the community sector with the aim to establish a unified, baselevel of understanding around the pathway, including economic modelling, market factors, and global lessons learned that have been factored into the ACT Government's decision-making process. The Forum was also an opportunity for key stakeholders to raise issues on their key concerns and challenges presented by the transition.

Stakeholder workshops

In November 2022, five stakeholder workshops were facilitated by an external consultant to support the development of this Issues Paper. Three key issues up for discussion, including:

- > current uses for mains gas
- > impacts of preventing new mains gas connections; and
- > implementation of new regulation.

The workshops were segmented by stakeholder groups and explored different views and perspectives held by building and construction groups, community organisations, trades associations, property and developer groups, and households.

Key themes that we have heard from consultations to date

Rising costs and low-income households

- > Reduced demand for gas will drive gas prices higher. We need to prioritise supporting low-income households and renters who will be disproportionately impacted by higher gas prices.
- > As the workforce moves to electrification, tradespeople still working in gas will be more sort after and can charge higher costs for services, disproportionately impacting low-income households.
- > A focus on electrification can mean decreased competition in the energy market resulting in higher costs for consumers generally.

Energy supply

- > It is important to consider the impact of increased electricity demand on the electricity grid. There are significant community concerns that the current infrastructure will not be able to support future demand and there are risks around relying on one energy source to power our city.
- > Energy users want surety about the availability back-up energy in a power outage: Gas is viewed as an energy source that can be used during blackouts.

Supply chain issues

- > Supply chains may not be ready to meet the increasing demand for electrical appliances and components to support electrification.

Workforce impacts

- > Skills and job transfer will be an important part of the transition, as will identifying opportunities for new business opportunities.
- > The Territory will require a strong trades industry with qualified electricians to support electrification.
- > There may also be a potential decline in tradespeople working in gas as there is a corresponding increased need for disconnection services

Implementation considerations

- > Government needs to be transparent about project timeframes for preventing new network gas connections.
- > Preventing new gas connections will have significant cost and timeframe implications on existing Development Applications – which in turn may lead to project closures or costs being passed to consumers. Reducing barriers and/or providing incentives for developers to switch from gas to electrification during this period could assist.
- > Sufficient time, effort and resources need to be directed toward raising public awareness of the change, the benefits and suitable alternatives to existing systems and appliances.
- > Heat pumps can require more space than gas network appliances, which may impact on new builds and retrofits.
- > The benefits of induction cooking need to be better publicised, including its improved safety for children in kitchens as the risk of burns reduces due to the cooktop surface not getting hot.



8.2 Next steps

Following the public consultation period, the ACT Government will undertake a comprehensive review of all feedback. The outcomes of this consultation will aid the decision-making around timeframes for various elements of the fossil fuel gas transition. Feedback received will inform the development of a regulation impact assessment, which will outline the costs and benefits of the proposals, and will inform the Minister's decision on the content of a regulatory response. The regulation impact assessment will be tabled in the Legislative Assembly by the Minister. The ACT Government has committed to the regulation commencing in 2023.

9. Key terms

Acronym	Title
Amendment VC221	Gas Connection Amendment VC221 (Victoria)
AER	Australian Energy Regulator
BA	Building Approval
Bill	<u>Climate Change and Greenhouse Gas Reduction (Natural Gas Transition) Amendment Bill 2022</u>
CCGGR Act	<u>Climate Change and Greenhouse Gas Reduction Act 2010</u>
Climate Change Strategy	ACT Climate Change Strategy 2019-2025
CO	Carbon Monoxide
DA	Development approval
EU	European Union
Framework	National Energy Customer Framework
IPCC	Intergovernmental Panel on Climate Change
LPG	Liquid petroleum gas
Minister	Minister for Water, Energy and Emissions Reduction
NatHERS	Nationwide House Energy Rating Scheme
NCC	National Construction Code
NCP	National Capital Plan
NGL	National Gas Law
NGR	National Gas Rules
NO2	Nitrogen Dioxide
NOx	Nitrogen Oxide
Parliamentary and Governing Agreement	Parliamentary and Governing Agreement: 10th Legislative Assembly Australian Capital Territory
Sustainability Strategy	Suburban Land Agency Sustainability Strategy 2021-2025
Territory Plan	Territory Plan 2008
US EPA	United States Environmental Protection Agency





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